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A feasibility study of four dietary approaches in a pilot intervention trial for the study of diet and insulin resistance syndrome

Sunitha Vaidyanathan
University of Wollongong

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A FEASIBILITY STUDY OF FOUR DIETARY APPROACHES IN A PILOT INTERVENTION TRIAL FOR THE STUDY OF DIET AND INSULIN RESISTANCE SYNDROME

A thesis submitted in fulfilment of the requirement for the award of the degree of

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by

Sunitha Vaidyanathan, M.Sc

DEPARTMENT OF PUBLIC HEALTH AND NUTRITION

1998
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There are many people to whom I am indebted in writing this thesis. Foremost, I thank my Master and Lord Jesus who stood by me every minute and helped me to complete this study. Thank you Lord.

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ABSTRACT

Although there is agreement that diet serves as the cornerstone for the management of insulin resistance and NIDDM, the most appropriate diet strategy in the treatment of diabetes remains to be completely established. Several dietary approaches have been proposed in an effort to overcome these complications of which a high-carbohydrate/low-fat, a high monounsaturated and a low glycemic index dietary regimens have gained popularity. However, concerns have been raised on the metabolic efficacy of these dietary approaches. The suggestion that these dietary approaches in isolated forms or in combined forms could be the solution remains equivocal. In order to investigate the efficacy of these approaches, large scale multi centre studies are required, but before undertaking such a major study, a pilot study is needed to help answer the practical questions involved in implementing these diets particularly in a free-living environment. Therefore, this study aimed to assess the feasibility and achievability of these four dietary approaches in their isolated forms namely high-carbohydrate/low fat diet (HCLF), low glycemic index diet (LG), high monounsaturated fat diet (MF) and in their combined form [high monounsaturated fat and low glycemic index diet (MFLG)].

These four intervention diets, along with a control diet were administrated to 44 overweight but otherwise healthy free-living individuals. Participants were randomly allocated to the diet groups for a period of eight weeks. Participants were given individualised counselling with the aid of dietary guidelines and sample meal plans. Dietary compliance was measured using a diet adherence/acceptance questionnaire and the difficulties participants faced while following the diets was obtained by using focus group discussions.
The findings of this study indicate that the feasibility of incorporating high monounsaturated fat diets in free-living individuals consuming a Western style diet is difficult and requires further research. The feasibility of incorporating low GI foods was found to be successful, however, acceptability of low GI foods was found to be reduced which was revealed in the focus group discussions. Despite the successful incorporation of low GI foods, the targeted difference in the GI score (13 units) was not achievable between the groups. The methodological difficulties encountered while calculating GI scores and missing GI data of many foods may have contributed to the problems in establishing this difference.

In conclusion, this study emphasises the need for adequate dietary compliance to evaluate the efficacy of recommended diets on the metabolic indicators of insulin resistance.
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GLOSSARY OF ABBREVIATIONS

ADA  American Diabetes Association
BMI  Body mass index
C    Control diet/group
CVD  Cardiovascular disease
GI   Glycemic index
GTT  Glucose tolerance test
HCLF High-carbohydrate/low-fat diet
HDL  High density lipoprotein
IDDM Insulin dependent diabetes mellitus
IGT  Impaired glucose tolerance
IRS  Insulin resistance syndrome
LDL  Low density lipoprotein
LG   Low glycemic index diet
MF   High monounsaturated diet
MFLG High monounsaturated-low glycemic index diet
MUFA Monounsaturated fatty acid
NEFA Non esterified fatty acid
NHMRC National Health and Medical Research Council
NIDDM Non insulin dependent diabetes mellitus
PUFA Polyunsaturated fatty acid
SFA  Saturated fatty acid
VLDL Very low density lipoprotein
WHR  Waist-hip ratio
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CHAPTER ONE

INTRODUCTION

1.1 Background

The approach to dietary treatment of non-insulin dependent diabetes mellitus (NIDDM) has dramatically changed in the last decade. There has been increasing awareness that the diabetic diet should not only facilitate normalisation of blood glucose but also prevent cardiovascular disease by improving serum lipid levels. There is considerable evidence that individuals with diabetes are at high risk of cardiovascular disease (CVD), with data from longitudinal studies suggesting that the risk of CVD is two to four times higher in NIDDM patients than in individuals without diabetes (Gerstein and Yusuf, 1996). This risk is considerably high in individuals who display resistance to insulin-stimulated glucose uptake popularly known as insulin resistance.

It is common knowledge that insulin resistance is a major feature linking NIDDM with a cluster of atherogenic disorders which include glucose intolerance, dyslipidemia, obesity and hypertension (Reaven, 1992). Resistance to insulin stimulated glucose uptake appears in individuals well before the manifestation of NIDDM, predicting the development of diabetes in later years. Identification of insulin resistance in individuals along with associated atherogenic abnormalities could help in preventing or delaying the development of NIDDM and related disorders.
Since insulin resistance is a known cause for diet related disorders, much interest is currently focused on the influence of dietary intake on insulin sensitivity. Despite a great deal of research, the role of diet in affecting insulin sensitivity is not fully understood. In addition, there is a lack of intervention studies comparing the effects of diets on insulin resistance and associated factors.

At present, a high-carbohydrate/low-fat diet is recommended to improve insulin sensitivity and NIDDM. However, this recommendation has been questioned, as there is growing evidence that, in patients with diabetes, a high-carbohydrate/low-fat diet does not improve blood glucose and plasma lipid concentrations. The benefit of obtaining lower concentrations of low-density lipoprotein (LDL) cholesterol with a high-carbohydrate/low-fat diet, is countered by an increase in fasting triglyceride levels and a decrease in high-density lipoprotein (HDL) cholesterol levels. In addition, a high-carbohydrate/low-fat diet is also claimed to increase plasma insulin and blood glucose levels (Stout, 1990). Furthermore, adherence to this diet has been shown to be unsatisfactory over a long period of time (Campbell et al, 1989) which further questions the judiciousness of recommending a high-carbohydrate/low-fat diet to individuals with diabetes as well as individuals who are prone to acquire diabetes.

An alternative to the high-carbohydrate/low-fat diet is a diet in which the total amount of fat is not decreased but the type of fat consumed is changed to unsaturated fats, mainly monounsaturated fats. Diets rich in monounsaturated fats are considered safe since they have been consumed for centuries in Mediterranean countries where CVD and the total mortality rate are extremely low (Keys et al, 1986). A diet high in monounsaturated fat results in better blood glucose control, lowered concentrations of LDL, triglycerides and
very-low density lipoproteins (VLDL) and increased HDL levels. However, increasing the intake of monounsaturated fats in Western diets seems to be an unachievable task (Knapper et al, 1996) rendering the metabolic advantages of the diet ineffective.

More recent investigations recommend a low glycemic index (GI) diet. A low glycemic index diet mainly focuses on the type of carbohydrates, which are digested slowly, raising the blood glucose levels gradually. Slowly digested carbohydrates are said to improve glucose and lipid metabolism in NIDDM and also increase the satiety value by suppressing hunger pangs (Wolever et al, 1991; Wolever et al, 1992). The experimental base to support this claim is limited, and not all studies agree. Coulston et al (1984a; 1987), for example, failed to observe any beneficial effect using a low GI diet. Conflicting results have led to the speculation of the clinical utility of GI in diabetes treatment.

Although a number of dietary approaches have been proposed for diabetic treatment, confusion still remains as to which is the ideal diet. Is there an optimal dietary approach to overcome diabetes? Would combining more than one approach yield better results? To answer these questions, it is necessary to conduct multi centre diet intervention trials which would establish the single and joint dietary effects on IRS and NIDDM. Prior to conducting large scale studies, it is important to conduct pilot intervention studies which are essential to bring out the feasibility issues involved.

An important feasibility issue often raised is whether the proposed diets would be accepted and adhered to without any difficulty, by individuals with diabetes as well as by individuals who are inclined to develop diabetes. Promoting dietary adherence among patients with diabetes is a major hurdle as pointed by Kurtz in 1990. The first step in promoting adherence
is to understand the feelings and attitudes of the individuals for which the qualitative research technique of focus group discussion is found to be an excellent tool. This tool is believed to bring out the perceptions of individuals and is claimed to provide insight into the motives and reasons for reported attitudes and behaviours.

1.2 Aims of the Study

The major aims of this IRIS pilot study are to investigate the practical and methodological issues involved in introducing four important diet regimens namely a high-carbohydrate/low fat diet, a low glycemic index diet, a high monounsaturated diet and a combination of the low glycemic index and a high monounsaturated diet, ad-libatum among free-living population. It also aims to study the acceptability of these diets and identify any difficulties faced while following them. Further, it aims to determine the sample size needed to conduct similar diet intervention trials on a larger scale.

1.3 Specific Objectives

The specific objectives of the study are subdivided into the primary and secondary objectives.

1.3.1 Primary objectives

The primary objectives of this study are,

1. To study four intervention diets namely a high-carbohydrate/low-fat diet (HCLF), a high monounsaturated diet (MF), a low glycemic index diet (LG) and a fourth form which is a combination of high monounsaturated and low glycemic index diet (MFLG).
2. To develop these diets based on the recommendations of the American Diabetes Association.

3. To assess whether these diets are practical, acceptable and feasible.

4. To assess whether it is feasible to achieve the targeted increase in monounsaturated fat intake and decrease in saturated fat intake.

5. To assess whether it is feasible to introduce and incorporate low GI foods in the daily diet.

6. To assess the nutrient intake of the participants using diet histories and weighed food records.

7. To assess the food intake pattern of the participants using food frequency questionnaire.

8. To determine participants’ adherence and acceptance of the dietary changes introduced using a diet adherence/acceptance questionnaire.

9. To explore the difficulties encountered while adopting dietary recommendations using focus groups.
1.3.2 Secondary objectives

The secondary objectives of this study are,

1. To assess the impact of these diets on anthropometric measurements of weight, body mass index (BMI), waist-hip-ratio (WHR), systolic and diastolic blood pressures, total body fat and skinfold measurements.

2. To assess the impact of these diets on biochemical variables: plasma glucose, plasma cholesterol, plasma triglycerides, HDL and LDL concentrations and non-esterified fatty acids (NEFA) levels.

1.4 Outline of the Study

Visit:

Subjects were seen four times - screening, baseline (week 0) which was the start of the intervention period, week 4 which was the mid-intervention period and week 8 which was the end of the intervention period.

Study groups:

The study groups consisted of four intervention groups namely high-carbohydrate/low fat group (HCLF), high monounsaturated fat group (MF), low glycemic index group (LG), high monounsaturated fat and low glycemic index group (MFLG) and a control (C) group.

Observations made:

- Food and nutrient consumption patterns using food frequency questionnaires, diet histories and food records.
• Anthropometric measurements (height, weight, BMI, WHR, systolic and diastolic blood pressures, total body fat, skinfold measurements at biceps, triceps, subscapular, suprailiac, abdomen, thigh and calf).

• Biochemical analysis of plasma glucose, plasma triglycerides, plasma cholesterol, HDL, LDL and NEFA.

• Acceptability of the diet using diet adherence/acceptance questionnaire

• Difficulties encountered while following the diet using focus groups.

1.5 Significance of the Study

Diet is the cornerstone for the prevention and treatment for IRS and diabetes. Several different dietary approaches have been proposed to overcome the complications of diabetes and IRS. However, there is no consensus on the most appropriate diet strategy and there are no comparative results of the efficacy for these diets. In addition, the emphasis on carbohydrate and fatty acid modifications which these diets propound is still under scrutiny. So far, no agreement has been reached as to which nutrient is of greatest importance and should therefore, be given priority. Moreover, the suggestion that a combination of these diets could be the solution remains ambiguous. Hence there is a need to compare the single and joint effect of these dietary treatments in order to identify the optimal diet which may contribute towards treating diabetes.

However, before venturing into studying their comparative efficacy, there is a need to understand the feasibility issues involved in implementing these dietary treatments. This
study recognises the need to identify the feasibility of introducing these diets under normal conditions of everyday living. The practicality and acceptability of the diets is vital since there is no benefit in proposing diets if they cannot be followed, particularly under a free-living environment. This study will also identify the difficulties encountered by the participants while adopting the diet. This information would contribute to the understanding of social and psychological issues involved in introducing diets among humans. Moreover, the methodological issues related to such research will be identified.

Since this pilot investigation is planned only for a short term (8 weeks) with a small sample size, the metabolic impact may not be apparent. However, it will yield valuable findings, particularly in planning studies of a similar nature for larger groups over an extended period of time.
2.1 Overview

Insulin resistance (IRS) is a common phenomenon which plays a pivotal role in the pathogenesis and clinical course of several important human diseases particularly NIDDM and thereby CVD. Hence, Foster (1989) has described insulin resistance as ‘a secret killer’. This description clearly indicates the potential importance of insulin resistance confirming the need to understand its role in the etiology of NIDDM and CVD.

As diet plays the predominant role in influencing the development of IRS and NIDDM, diabetologists are always seeking to identify an optimum dietary treatment for the above conditions. However, despite several suggestions, opinions on an optimum diet remain unsettled. Consequently, there is a need to assess the influence of the suggested diets on IRS and understand their advantages and disadvantages. This review therefore examines the effect of diet in IRS with an emphasis on the high-carbohydrate/low-fat diet, high monounsaturated fat diet and low glycemic index diet as these are some of the important dietary treatments recommended to overcome the metabolic complications of IRS and NIDDM.

The complete benefit of these dietary approaches can only be achieved if they are accepted and adhered to without any difficulties. Therefore, this review examines the dietary
compliance of these regimens and difficulties associated in complying with these dietary regimens.

2.2 Insulin Resistance

The term 'insulin resistance' when applied to human disease, is often equated with impaired insulin stimulated glucose disposal. This insulin stimulated glucose disposal is the chief factor underlying various conditions, all of which predispose CVD (Reaven, 1988). Also known as 'Syndrome X', it is defined as a diminution of the biological response to a given concentration of insulin (Frayn, 1993) and is associated with a clustering of metabolic disorders (DeFronzo and Ferrannini, 1991).

Reaven first proposed the major role of insulin resistance in human disease in his Banting Lecture in 1988. He described insulin resistance as the resistance to insulin-stimulated glucose uptake, which is characteristic of individuals with either impaired glucose tolerance (IGT) or NIDDM. As a consequence of the resistance, glucose concentrations rise slightly leading to compensatory release of insulin which, in turn, results in hyperinsulinemia. Evidence shows that hyperinsulinemia is a risk factor for the development and clinical course of three major related diseases - NIDDM, CVD and essential hypertension (Reaven, 1988; Haffner et al, 1992).

Nevertheless, not all individuals with insulin resistance and hyperinsulinemia develop diabetes, probably because of their body's capacity to increase insulin secretion appropriately. Only those individuals with reduced or defective insulin secretion or, those
with impaired insulin action in target tissues, are susceptible to develop diabetes and other related disorders.

Clinically, IRS is characterised by metabolic, anthropometric and haemodynamic abnormalities (Laws and Reaven, 1993). They include

- Glucose intolerance/diabetes
- Hyperinsulinemia
- Dyslipidemia (raised plasma triglycerides and diminished HDL cholesterol levels)
- Obesity (particularly central obesity)
- Hypertension
- Disordered uric acid metabolism and
- Raised levels of plasminogen activator inhibitor

There is increasing evidence that the above listed disorders cluster together into a metabolic syndrome accelerating the development of CVD particularly in individuals with hypertension. These risk factors also induce the development of NIDDM, which subsequently progresses into CVD. In short, it is suggested that insulin resistance is a potential inducer of NIDDM, hypertension and CVD.

2.2.1 Etiology of insulin resistance

Insulin resistance may be genetic and/or can be acquired due to the influence of environmental factors. Evidence of a genetic basis in normal-weight individuals with
NIDDM comes from studies of identical twins and is also suggested by the high prevalence of insulin resistance and resulting NIDDM in certain racial groups (Haffner et al, 1988). Some of the common causes for acquiring insulin resistance are unfavourable dietary intake; obesity; lack of physical activity; cigarette smoking, and aging. It may also emerge as a consequence of diseases and drugs that antagonise insulin action (Williams, 1994).

2.2.2 Metabolic abnormalities in insulin resistance

Insulin resistance is characterised by insufficient production of insulin or inefficient uptake of glucose stimulated by insulin. The resultant rise in blood glucose concentration is associated with a compensatory increase in insulin levels leading to hyperglycaemia and hyperinsulinemia respectively (Williams, 1994).

Hyperinsulinemia is considered to be a distinctive feature of insulin resistance. Epidemiological studies have shown that hyperinsulinemia is a risk factor for diabetes (Haffner et al, 1992) and for morbidity and mortality in CVD (Ducimetiere et al, 1980). In addition, it has been proposed that hyperinsulinemia may be causally related to the development of hypertension (Reaven, 1988). However, experiments with humans and animals with secondary forms of hypertension have shown that they do not develop insulin resistance and when subjected to antihypertensive treatment did not show any improvement in insulin resistance (Williams, 1994). Thus, it can be stated that not all individuals with hyperinsulinemia are hypertensive, and not all hypertensive individuals are
Nevertheless, the presence of hyperinsulinemia together with hypertension in individuals is thought to be a critical factor in the development of CVD.

Obesity and body fat distribution are also considered to be important disorders affecting insulin resistance. Not only the increase in body weight but also the distribution of adipose tissue tends to influence insulin action (Björntorp, 1991). Central adiposity, with waist-hip ratio (WHR) greater than one, is found to impair the insulin action gradually progressing to glucose intolerance and to diabetes (Storlien et al, 1996). Several studies show that abdominal or upper body (android) obesity is more closely associated with glucose intolerance and insulin resistance than lower body (gyneoid) obesity (Carey et al, 1996; Abate, 1996).

Another frequent occurrence in insulin resistance is dyslipidemia, which is often associated with elevated plasma triglyceride levels and decreased HDL concentrations (Stern et al, 1989; Taskinen, 1995). The elevation in plasma triglyceride concentration results in an increase in VLDL-triglyceride secretion and LDL cholesterol leading to hypercholesterolemia (Goldberg, 1981). The decrease in the HDL level hinders the protective, antiatherogenic role played by this lipoprotein (Howard, 1987). Such deviations in the lipid profile act as the major contributing factor for coronary metabolic abnormalities in patients with diabetes (Krentz, 1996).

In summary, resistance to insulin-stimulated glucose uptake combined with hyperinsulinemia, glucose intolerance, increased plasma triglyceride, increased LDL
cholesterol, decreased HDL cholesterol and hypertension has been shown to increase the risk of developing NIDDM and subsequently CVD (Reaven, 1988). These disorders are also considered to be independent risk factors for the development of CVD. It is known that these disorders are influenced by many environmental factors, particularly by dietary consumption. Hence the effect of diet on these disorders is a major concern.

2.3 Effect of Diet in Insulin Resistance

The association of dietary carbohydrates, fats and fibre with the development of insulin resistance and NIDDM has been verified through several studies (Hollenbeck et al, 1986; Storlien et al, 1991; Marshall et al 1994).

2.3.1 Effect of carbohydrate intake

An improvement in insulin sensitivity has been shown in individuals with IGT consuming a high-carbohydrate and a fibre rich diet (Anderson and Ward, 1979). This finding has been repeatedly shown in many studies, which forms the basis for the current dietary recommendation in the treatment of diabetes. In addition to improving insulin action, high levels of carbohydrates in the diet have shown to produce better glucose tolerance and lower total and LDL cholesterol levels (Simpson et al, 1981). On the other hand, Borkman et al (1991) did not observe any difference in the insulin sensitivity after a high carbohydrate diet. Instead they found an unfavourable increase in plasma triglycerides and decrease in HDL cholesterol levels. As mentioned above, it is well known that increased plasma triglycerides and diminished HDL cholesterol levels induce CVD especially in NIDDM patients.
2.3.2 Effect of fat intake

A high fat intake is positively associated with fat cell enlargement and insulin resistance. Epidemiological (Marshall et al, 1994; Stern and Haffner, 1986) and animal studies (Storlien et al, 1986; Storlien et al, 1991) using high fat diets, particularly high in saturated fats, were found to produce insulin resistance. Lovejoy and Digirolamo (1992) supported this view by demonstrating a positive relationship between increased saturated fat consumption and insulin resistance in healthy free living individuals.

Saturated fats are considered to be the main cause in the development of CVD since they tend to raise plasma cholesterol levels, particularly LDL cholesterol concentrations. A comparison of epidemiological and dietary studies clearly show that among various types of dietary fats, only saturated fats have the ability to increase plasma cholesterol levels (Ferro-Luzzi et al, 1984; Schonfeld et al, 1982). A reduction in saturated fat intake is recommended for individuals with diabetes as well as normal individuals with the aim of decreasing dietary cholesterol levels.

It has been suggested that unsaturated fats should replace saturated fats because they are believed to be less harmful. Commonly found unsaturated fats in the diet are mono and poly unsaturated fats. Both types of unsaturated fats are found to be effective against reducing LDL cholesterol (Garg et al, 1988; Nestel, 1987) but polyunsaturated fats also showed an undesirable decrease in HDL cholesterol (Vega et al, 1982). Further, poor glycemic control was observed by Glauber et al in 1988 using ω-3 polyunsaturated fatty acids.
On the other hand, a high monounsaturated fat intake was found to decrease plasma triglycerides and VLDL cholesterol levels considerably while significantly increasing HDL cholesterol levels (Garg et al, 1988). Similar results were observed by Mensink et al (1989) and Rasmussen et al (1993) who further noted a significant reduction in systolic blood pressure levels. Hence, monounsaturated fats may be considered a better alternative for replacing saturated fats rather than polyunsaturated fats.

2.3.3 Effect of protein intake

Protein intake is said to be high in Western diets (Riccardi and Rivellese, 1991) where it mostly comes from meat and meat products (National Dietary Survey for Adults, 1986). Excessive protein intake from animal products could mean that there is a simultaneous increase in fat intake, particularly in saturated fats. Due to lack of sufficient evidence to support higher or lower intake of proteins, the American Diabetes Association (ADA, 1996) recommends adequate amounts to meet the adult recommended dietary allowance of 0.8g/kg body weight per day or 10-20 percent of the daily caloric intake.

2.3.4 Effect of fibre

Studies have shown that dietary fibre has important beneficial effects on blood glucose and lipoprotein metabolism. A study by Rivellese et al in 1990 compared three diets containing 20 grams (fat modified), 54 grams (low-fat/high-carbohydrate) and 16 grams (fibre depleted starch diet) of fibre per day. The results clearly indicated that fibre rich low-fat/high-carbohydrate diet improved blood glucose control and reduced LDL cholesterol
levels significantly. Hence, the consumption of dietary fibre is encouraged in individuals with diabetes.

2.3.5 Effect of alcohol

The relation of alcohol intake and mortality has been speculated upon for many years. Past studies have documented adverse effects of alcohol while the recent research claim that they have an anti-atherogenic effect (Marmot and Brunner, 1991; Maclure, 1993) in addition to the ability of preventing obesity (Suter et al, 1992).

In diabetes, alcohol is known to influence blood pressure, HDL and LDL cholesterol levels, triglycerides, fibrinogen and clotting factors. Choudhury et al (1994) conducted studies on the German population and found that HDL cholesterol increased while LDL cholesterol decreased with high levels of alcohol intake, thus increasing the protective effect against CVD. Similar outcomes were noted by other studies (Puddy et al, 1985; Keil et al, 1997). However, some negative effects were also seen with high intake of alcohol which includes increase in the serum triglycerides, systolic blood pressure, haemorrhagic stroke and CVD (Keil et al, 1997).

National Health and Medical Research Council (NHMRC) has advised patients with diabetes to cut down their consumption level to no more than two standard drinks per day (40 g/day) for men and no more than one standard drink (20 g/day) for women. However, total abstinence is suggested for people with a history of alcohol abuse or during pregnancy.
2.4 Physical activity

Diminished physical activity is said to induce insulin resistance (Fagard, 1993), obesity, diabetes, cardiovascular diseases, cancer and hypertension. Evidence from studies indicate that regular exercise enhances weight loss, improves insulin action (Oshida et al, 1989), lowers blood sugar levels, reduces certain cardiovascular risk factors and increases psychological well being in individuals, particularly in individuals with diabetes (ADA, 1996).

There are a number of reports concerning the positive effect of exercise, however, exercise alone is not sufficient to prevent diabetes. A combination of diet and exercise seems to be the most effective intervention. The Oslo Diet and Exercise Study (Anderssen et al, 1996) compared the single and joint effects of diet and exercise intervention and concluded that the combination of the two was more effective. Significant reduction in fasting insulin levels was seen in the combined group rather than the diet only or the exercise only groups.

In order to improve glycemic control and insulin action, exercise program lasting 20-45 minutes for at least 3 days per week and with 50-70 percent aerobic capacity is recommended along with an appropriate diet therapy (ADA, 1996).

2.5 Dietary Treatment in Insulin Resistance

An initial strategy in the treatment of insulin resistance and diabetes is to make appropriate food choices that primarily focus on improving blood glucose and lipid levels as well as in
maintaining optimal weight. Although many attempts have been made to achieve an optimal diet, there is still a struggle to identify a diet that improves the glycemic control as well as the lipid levels. A detailed account of the three currently recommended dietary regimens is given below.

2.5.1 High-carbohydrate/low-fat diet

Until recently a high carbohydrate/low-fat diet was recommended to treat NIDDM. It was believed that 'simple' sugars should be avoided and replaced by complex carbohydrates. This belief was based on the assumption that simple sugars were easily digested and were readily absorbed, thereby increasing the blood glucose levels. Simpson et al (1981) verified this premise by conducting experiments on 18 NIDDM and 9 IDDM patients using a high leguminous fibre/carbohydrate diet and a low carbohydrate diet for a period of 6 weeks. The results showed that the high carbohydrate/fibre gave a better overall blood glucose control in both NIDDM and IDDM individuals rather than a low carbohydrate diet.

Improvement in glucose tolerance has also been demonstrated using a high carbohydrate diet. In a study by Howard et al in 1991, a traditional Native American diet high in carbohydrates (70% carbohydrates and 15% fat) was compared with a Western high fat diet (43% fat and 65% carbohydrates). Results showed improvements in the insulin mediated glucose disposal as well as in glucose tolerance. However, the improvement in glucose levels were seen only when the carbohydrate content of the diet was extremely high which may be difficult to achieve in everyday practice.
An additional benefit of a high-carbohydrate diet is the blood-cholesterol-lowering effect. A study by Hollenbeck et al (1985) on IDDM individuals indicated significant improvements in fasting total plasma and LDL cholesterol levels. However, this study demonstrated a simultaneous undesirable increase in total plasma and VLDL triglyceride and a significant fall in HDL cholesterol concentration. Stout (1990) observed similar deleterious effects which questions the use of a high-carbohydrate diet in the treatment of diabetes.

Disadvantages of high-carbohydrate diets are further emphasised by Garg et al (1988) and Riccardi and Parillo (1993) who demonstrated a poor glycemic and lipid control by using these diets. Increased insulin production, leading to hyperinsulinemia has also been reported using high-carbohydrate diets. Studies conducted on IDDM and NIDDM patients comparing a high starch diet with a modified lipid diet showed significant rise in plasma insulin levels after the consumption of the starchy diet (Riccardi and Rivellese, 1991). Moreover, it was also noted that blood glucose control was aggravated in both IDDM and NIDDM individuals.

In addition to increasing carbohydrate levels, this dietary treatment also recommended a low fat intake. A reduction in total fat, saturated fat and cholesterol level is recommended. However, the rationale behind decreasing total fat intake remains disputed. The main contention is that saturated fat alone influences plasma cholesterol levels and the unsaturated fats (monounsaturated and polyunsaturated) do not have any hypercholesterolemic effect and may even be beneficial.
The main advantage of low-fat diets is the weight loss that can be achieved, particularly in obese patients. Some studies have documented a considerable amount of weight loss using a low-fat/high-carbohydrate diet, but this is found to be true only when the diets were extremely low in fat such as formula diets. Though a significant weight reduction was seen, Walker et al (1996) noted a disproportionate loss of lower body fat which resulted in an increased upper fat to lower fat ratio and is considered to be more hazardous than that of obesity.

In summary, even though some early studies have demonstrated the efficacy of the high-carbohydrate/low-fat diets in glycemic control and weight loss, the effectiveness is not fully established. Despite the lack of clear evidence, the current recommendations for patients with diabetes still insist on including high complex carbohydrates and decreased sugar and total fat intakes (ADA, 1998). Further research is required to determine the beneficial effects of high-carbohydrate/low-fat diets on not only the blood glucose improvement but also on the improvement of serum lipid levels. Moreover, the effect of reducing total fat intake needs to be compared with the effect of high unsaturated fat diets in order to identify the cholesterol-lowering capacity of the two diets. This comparison would help to establish whether a high-carbohydrate/low-fat diet is an appropriate recommendation for the patients with diabetes.

2.5.2 High Monounsaturated fat diet

Dietary recommendations for individuals with diabetes have changed dramatically in the last decade. Now, the focus is on modifying the fats consumed instead of decreasing the
total fat intake. Currently, emphasis is placed on substituting saturated fatty acids with monounsaturated fatty acids (MUFA) which are claimed to be effective against lipoprotein and blood glucose concentrations.

A high monounsaturated fat intake is thought to be a beneficial alternative to the existing regimens in the treatment of diabetes. In a study by Rasmussen et al (1996), it has been demonstrated that a high monounsaturated fat diet (MF) improves blood glucose and lipid concentrations besides lowering blood pressure levels. Improvement in the β-cell sensitivity to glucose and glycemic control was also noted by Low et al (1996) who conducted a twenty-four-hour meal study in 17 obese individuals with diabetes using hypocaloric diets containing high carbohydrates or high monounsaturated fats. Weight loss and improved glycemic control was seen in both groups. Nevertheless, the effect was found to be more pronounced in the MF diet group.

In a randomised crossover study, Garg et al (1988) compared a high MF diet with a high-carbohydrate diet on 10 NIDDM patients. The high MF diet resulted in lower glucose, insulin and VLDL concentrations while, HDL and apolipoprotein-A-I levels were higher when compared to the high-carbohydrate diet. No changes were seen in the total cholesterol, LDL cholesterol and apolipoprotein-B levels in the two diets, which perhaps, was due to the short duration of the study.

Similar results were demonstrated by The Jerusalem Nutrition Study, which assessed the effect of MF diets on 17 male Yeshiva students. The students were given a high-
carbohydrate and a high MF diet for a period of 6 months. The results revealed a decrease in total and LDL cholesterol levels on a MF diet, whilst, adverse effects such as an increase in plasma triglyceride concentrations and a decrease in HDL levels were noted using a high-carbohydrate diet (Berry et al, 1992).

Yet another study by Campbell et al (1994), compared a high MF diet (40% carbohydrate and 38% of fat with 21% monounsaturated fat) with a high-carbohydrate diet (52% carbohydrate and 24% fat) in 10 NIDDM patients. The patients prepared the diets at home and consumed each diet every alternative week for a period of 2 weeks with a washout of one week in between. The results showed that the high MF diet had better control over glucose and lipid concentrations than the high-carbohydrate diet.

Although these studies have illustrated beneficial effects of high MF diets, they must be viewed cautiously due to small sample sizes and short duration of the trials. Due to these limitations, the full effect of the MUFA may not become apparent and hence needs be verified using long term trials.

Only very few long term trials are available and interestingly of these, two studies exhibit conflicting results. The Zutphen Elderly Study, a major epidemiological study, demonstrated a positive relationship between the intake of monounsaturated fats and factors affecting insulin resistance (Feskens et al, 1994). In addition, fasting C-peptide levels which gives a clearer picture of insulin secretion, was found to be significantly correlated to increased saturated and monounsaturated fatty acids. A similar outcome was
reported by Marshall et al (1994) who observed an association between monounsaturated fat intake and increasing incidences of glucose intolerance and diabetes. These findings raise concerns as to whether high MF diets are as beneficial in the treatment of diabetes as they are claimed to be. However, the results of these studies should be carefully considered since they only used retrospective methods (diet history and 24 hour recall respectively) to measure dietary intake which could introduce within-person variations and memory errors.

Another concern raised about the use of high monounsaturated fat diets and high fat diets in general, is that, they may cause or aggravate obesity (ADA, 1998). However, this claim may be true only in diets high in saturated fats and needs further investigation.

In summary, the substitution of monounsaturated fats for saturated fats may appear to be a preferred option to prevent diabetes. Short term studies indicate that high MF diets show favourable effects such as improved blood glucose levels, enhanced insulin sensitivity, lowered LDL cholesterol, triglycerides and total cholesterol concentrations and increased HDL cholesterol levels. However, long term trials have shown contrasting results discrediting the effect of the MF diet. Therefore, well designed long term clinical trials are needed to substantiate the full benefit of a MF diet.

2.5.3 Low Glycemic index diet

The third dietary approach advocates the inclusion of slowly digested carbohydrate foods as they are said to have a beneficial effect on the glucose and the lipid metabolism in both
IDDM and NIDDM individuals (Wolever et al, 1991). The slow digestion of foods is also suggested to increase the satiety value promoting weight reduction in overweight and obese individuals (Wolever et al, 1992).

In recent years, the glycemic index (GI) concept has gained popularity as well as criticisms. The credibility of GI is mainly questioned in terms of its clinical utility in the treatment of diabetes and its application in practice. Lack of compelling evidence from long term studies has been the major obstacle in determining the clinical significance of GI.

2.5.3.1 Definition of GI

The glycemic index (GI) is defined as the systematic ranking of carbohydrate rich foods based on their acute glycemic response (Jenkins et al, 1981). The glycemic response is the ability of carbohydrate foods to raise glucose levels in the blood stream. Some carbohydrate foods elicit a greater glycemic response than others, since they are broken down quickly during digestion and are released rapidly as glucose in the bloodstream. Some others produce a relatively small response because they are digested slowly and are released gradually.

The GI is determined by comparing the acute glycemic response of a test food to a reference food in individual subjects. Portions of test foods and reference foods (glucose or white bread) containing 50 g of available carbohydrates are administrated to normal or subjects with diabetes on separate occasions after an overnight fast (Wolever et al, 1991). Blood glucose levels are measured and the results are plotted on a graph. The incremental
area under the response curve is calculated. The area under the blood glucose response
curve for the test food, expressed as a percentage of the mean response to the reference
food, gives the glycemic response of the food. The procedure is repeated in a group of
subjects and the results are averaged to give the GI value for the tested food. Jenkins et al
(1981) have outlined the glycemic index as,

\[
\text{Glycemic index (GI)} = \frac{\text{Area under the curve after the consumption}}{\text{Corresponding area after the consumption}} \times 100
\]

\text{of test food with 50 g of carbohydrate}
\text{of an equivalent portion of standard food}

Depending on the glycemic responses obtained which varies between a high peak to a
slow flat response, foods are classified into low, intermediate of high GI foods.

2.5.3.2 Classification of GI

Foods that are digested slowly, and therefore produce a small rise in the blood glucose
levels, are classified as low GI foods while foods that are digested more quickly are
classified as high GI foods. For example, potato is quickly digested and hence has a higher
GI value than pasta which is gradually digested, even though both foods are rich in
carbohydrates (Brand Miller et al, 1996). Some foods give an intermediate response and
they are classified as intermediate GI foods. The classification of some popular foods is
given in Table 2.1.
Table 2.1: The GI classification of some popular foods.

<table>
<thead>
<tr>
<th>Low GI foods</th>
<th>Intermediate GI foods</th>
<th>High GI foods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ploughman's/Fruit &amp; raisin Loaf</td>
<td>Crumpets</td>
<td>White/wholemeal bread</td>
</tr>
<tr>
<td>All bran / Sultana bran</td>
<td>Untoasted muesli</td>
<td>Cornflakes/Rice bubbles</td>
</tr>
<tr>
<td>Long grain rice</td>
<td>Basmati rice</td>
<td>Calrose rice</td>
</tr>
<tr>
<td>Apples, oranges, kiwi fruits</td>
<td>Banana/Rockmelon</td>
<td>Watermelon</td>
</tr>
<tr>
<td>Lentils and pastas</td>
<td>Beetroot</td>
<td>Potatoes</td>
</tr>
</tbody>
</table>

2.5.3.3 Factors influencing GI

The GI value of foods is influenced by several factors. Carbohydrate composition of the food is one of the main influences. The GI values of fresh fruit ranges from 22 for cherries to 66 for pineapples to 72 for water melons (Brand Miller et al, 1996). This difference in the GI values can be attributed to the monosaccharide composition of the fruits as well as their fibre content (Wolever and Brand Miller, 1995). Ripeness of fruit is also one of the contributing factors. Two studies tested the GI of bananas and found that under ripe bananas gave a lower glycemic response than the overripe ones (Wolever et al, 1988; Hermansen et al, 1992).

Types of starch also affect the GI of food. Long grain rice containing amylose starch appears to give a low glycemic response when compared to the amylopectin rich short grain varieties (Goddard et al 1984). The degree of gelatinisation and the rate of cooking of starch also have an impact on the GI (Collings et al, 1981).
The presence of lipids and protein, as part of a mixed meal, also act as a factor. A few studies failed to show predicted changes when individual carbohydrate foods were consumed as part of a mixed meal (Hollenbeck et al, 1988; Laine et al, 1987; Coulston and Hollenbeck, 1986). Some researchers argue that failing to detect any difference may be due to wrong interpretation of the data rather than the non existence of a difference (Jenkins et al, 1988). Several other factors such as the method of processing and preparation of foods, rate of ingestion, digestion and absorption of nutrients also affect the GI value (Truswell, 1992).

Methodological variables also influence the GI value of foods. The prime influence is the choice of the standard food. Glucose has been suggested to be the ideal standard food rather than white bread, because the GI of bread may vary due to type of flour and the method of processing involved (Brand Miller 1994). However, concerns have also been raised about the use of glucose due to excessive sweetness and the osmotic effect of glucose solutions (Wolever et al, 1991).

Food portion size, repeated testing of the standard food, frequency and length of time of blood sampling, method of calculation of the area under the curve, method of blood sampling and characteristics of the individuals involved in the tests and their degree of glycemic control have also been suggested to affect the GI obtained (Wolever et al, 1991).
2.5.3.4 Effect on glycemic and lipemic control

Several studies have examined the long term effects of low GI foods on the glycemic and lipemic control of IDDM and NIDDM patients. Brand Miller et al (1991), compared a high GI diet with a low GI diet in 16 NIDDM patients. Nine subjects were asked to consume a low GI diet containing porridge, oatmeal and pasta while 7 subjects were started on a high GI diet containing processed cereals and potatoes. Biochemical assessments at the end of the study period revealed a small improvement in the glucose profile with the low GI diet but no changes were seen in the plasma lipid levels. A similar study by Wolever et al in 1992 on 6 NIDDM subjects showed a significant change in both the glucose and the lipid levels. Studies on IDDM patients have also demonstrated modest improvements in both the glucose and the lipid metabolism (Collier et al, 1988; Fontville et al, 1988).

Brand Miller in 1994 reviewed the results of eleven medium to long-term studies that have applied the GI approach in the treatment of diabetes. A meta-analysis of eleven studies indicates an average of nine percent decrease in glycosylated haemoglobin, eight percent decrease in fructosamine, a twenty percent reduction in urinary C-peptide and sixteen percent decrease in blood glucose levels. Cholesterol level went down by six percent while triglyceride level decreased by nine percent. These modest improvements were achieved by exchanging approximately fifty percent of carbohydrates from high to low GI foods.

On the other hand, not all studies showed positive results. Studies by Coulston et al (1984a; 1987) did not show any significant difference in the plasma glucose response and
concluded that glycemic responses do not hold true in the concept of mixed meals.
Hollenbeck et al (1988) agreed with this conclusion by demonstrating little variation in the
plasma glucose response to high, intermediate and low glycemic mixed meals. Such varied
findings have raised a major debate on the clinical utility of the GI approach.

2.5.3.5 Clinical utility of GI

Many countries around the world have adopted the GI concept. In 1991, the American
Diabetes Association incorporated the GI concept into the diabetes regimen provided
patients maintained normal blood glucose levels. In Australia, The International Diabetes
Institute, Melbourne, has accepted the GI approach advising patients with diabetes to
include at least one low GI food at each meal (International Diabetes Institute, 1994).

Though the GI approach has been fairly widely accepted, the clinical utility and the long
term significance in the treatment of diabetes are still widely debated. The three main
contentions raised against the GI concept are, large individual variation in responses, lack
of difference between mixed meals and lack of uniformity in the results obtained from
different centres (Kolata, 1987).

Variations in individual response occur due to differences between individuals as well as
within individuals. Characteristics such as age, sex, body weight, race, presence or absence
of diabetes and type of diabetes are said to influence the glycemic response (Simpson et al,
1985a; 1985b). It is suggested that such variations could be minimised by testing the
glycemic responses to foods in a specific group to which the recommendations are made.
(Coulston et al, 1984b). Disagreement in the results obtained from different test centres is mainly attributed to the lack of standardised procedures and to the differences in physiological effects between foods. Nevertheless, Jenkins et al (1988) claim that some agreement has been shown in the GI obtained from different groups in different countries.

Another major criticism of GI is that when individual carbohydrate food is eaten with protein and/or fat as part of a mixed meal the effect of GI is lost (Coulston et al, 1987; Hollenbeck et al, 1988). Experiments conducted by these researchers failed to demonstrate the predictive ability of the GI as previously proposed by Wolever and Jenkins in 1986. However, Wolever (1990) insists that there is no substantial evidence to support this criticism.

Questions have also been raised about the judiciousness of applying the GI concept in the dietary regimen of individuals with diabetes (Coulston and Reaven, 1997). It is argued that GI is too complex and hence can be burdensome on individuals with diabetes as well as on health professionals (Perlstein et al, 1997). Further, they point out that minor variations in foods that cause a huge difference in GI may become difficult for patients to understand and follow. Conversely, some researchers insist that GI is easy, simple to practice and is well accepted by the individuals (Brand Miller et al, 1997). However, Wolever (1997) points out that GI is applicable only for highly motivated individuals who are willing to select specific brands and are ready to alter their food preparation methods.
2.5.3.6 Application of GI in practice

Brand Miller et al (1997) state that the application of GI is merely substituting low GI foods for high GI foods. They describe the approach as "simple, logical and helpful". This approach suggests inclusion of at least two low GI foods every day (Brand Miller, 1994). As mentioned above, International Diabetes Institute (1994) suggests inclusion of one low GI food at every meal, which is considered to be easier for patients to remember as well as to follow. However, some researcher claim that GI is complicated and the patients may not understand the theory involved (Coulston and Reaven, 1997). According to them, since GI depends on subtle variations such as the ripeness of bananas, physical form of foods such as cubed or mashed potatoes, it may become difficult to incorporate the concept into the diabetic regimen. In addition, GI relies on the type of food, method of processing, preparation, and manufacture of foods (Wolever 1997) which restricts the application of GI to the local area where the particular food is manufactured and tested.

Wolever (1997) suggests that care should be taken while applying GI in practice. Some low GI foods such as chocolate and peanuts may need to be restricted due to their high fat content while some high GI foods such as potatoes and carrots can be included liberally because of their low energy and high nutrient content. Recommendation of GI diets could therefore become complex for health care professionals as well as for patients with diabetes.

The administration of GI on patients with diabetes over a long period needs to be studied. Successful implementation of GI diets, particularly in the free living population is an area
open to research. Investigations that specifically address the practical issues associated with the implementation of GI also need to be investigated.

2.5.3.7 Advantages and disadvantages of GI

GI is a useful tool in proving the existence of differences in the glycemic responses of carbohydrate rich foods. GI has paved the way to end the long held belief that all carbohydrates elicit similar glycemic responses (Jenkins et al, 1981).

GI is also claimed to be a valuable therapeutic tool in diabetes therapy. As previously mentioned, some studies have shown that low GI foods improve blood glucose and lipid levels moderately. Another advantage of the GI is that it favours the inclusion of modest amounts of sugar and foods containing sugar in a diabetic diet. This is believed to enhance dietary compliance, avoid feelings of deprivation and improve psychological well being of individuals with diabetes without causing any adverse effect.

The classification of foods based on GI is said to facilitate the selection of ideal carbohydrate foods for IDDM and NIDDM individuals. Walton and Rhodes (1997) recommend athletes to consume low GI foods prior to exercise and high GI foods while exercising and during post exercise periods. The appropriate selection of carbohydrate food is said to give athletes' longer endurance capacity and faster recovery during peak sports performances.
Low GI foods are known to have excellent satiety value (Holt and Brand Miller, 1994) which delay hunger pangs and thereby promote weight loss in overweight and obese individuals. Low GI foods are also claimed to improve the glycemic response of the subsequent meals. A study by Wolever and colleagues (1988) documented that the low GI foods eaten at an evening meal improved the blood glucose response to the subsequent breakfast.

However, the GI has several limitations. The main limitation is the large individual variations. Within-person variations and variations between people affect the glycemic response obtained, which in turn, may tend to cause error in the GI values obtained. Also, GI tends to vary with a small variation in food composition or due to a change in the physical forms of foods. For example, the ripeness of the banana alters the GI largely making the under ripe bananas a low GI and the overripe a high GI. This may cause problems when identifying low GI foods.

Another primary disadvantage of GI is its misleading numerical data. Despite being high GI foods, potatoes and carrots are generally recommended for patients with diabetes because of their low fat content. Chocolates, peanuts and sausages are restricted due to their high saturated fat levels. The above illustration suggests that GI cannot be used in isolation but can only be utilised as a supplement to the food composition tables (Wolever, 1997). In addition, a low GI diet is believed to limit food choices severely (Franz et al, 1994). On the contrary, Wolever (1997) and Jenkins et al (1988) claim that diet variety
actually increases in a low GI diet. They suggest that the ethnic varieties of foods and different methods of food preparation are introduced to people using low GI diets.

The GI concept is also believed to be complex to understand not only for the lay person, but also for health professionals (Perlstein et al, 1997). This may give rise to difficulties in client education (Coulston and Reaven, 1997).

In summary, the glycemic index emphasises the type of carbohydrates in the diet that gives a low glycemic response, thus improving the blood glucose control. A few studies have established the improvement in the glycemic response using a low glycemic index diet. However, long term studies are needed to confirm whether low glycemic foods can improve glycemic response over a long period of time. Further, the methodological issues involved in introducing GI diets in free living populations' needs to be addressed. Also, the clinical relevance of GI diets which demonstrate a significant overall improvement in individuals with diabetes needs to be verified.

2.5.4 Combination of Dietary Treatments in IRS

The dietary treatments recommended to overcome insulin resistance and NIDDM have certain flaws which, perhaps could be negated by using more than one approach in the same treatment. However, no study has investigated the joint effect of the proposed diets. A combination of a low GI and a high monounsaturated fat diet along with reduced saturated fats would be interesting to study if the combined effect would favour all aspects of the glucose and lipid metabolism in diabetes.
2.6 Feasibility of Achieving Dietary Changes

Introducing dietary changes that could be easily accepted by the targeted group has proved to be a difficult task since people do not readily accept changes even after intensive education and motivation. A comparative study of three dietary regimens by Milne and associates (1994) on individuals with diabetes showed little or no dietary change among the participants even after regular instructions. Similarly, Laitinen and coworkers (1993) noted only 2 of 38 patients undergoing diet intervention were able to consume the recommended amount of dietary fibre.

In like manner, Drewnowski (1990) found that acceptance of low-fat diets was poor due to reduced food palatability. In contrast, one study showed that hedonic ratings for high fat foods declined in those who sustained low frequency of fat use (Mattes, 1993). Although such a shift was observed, it was not adequate to ensure dietary changes over a long period of time.

Dietary changes may be achieved by introducing a diet that is similar to the regular intake of the general population. This idea is reflected by Garg (1994) who believes that a high MF diet can be successfully substituted in Western households, as it does not deviate greatly from their regular consumption. In contrast, a study by Knapper et al (1996) failed to achieve the target increase in MF levels, even after supplying MUFA enriched foods to the participants.
In order to ensure the acceptance of dietary modifications, the changes introduced should be practical and realistic with goals that can be reached by individuals with diabetes. Moreover, the dietary advice should be individualised considering the likes and dislikes of individuals and should be appropriate for their personal lifestyle (ADA, 1998). The diet should also be acceptable in terms of palatability and availability. In addition, intensified counselling and education of the individuals are necessary to initiate desired changes.

2.7 Dietary Compliance (Adherence)

Dietary compliance is the chief concern of health professionals since it is a valuable non-drug method for reducing risk factors of chronic diseases. Past studies have shown that compliance can be achieved in diabetes therapy, but in practice it still remains a challenge. Compliance or adherence to diets (compliance and adherence are used interchangeably) is defined as the capability of individuals to adhere to the specified dietary recommendations (Glanz, 1980). It reflects the extent to which the individuals are required to modify their behaviour and lifestyle so as to follow specific guidelines and make appropriate food choices.

Cerkoney and Hart (1980) studied the compliance of individuals with diabetes mellitus and found that only seven percent of the individuals were fully adherent with all aspects of the prescribed regimen including diet. Another study by Kurtz in 1990 reported that patients with diabetes were mostly non-adherent. Similarly, Christensen et al (1983) and Glasgow et al (1987) observed that adherence to the diabetes diet averaged only 65 percent.
Difficulties encountered while adhering to the diabetic diet were identified as threefold McNabb (1997). According to him, the first difficulty is the complexity of the diabetes regimen, secondly, the individual characteristics of each patient and thirdly, the variability in formulation of the diets and the manner in which they are communicated to the patients. Difficulties also arise through situational obstacles such as eating at restaurants and declining offers of inappropriate foods from other individuals (Ary et al., 1986). Schlundt et al. (1994) point out specific situations such as negative emotions, resisting temptations, eating out, feeling deprived, time pressure, tempted to relapse, planning, competing priorities, social events, family support, food refusal and friends support to be barriers to adherence. These barriers tend to make individuals deviate from the specified regimen resulting in non-compliance. Hence, it is important to understand the underlying reasons that generate these barriers and other associated behaviours.

Understanding the barriers to adherence requires methods which would permit individuals to talk freely about these issues without being judged. Quantitative methods are inadequate for this purpose. Hence, qualitative methods such as focus group discussions are used, as they allow free discussions and group interactions (Morgan, 1988). They also permit interaction and sharing of ideas with other individuals who are facing similar difficulties.

2.8 Focus Groups

Many studies have been directed towards determining the obstacles responsible for poor compliance with the diabetic diet (Ary et al., 1986; Schlundt et al., 1994). These studies
were able to point to specific situations which gave rise to non-compliance but barely provided information on what causes these situations and how individuals cope with these situations. A promising approach in understanding the causes for these situations is to examine the social and psychological factors and any other related factors which hinder compliance.

Focus group discussion, one form of qualitative research, is effective in providing insight into psychosocial profiles. This technique is less formal and therefore overcomes the restrictions of forced response categories and the effects of functional illiteracy in survey data. It also provides descriptive data with respect to how individuals perceive difficulties in their own lives and indicates how they intend to manage these difficulties. It also supplies a wide range of views and ideas since it involves a group approach. In short, the focus group technique is an exploratory tool, obtaining in-depth information from a homogeneous group in a relaxed environment that encourages open discussion. It is defined by Basch (1987) as “...a qualitative approach to learn about population subgroups with respect to conscious, semiconscious, and unconscious psychological and socio-cultural characteristics and processes”.

The focus group technique involves in-depth, directed discussion with small groups where participants feel comfortable enough to share personal experiences openly with no threat of judgement or disapproval. This permits understanding and insight into beliefs, opinions, feelings, attitudes and behaviours which are not possible through quantitative methods (Murphy et al, 1992). Discussions are usually tape recorded and information is content
analysed for themes, concepts and ideas. However, the data obtained cannot be
generalised and cannot be used to draw conclusions in a quantitative sense. Hence, the
focus group method can only be used to supplement and verify data obtained from
quantitative research, rather than replace them (Egger et al, 1992).

Several nutrition related studies have used focus group methods successfully. Quatromoni
et al (1994) conducted focus group interviews on Caribbean Latino women and found that
focus groups provide useful information for planning innovative intervention programmes.
Similarly, Maillet et al (1996) used the focus group method to characterise health beliefs,
self-care practices in black women with NIDDM. One major theme, which emerged from
the focus group, was the motivation to prevent multiple barriers related to diet and the
need for family support in dietary management. In a similar study, Anderson et al (1996)
used the focus group method to elicit psycho-social issues in 34 black adults with diabetes.
The result showed that the most important issue raised was the food and eating habits
related to diabetes. The successful results of these studies indicate that focus groups are
effective for obtaining relevant, specific, in-depth information about the management of
diabetes particularly in relation to diet.

2.9 Dietary Assessment Methodology

In order to obtain credible data it is essential to employ reliable and precise methods that
estimate dietary patterns and nutrient intakes accurately (Buzzard, 1994). It is also
important to utilise methods that are quick and inexpensive (Retzlaff et al, 1997).
Dietary intake data is usually measured directly by measuring biochemical variables, or indirectly by using food diaries, self administrated questionnaires or interviews. While direct measures are said to produce reliable results, it is an expensive method in terms of cost and time. Self-reports obtained using indirect measures however, can produce valid information and are therefore, more commonly preferred in research. Though indirect measures may involve certain degrees of inaccuracies, these could be effectively utilised by combining more than one method.

2.9.1 Dietary assessment using indirect measures

The commonly used tools in indirect measures of data collection are diet histories, food frequency questionnaires and weighed food records.

2.9.1.1 Diet history

The diet history first developed and used by Burke (1947) is a detailed interview of the dietary habits of an individual over a period of time usually a week, a month or a year. Burke incorporated a 24 hour recall, usual frequency, a cross check list and a 3 day menu in order to make this tool appropriate for research settings and to enhance the accuracy of the data collected.

A comprehensive diet history provides an accurate estimate of the usual intake of the individuals in a given period of time. The results acquired using this tool are consistent and reliable since it is not influenced by day to day variations in the intake (Bingham et al, 1988). A diet history is relatively easy to conduct when compared to the other dietary
assessment methods (Mares-Perlman et al, 1993). Minor details such as food preparation, recipes and seasonal variations can also be evaluated which are difficult to obtain from other methods.

One limitation of this tool is that it is time consuming (Freudenheim, 1993) and requires trained staff to conduct the interviews. Possibilities of memory errors are high since individuals are expected to evaluate the consumption pattern over a certain period of time.

2.9.1.2 Food frequency questionnaire

A Food frequency questionnaire is a modified form of a cross checklist, first used in Burke’s diet history method. Food frequency questionnaires are designed to ascertain the average frequency of consumption of a list of food items with regard to a specified period of time (Zulkifli and Yu, 1992). The food items may be listed as individual foods or classified into groups of foods with similar nutrient composition (Teufel, 1997). The food frequency can be administered by an interviewer in a face to face interview or on the telephone, or can be self-administered. It has been claimed that self-administered questionnaires can be effectively used in the measurement of individual intakes (Willett et al, 1985), though some researchers disagree with this view (Pietinen et al, 1988; Sobell et al, 1989).

Food frequency questionnaires may or may not elicit details on portion sizes. The need for including the portion sizes in the frequency questionnaire is still under speculation. Block et al (1990) found that portion size data obtained provided more valid results when
correlated with the nutrient intakes obtained from dietary records. On the other hand, Hernandez-Avila et al (1988) failed to notice any valid results. In addition, the standard portion sizes provided in the questionnaire are said to create problems of overestimation of nutrient intake in older individuals (Cummings et al, 1987) and underestimation among young and middle aged men (Block et al, 1992).

Food frequency methods are excellent in determining the usual intake of individuals (Barret-Conner, 1991). However, food frequency methods have the tendency to yield higher estimates of nutrient intakes (Mullen et al, 1984; Jain et al, 1996). Lower estimates have also been reported (Pietinen et al, 1988). Such variations in nutrient estimates could be accounted to the differences in the recall ability of individuals (Kushi, 1994).

2.9.1.3 Weighed food record

Weighed food records are generally accepted as the current practical gold standard for dietary assessments (Carroll et al, 1997). In this method, the individuals are asked to weigh all the foods before consumption and leftovers are also weighed. Weighing scales, measuring cups and spoons are usually provided along with instructions in order to increase accuracy. In addition, individuals are also asked to note various details such as the ingredients, brand name and methods of food preparation used. Weighed food records are usually obtained over a period of 3 days, which include 2 weekdays and a weekend day. Some investigators try to acquire 7 day records but this could prove burdensome for the participants.
Weighed records provide accurate and precise data on the current food intake. Results from weighed records have been found to closely correspond with the results obtained from metabolic studies (Bazarre and Myers, 1980). However, weighed food records have been found to be intrusive as every single food consumed needs to be weighed and this places some burden on the participants. Also, some individuals may not record the foods at the time of consumption, which may introduce some amount of inaccuracy.

2.9.1.4 Combined methods of dietary data collection

Adopting more than one method is the best approach for an accurate data collection. Using a single method will introduce errors at each stage of the dietary assessment, which will result in large deviations from the actual estimates. A combination of retrospective and prospective methods is ideal since it supplies more information and provides more accurate data. Moreover, the data obtained using different tools could be compared and checked for their reliability and validity. A combination of diet histories, food frequency questionnaires and weighed food records could be useful in intervention studies as the usual intake as well as the absolute nutrient intake could be obtained.

It is also advantageous to use qualitative methods, in addition to the quantitative dietary assessment methods, since data that is missed by one method can be collected by the other. Certain data such as the social and psychological issues involved while making dietary changes can be obtained only by using qualitative methods (Egger et al, 1992). Hence, using a combination of methods could improve the accuracy of the dietary data collected.
2.10 Summary

In summary, although dietary treatment is accepted to play a significant part in the management of insulin resistance and NIDDM, controversy still remains as to which diet is best suited for treating such individuals. Past studies have proposed three main dietary regimens, which are believed to alleviate diabetes and the associated metabolic abnormalities. However, not one of these regimens is claimed to be entirely perfect. Therefore, it would be appropriate to compare the single and joint effect of these dietary treatments in order to identify the optimal diet, which may contribute towards treating diabetes. Before venturing into studying the comparative efficacy, there is a need to understand the feasibility and practical issues involved in implementing these dietary treatments because a successful treatment does not only depend on advocating the right diet, but also on adhering and following all aspects of the prescribed diet.
CHAPTER THREE

METHODS AND MATERIALS

3.1 Ethics Approval

The ethics approval for this pilot study (Insulin Resistance Intervention Study) was granted by the Human Research Ethics Committee of the University of Wollongong.

3.2 Study Design

The IRIS pilot study was a randomised, single blinded diet intervention trial comparing four ad-lib intervention diets and a control diet on free-living individuals. This study is single blinded, because the participants were not aware of the type of diet they consumed during the intervention period. Even though, they were asked to include certain foods and avoid certain foods, they were not explicitly told the type of diet they followed. This study was conducted for a period of 8 weeks.

3.3 Research Team

The investigator organised the intervention trial, developed the intervention diets and was involved in the development of questionnaires and other instruments used in the study. The investigator was also involved in diet counselling, conducting diet interviews, performing anthropometric measurements and diet analysis. Three other student researchers were also involved in data collection. Each researcher was allocated a set of participants and this same set was seen in the subsequent follow-ups by the same researcher. The investigator also designed and conducted the focus group interview. Further, the investigator was also involved in conducting the biochemical analysis.
3.4 Study Population
Healthy volunteers of both sexes in the age group of 35-70 were selected from the Illawarra region, NSW, Australia.

3.5 Sample Size
Nine individuals were selected for each of the five diet groups making up a total of 45 participants. At the baseline (week 0) this was reduced to 44 participants, as one person withdrew from the study. However, only 41 subjects successfully completed the study because three individuals failed to attend the clinic at the end of the intervention period.

3.6 Participant Consent
An information sheet (Appendix VII, p. 197) was mailed to the participants explaining the main aspects of the study. An outline of the specific goals to be reached, the diets involved and the roles of participants in the study were given. Also, participants were given assurance about the confidentiality of the information provided and signed consents (Appendix VII, p. 200) were obtained from those participants who were willing to take part in the study.

3.7 Recruitment
Subjects were invited to participate in the study through advertisements in the local media. About 180 individuals responded to the advertisements. An initial contact questionnaire (Appendix VIII, p. 205) was mailed to the respondents for which 120 replies were received. The self-reports obtained from the contact questionnaires were scrutinised for a preliminary elimination procedure. As a result, sixty participants who had BMI < 25 or who had
diabetes, CVD, renal disorder or any other disease that may hinder with the study were excluded. The remaining sixty individuals were invited to a screening examination.

3.8 Screening

The screening procedure involved anthropometric measurements, blood pressure and Glucose Tolerant Test (GTT) and lipid analysis. Individual dietary assessments were made using diet histories and food frequency questionnaires in order to identify any dietary restrictions or special diet followed.

During screening, participants were selected based on inclusion and exclusion criteria, which are detailed in the following paragraphs. Participants who showed one or more exclusion criteria were omitted. Only those individuals who had an abdominal obesity indicated by waist-hip-ratio (Bray, 1992) and displayed at least one of the metabolic indicators of insulin resistance shown in the inclusion criteria were included. A total of 45 participants were recruited for the study although only 41 participants successfully completed the study.

3.8.1 Inclusion criteria

- BMI \( \geq 25 \)
- Waist-Hip-ratio \( \geq 0.95 \) for men and \( \geq 0.8 \) for women
- Triglycerides \( > 2.0 \) but \( < 4.0 \) mmol/L
- HDL cholesterol \( < 1.0 \) mmol/L
- Blood pressure 140/100 mm Hg or established hypertension
- Glucose concentration \( \geq 5.5 \) but \( < 7.0 \) mmol/L after an overnight fast and \( \geq 8.0 \) but \( < 11.1 \) mmol/L, 2 hours after 75g glucose load.
3.8.2 Exclusion criteria

- Life threatening illness
- Individuals > 35 and ≤ 70 years of age
- Lack of familiarity with English
- Diabetes mellitus and cardiovascular diseases
- Social or psychological circumstances such as alcoholism or mental illness
- A condition like familial hypercholesterolemia where greater dietary fat restriction than used in this study is indicated
- Conditions such as chronic renal failure or adult coeliac disease which may require major dietary constraints
- Use of medication that may interfere with the diet such as anti-hypertensive drugs

3.9 Blocking

Following recruitment, participants were blocked (stratified) into five equal groups. Blocking was carried out so that each study group would have the same chance of receiving each of the possible treatments and that the probability that a given group would receive a particular allocation is independent of the probability that any other group will receive the same treatment assignment. Blocking increases the comparability of treatment groups and ensures that the treatment groups are equally balanced. Participants were blocked with respect to sex, BMI and alcohol consumption. Alcohol consumption was included as one of the variables because the study population had a wide variety of alcoholic drinkers ranging from heavy drinkers to total abstainers.
3.10 Randomisation

After blocking, the blocked groups were randomly assigned to the diets. Each block had an equal chance of being allocated to each of the diet group. Randomisation was conducted using a sealed envelope system, in which the names of each stratified (blocked) group was drawn along with the name of the diet to which the particular block of participants had been allocated.

3.11 Diet Groups

The study consisted of five diet groups, of these four groups followed intervention diets and one group followed a control diet. The intervention diets were, a ‘high-carbohydrate/low fat diet’ (HCLF) as recommended by the ADA where the carbohydrate levels are raised and the total fat intake is cut down; a ‘high monounsaturated fat diet’ (MF) which is low in carbohydrates and saturated fatty acids but high in monounsaturated fats; a ‘low glycemic index diet’ (LG) where carbohydrate foods are included in the form of low GI foods and high GI carbohydrate foods are excluded; a ‘high monounsaturated fat and low glycemic index diet’ (MFLG) a combination of MF and LG diets and a control diet (C) consisting of the usual dietary intake of participants which was assumed to represent a typical Australian diet.

3.12 Diet Composition

The compositions of the target macro nutrients of the intervention diets were based on the recommendations made by the ADA (1996). The target energy level was calculated for each participant using the Diet-1 program (Xyris software Inc, Australia). No specific target levels were designed for the control group as they were advised to continue their current
eating habits throughout the study. The target level for each of the intervention diets is given in Table 3.1.

Table 3.1: The target nutrient profile of the diets recommended to the intervention groups.

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>HCLF diet</th>
<th>LG diet</th>
<th>MF diet</th>
<th>MFLG diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrate (%E)</td>
<td>55</td>
<td>55</td>
<td>44</td>
<td>44</td>
</tr>
<tr>
<td>Protein (%E)</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Total fat (%E)</td>
<td>25</td>
<td>25</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>Saturated fat (%E)</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Polyunsaturated fat (%E)</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Monounsaturated fat (%E)</td>
<td>7</td>
<td>7</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Glycemic index (units)</td>
<td>13 units lower</td>
<td>13 units lower</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cereal fibre (g)</td>
<td>10</td>
<td>21</td>
<td>10</td>
<td>21</td>
</tr>
<tr>
<td>Non cereal fibre (g)</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

3.13 Diet Counselling

Following the random allocation, participants of the intervention groups were advised on the diets to be followed. Individual counselling was given to each participant. Dietary materials were provided to the participants which included summarised dietary guidelines and recipe sheets (Appendix IX, p. 259 - 303) that were appropriate to their specific dietary regimen. Participants also received an individualised sample meal plan (Appendix IX, p. 305) based on their usual eating patterns. In addition, participants received sample foods which were representative of their respective diets. Standardised cups, spoons and measuring scales were also supplied to assist in weighing foods.

The energy intake was calculated for each participant based on his or her BMI. This quantification of energy intake in individuals was necessary in order to maintain their initial body weight so that a shift in body weight may not influence the glucose or the lipid metabolisms. Also, any true change can be attributed directly to the change in the diet only.
if the body weight remains unchanged. Further, it was necessary to quantify the energy intake in order to calculate the percentage macro nutrients as per their target requirement given in Table 3.1.

After the initial counselling at baseline (week 0), participants were assisted during the study period via the telephone. Assistance was given to the participants of the intervention groups to help them reach their dietary goals and to the participants of the control group to maintain their regular eating habits. The telephone contact also helped to remind the participants to complete their food records.

The HCLF group was advised to eat foods rich in carbohydrates such as bread, rice, potato and pasta. High GI varieties of carbohydrate foods were recommended. Fat intake was cut down by limiting the amount of oil, butter and margarine consumption and high fat foods such as fried foods, meat and fast foods were restricted. Small amounts of polyunsaturated oils and margarines were recommended. The LG group was given similar advice but was asked to include only low GI carbohydrate foods. Some of the low GI foods recommended were Ploughman’s loaf, fruit loaf, mixed grain bread, pumpernickel bread, ‘Sultana bran’, ‘Special K’, ‘All-Bran’, rolled oats, porridge, long grain rice, lentils and pastas. All recommended low GI foods were rich in cereal fibre. Cereal fibre refers to the fibre obtained from all types of cereals consumed. The LG group was asked to avoid high GI foods such as white or wholemeal bread, ‘Calrose’ rice, watermelon, rockmelon and fruit cordials. Fat intake was also limited to 25% of total energy intake. The MF group was prescribed a diet high in monounsaturated fats and low in carbohydrates. Monounsaturated rich foods such as sunola, canola, olive oils and margarines, avocado, fish, omega enriched eggs and ‘Farmer’s Best’ milk were recommended. Total carbohydrate intake was restricted
and the intake of low GI carbohydrate foods was discouraged. Dietary advice for the MFLG group included the carbohydrate recommendations of the LG group and the fat recommendations of the MF group. Apart from these recommendations, all intervention groups were advised to decrease their saturated fat intake to 10 percent of their total energy intake. The intervention groups were also encouraged to include non-cereal fibre that is the fibre obtained from foods other than cereals such as fruits and vegetables. Participants of the control group were asked to continue their usual eating habits and hence no specific dietary advice was provided for them.

Each intervention diet consisted of including certain food items and avoiding certain food items. However, several options were given for each of the intervention diet and the individual participants were allowed to choose the food items they preferred within the given options. For instance, in the low glycemic index (LG) group, options given for breakfast cereal were ‘All-Bran’ or rolled oats or ‘Special K’ or ‘Sultana Bran’ or ‘Rice Bran’. An individual may choose ‘All-Bran’ while another individual in the same group may choose ‘Special K’ as his/her breakfast cereal. Similarly, several options were given for each food group for each of the intervention diet (Appendix IX p. 259 - 303). In this sense, the diets were individualised. Even though the food options given were the same within the diet group, the different combination of the food items chosen by the participants made it an individual diet.

In addition, participants of the intervention groups were advised to restrict their alcohol intake to four standard drinks (40 grams) per day. Since a majority of the study population particularly, male participants, were found to be heavy alcoholic consumers, it was considered that restricting consumption to two standard drinks per day as per the
recommendation of NHMRC and ADA was not realistic. Participants were also advised not to change their activity levels in any way.

3.14 Diet Assessment

Three major instruments were used to extract dietary data. They include diet histories, food frequency questionnaires and food records. Each of these instruments was administered at baseline (week 0), at week 4 and at week 8. In addition, diet histories and food frequency questionnaires were also administered at the screening period.

A detailed diet history (Appendix VIII, p. 239) was obtained from the participants using Burke’s method (Burke, 1947). Participants were asked to narrate their usual intake in a week starting with the first meal and finishing with the last meal of the day. The frequency of consumption, portion size, amount, seasonal variation and brands of food used were obtained. Additional information on low fat products, alcohol consumption and artificial sweeteners were also found.

A three day food record (Appendix VIII, p. 240) was completed by the subjects which included two week days and one weekend day (preferably Saturdays). Subjects were provided with measuring cups, spoons and weighing scales in order to standardise methods of weighing and to ensure accuracy in measurement. Instructions were given to weigh all foods at the time of consumption and leftovers if present. In places where weighing was not possible such as restaurants, participants were asked to estimate the portion size consumed using food photographs provided.
Food frequency questionnaire (Appendix VIII, p. 228) is discussed in detail under the subheading - analysis of food frequency questionnaire.

3.15 Diet Analysis

The dietary information obtained from diet histories and three day food records were analysed using the Diet-1 program (Xyris software Inc, Australia) which is based on the NUTTAB 1995 (version 4) food composition database. Energy and macro nutrient compositions were obtained in grams of consumption as well as percentage of energy. Unlisted foods were coded by using information obtained from the food manufacturer. All recipes provided for the participants were also coded separately and added to the database.

3.16 Diet Acceptability

Diet acceptability was assessed by means of a diet acceptance and adherence questionnaire (Appendix VIII, p. 251). Subjects completed this questionnaire at weeks 4 and 8 of the intervention period. Subjects were asked to indicate their satisfaction, acceptance, ease in following, taste, satiety, appeal, variety, cost, ease in preparation and adequacy of each meal of the diet recommended to them. The response was rated using scores of 0 to 5. An average score was obtained from the two questionnaires to give the final score.

3.17 Dietary Compliance

Measurement of compliance is evaluating how closely a subject’s eating behaviour approximates the dietary recommendations. Compliance was measured by comparing the macro nutrient intake of each of the intervention groups during the intervention period with their target macro nutrient requirement specified. Each group had their own target for each of the macro nutrient, which is given in Table 3.1. These targets (Table 3.1) were used as
the point of decision to classify intakes as compliant or non-compliant. No error in meeting the target was allowed as it is critical in feasibility studies to know whether the participants were be able to achieve the target set before them.

3.18 Calculation of GI Scores

GI scores were calculated with the aid of the “International Tables of Glycemic Index” which gives GI data for about 600 foods (Foster-Powell and Brand Miller, 1995). Glucose was used as the reference food. White bread was not preferred as the reference food since the ingredients and methods used in the production of white breads may vary from one test centre to another (Brand Miller 1994). Hence using glucose as the reference food increased comparability of the GI data between various test centres. Locally tested foods were applied whenever possible. In case local data was not available, the mean value of foods tested at various centres was used. However many foods, which were popular among the study population, had no assigned GI value.

Therefore a cautious attempt was made at substituting the GI value of one food for another despite the warning given by Brand Miller et al (1996) who stated that “the GI factor of a food cannot be predicted from its composition or the GI factor of related foods”. Substitutions such as: the GI of wholemeal flour for wholemeal Lebanese bread, GI of skim milk for low fat milk and GI of orange flavoured soft drink for coke a cola were made. However, only a few foods which had a single carbohydrate source could be substituted in this manner. For foods which had more than one source of carbohydrate such as jam (fruits and sugar), apple pies (apples, sugar and pastry), and commercially prepared foods such as Tim Tam biscuits (chocolate, sugar, flour), Sara Lee puddings and Danish pastries, substituting GI value was difficult since the amount of each ingredient was not known and
it was not feasible to obtain this information from the manufacturers. Foods that had no GI value and foods, which could not be assigned a GI value, were excluded from GI value calculation.

GI of individual foods for the amount consumed were obtained using the formula,

\[
\frac{\text{Carbohydrate (g) contributed by the food}}{\text{Total carbohydrate (g) content for the day}} \times \text{GI value of the food}
\]

The GI thus obtained was aggregated and the total GI for the whole day gave the GI score (Brand Miller et al, 1996). Illustrations of GI score calculation are given in Appendix VI (p. 194 – 195).

3.19 Questionnaires

Questionnaires were used to elicit details on demographic data, medical history, dietary pattern, food preparation methods, frequency of consumption and physical activity (Appendix VIII, p. 207 - 228). These questionnaires were tested on five individuals and any ambiguous questions were restructured. All the questionnaires were self-administered and were given at the screening period and baseline (week 0). At weeks 4 and 8, only questionnaires relating to frequency of consumption and physical activity were given. The medical history questionnaire was used to eliminate individuals based on the exclusion criteria. The dietary pattern and food preparation questionnaires were only used to clarify any ambiguous reporting in dietary assessment methods. In addition, as mentioned above, participants indicated their acceptability and adherence to the diet by means of a questionnaire at weeks 4 and 8 of the intervention period.
3.20 Anthropometric Measurements

Anthropometric measurements were taken at baseline (week 0), week 4 and week 8 of the intervention period. Measurements were recorded in a form (Appendix VIII, p. 250) at each visit.

3.20.1 Height and Weight

Body weight was measured using electronic digital scales with subjects wearing only a light hospital gown. Height was measured at the same time using a stadiometer with a moveable headboard while the subjects were standing barefoot. Measures were recorded to the nearest 0.1 cm. Body Mass Index (BMI) was calculated using the formula, body weight (kg) divided by squared height (m²) (Bray, 1978).

3.20.2 Waist and hip circumference

Waist and hip circumference were measured in standing position using a dressmaker's tape. Waist circumference was measured midway between the lower rib margin and above the iliac crest. The hip circumference was measured at the largest circumference over the posterior extension of the buttocks. Waist measurement was taken with the waist fully exposed and hip circumference over the subject's underwear. Waist-hip-ratio (WHR) was calculated to obtain an index of the pattern of body fat distribution.

3.20.3 Skinfold thickness

Skinfold thickness was measured using skinfold calipers. Measurements were taken at seven sites which included the biceps, triceps, suprailiac, subscapular, abdomen, thigh and calf using the procedure given in the Australian Fitness Norms (Gore and Edwards, 1992). All measurements were taken at the right side except the abdominal skinfold.
Measurements were repeated five times at each site. The average of the five measurements gave the final value. In order to reduce possible interviewer variability, the same sets of subjects were measured by the same investigator at each time period.

3.20.4 Blood pressure

Blood pressure was measured using an automatic portable Dinamap monitor (Dinamap XL vital signs monitor, Model 9300) using the oscillometric technique. Dinamap has been found to be accurate in measuring systolic and diastolic blood pressure, although there is some concern about the diastolic accuracy (O’Brien et al, 1993). However, Dinamap was preferred over the standard mercury sphygmomanometer since it was easy to use and required less training for the observers.

Before the measurements were taken, participants were seated comfortably in a reclining chair and were allowed to rest for 10 minutes. The cuff was applied to the non-dominant arm, which was supported over a pillow. Participants were instructed to hold their arm still while the measurements were being recorded. A set of five readings was obtained for each participant and the average was calculated.

3.20.5 Total body fat

Total body fat percentage was measured with Futrex-1000 (Futrex Inc., MA, USA) which is based on the near-infrared spectroscopy technique (Franssila-Kallunki, 1992). In this technique, an infra red light is passed into the biceps measuring the density of body fat contained within the biceps. Futrex-1000 was placed midpoint on the biceps of the subject and the fat percentage was automatically calculated by the equipment. Readings were taken twice in order to increase accuracy and the average of the two values was used.
3.21 Measurement of Physical Activity

Physical activity was measured using the questionnaire given in Appendix VIII (p. 218). The change in physical activity was found by determining the time (numbers of hours) spent on each activity before and after the intervention period and calculating the difference.

3.22 Biochemical Measurements

Fasting blood samples were collected at weeks 0, 4 and 8 from the subjects by a trained nurse. Plasma was separated immediately by centrifugation using Hettich centrifuge at 3500 rpm for 10 minutes at 4°C. Glucose analysis was done soon after centrifugation. Fasting plasma glucose levels were measured using a glucose analyser (YSI Model 23AM Glucose Analyser, Yellow Spring Inc., OH). The remaining plasma was kept in eppendorf tubes which were stored at -85°C for lipid analysis. The lipid analysis was conducted at the end of the study to minimise intra-assay variation.

Lipid analysis was carried out by the investigator using the Cobas-Fara automated centrifugal analyser (Roche Centrifugal Analyser, France). Plasma cholesterol and triglycerides were determined by standard enzymatic colorimetric method (Appendix X, p. 307 - 309). Reagents were supplied by Boehringer Mannheim, Germany [plasma cholesterol (catalogue 1442350), plasma triglycerides (catalogue 70191)]. NEFA was determined by an acyl-CoA oxidase-based colorimetric method (WAKO NEFA-C, Wako, Osaka, Japan). HDL cholesterol was isolated after precipitation with dextran sulfate and magnesium chloride (Warnick et al, 1982). LDL concentration was calculated using the Friedewald equation which is plasma cholesterol - HDL - (Triglycerides) / 2.2 (Friedewald et al, 1972).
3.23 Focus Group Discussion

Focus group discussions were conducted in order to compare the usual dietary practice of the participants with the recommended diet and to identify any possible problems faced while following the recommended diets. A separate ethical approval was obtained from the Human Research Ethics Committee of the University of Wollongong to conduct focus groups. A letter, an information sheet and a consent form (Appendix VII, p. 201 - 203) were mailed to the participants explaining the need and the conduct procedure of the focus groups. Only participants of the intervention groups who gave signed consents were invited to take part in the discussion. It was thought that the participants would be able to make a better comparison while they were still following the diet and hence the discussion was held in the sixth week of the intervention period. The investigator played the role of the moderator and conducted the discussions. Eight open ended questions and three follow-up questions (Appendix VIII, p. 254) were formulated as a guide for the moderator to conduct the discussion. The involvement of the investigator (moderator) was limited to taking notes, guiding the groups to different topics and ensuring that all individuals had an opportunity to present their views.

3.23.1 Conduct of focus group

Focus group discussions were held in the Medical Research Unit located at 108, New Dapto Road, Wollongong. Single focus group discussion was conducted for each of the intervention groups. The discussions were conducted after office hours (between 5 PM and 7 PM), the most suitable time for the participants. This also ensured privacy and a quiet environment. Before the discussion began, the role of the moderator and the confidentiality of the focus group were explained. Participants were encouraged to speak freely and were assured that they would not be judged in any way. First names were used to address the
participants since some of the participants knew each other before the intervention trial and some had become friends during the trial. Therefore, it was not possible to maintain anonymity. Each discussion lasted about 45-90 minutes and the discussions were recorded on audio tapes. The recorded discussions were transcribed verbatim.

3.23.2 Focus group analysis

Once transcribed, data were content analysed. Content analysis is a method of understanding the data obtained by coding them into different categories. Codes previously developed by the investigator were used and new codes which emerged during analysis were also included. Sections of data related to the categories are given in Extracts 1-17 (Appendix V, p. 179 - 193).

3.24 Statistical Analysis

Statistical analysis was performed using JMP statistical package, version 3.2.1 (SAS Institute Inc., NC, USA). Statistical comparisons between groups were analysed using one way analysis of variance (ANOVA) and non parametric Wilcoxon/Kruskal-Wallis rank tests. Differences within groups were analysed using two tailed Wilcoxon signed rank t test. Non parametric tests were chosen when the data were not consistent with the hypothesis of normality. P<0.05 was considered statistically significant unless otherwise indicated. Data are expressed as mean ± standard deviation (SD).

3.25 Analysis of Food Frequency Questionnaire

The food frequency questionnaire was self administered by the participants in which the frequency of intake of about 169 foods (with some grouped together if the nutritional composition was similar) was collected. The primary purpose of the questionnaire was to
obtain patterns of intake in relation to food types but not food amounts. It was also used to crosscheck data obtained from diet histories and food records. Information was not collected on the quantities of the various foods eaten by the participants or on the amount of change they had made to their diet. The participants merely indicated their frequency of intake by marking columns which read ‘daily’, ‘4-6 times a week’, ‘1-3 times a week’, ‘1-3 times a month’, ‘1-3 times a year or never’. The information obtained is therefore semi quantitative. Despite this limitation, the data have important use in showing the direction of dietary change among the participants.

The questionnaire was administered at the screening, weeks 0, 4 and 8 of the intervention period. The data collected at each of these visits were coded using scores. A score of 1 was given if the frequency of intake was daily and 2 for 4-6 times a week, 3 for 2-3 times a week, 4 for 2-3 times a month and 5 for 1-3 times a year or never.

The coded food frequency data were entered into the JMP statistical package. The data were entered separately for each person in each of the four intervention groups and the control group. The data obtained at screening and week 0 were averaged to give the final baseline data for each person in their respective groups. (The screening and the week 0 data were combined as a baseline since each set of data was collected before the start of the intervention period). Similarly, the coded food frequency data obtained after weeks 4 and 8 of intervention were averaged to give the final intervention data. The change in the frequency of intake for each person was taken to be the difference between the final baseline data and the final intervention data.
The change in frequency for each person was determined by assigning zero when the average baseline values were equal to the average intervention value indicating no change was made during the intervention period. An increase was indicated by assigning +1 when the average baseline values were greater than the average intervention values and a decrease was indicated by assigning -1 for the reverse case, so that for each person, an index of change was calculated for each food.

Once the values were assigned, the mean change in frequency of food consumption of individuals in their respective groups was determined by aggregating individuals' values. This was done for every single food item. For instance, in the HCLF group, using white bread as an example, individual 'P' might have a value of 0, individual 'Q' might have a value of +1, individual 'R' might have -1 and individual 'S' might have +1, then the group mean would be +1 for white bread in that group.

The mean data thus acquired was plotted as a bar graph. The bar graph for the various food types has a bar for each of the four intervention groups and for the control group. The bar indicates values between +1 and -1. Positive values indicate an increase in frequency of intake, negative values a decrease and zero indicates no change.
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The results of this study are illustrated at three time periods - baseline (week 0), mid intervention period (week 4) and the end of the intervention period (week 8). Comparisons were made with baseline data and the results are expressed as the means and standard deviations (SD). Comparisons between groups were made using one way analysis of variance (ANOVA) and Wilcoxon/Kruskal-Wallis rank tests. Mean distributions within the group were determined using two tailed Wilcoxon signed rank t tests. The P values given refer to significant differences. P values shown with * refer to P<0.05 and those shown with ** denote P<0.01.

4.1 Baseline data

At baseline (week 0), the study participants were entered into one of five test groups referred to as C (control), HCLF (high-carbohydrate/low fat diet), LG (low glycemic index diet), MFLG (high monounsaturated fat and low glycemic index diet) and MF (high monounsaturated diet). The baseline characteristics of the each group are given in Table 4.1. Each group had nine participants except the MF group which had eight participants as one male participant withdrew from this group. In total there were forty-four participants out of which 31 (70%) were males and 13 (29%) were females. A comparison of the five groups showed that the MF group had the lowest mean values for height, weight, BMI, systolic blood pressure and total body fat but had the highest for waist-hip-ratio. The HCLF group displayed the highest mean values for weight, BMI, systolic blood pressure and total body fat. However, it was noted that none of these differences were statistically significant.
Table 4.1: Baseline (week 0) characteristics of control and intervention groups. Mean values ±SD are shown.

<table>
<thead>
<tr>
<th>Variables</th>
<th>C</th>
<th>HCLF</th>
<th>LG</th>
<th>MFLG</th>
<th>MF</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>n = 9</td>
<td>n = 9</td>
<td>n = 9</td>
<td>n = 9</td>
<td>n = 8</td>
<td></td>
</tr>
<tr>
<td>Sex (M/F)</td>
<td>6 / 3</td>
<td>6 / 3</td>
<td>6 / 3</td>
<td>7 / 2</td>
<td>6 / 2</td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>42.6 ±8.1</td>
<td>46.4 ±6.8</td>
<td>46.4 ±6.1</td>
<td>52.8 ±9.8</td>
<td>50.6 ±6.7</td>
<td>0.102</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>170.5 ±10.9</td>
<td>175.1 ±9.2</td>
<td>176.1 ±10.1</td>
<td>175.2 ±10.5</td>
<td>172.6 ±11.9</td>
<td>0.712</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>90.5 ± 10.7</td>
<td>99.0 ±18.1</td>
<td>97.7 ±10.0</td>
<td>96.7 ±21.2</td>
<td>88.6 ±12.7</td>
<td>0.450</td>
</tr>
<tr>
<td>Body Mass Index (kg/m²)</td>
<td>31.1 ±3.3</td>
<td>32.2 ±5.2</td>
<td>31.5 ±2.7</td>
<td>31.2 ±4.4</td>
<td>29.7 ±3.6</td>
<td>0.736</td>
</tr>
<tr>
<td>Waist/Hip ratio</td>
<td>0.90 ±0.11</td>
<td>0.95 ±0.06</td>
<td>0.95 ±0.07</td>
<td>0.96 ±0.09</td>
<td>0.98 ±0.07</td>
<td>0.450</td>
</tr>
<tr>
<td>Systolic blood pressure (mm Hg)</td>
<td>125.9 ±12.4</td>
<td>141.1 ±23.2</td>
<td>134.5 ±10.2</td>
<td>138.8 ±14.4</td>
<td>122.5 ±46.3</td>
<td>0.192</td>
</tr>
<tr>
<td>Diastolic blood pressure (mm Hg)</td>
<td>77.2 ±10.7</td>
<td>84.7 ±16.0</td>
<td>82.8 ±5.1</td>
<td>84.1 ±8.2</td>
<td>78.8 ±10.3</td>
<td>0.466</td>
</tr>
<tr>
<td>Skinfold measures</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biceps (mm)</td>
<td>11.0 ±3.8</td>
<td>13.5 ±5.9</td>
<td>12.7 ±4.1</td>
<td>14.3 ±6.4</td>
<td>10.2 ±4.8</td>
<td>0.410</td>
</tr>
<tr>
<td>Triceps (mm)</td>
<td>14.2 ±4.8</td>
<td>17.9 ±8.9</td>
<td>17.2 ±6.1</td>
<td>18.0 ±6.3</td>
<td>15.4 ±6.5</td>
<td>0.760</td>
</tr>
<tr>
<td>Subscapular (mm)</td>
<td>24.5 ±6.1</td>
<td>26.5 ±8.0</td>
<td>21.4 ±6.8</td>
<td>25.9 ±12.9</td>
<td>24.2 ±6.4</td>
<td>0.868</td>
</tr>
<tr>
<td>Suprailiac (mm)</td>
<td>22.5 ±7.8</td>
<td>25.8 ±9.5</td>
<td>23.7 ±6.4</td>
<td>25.3 ±11.1</td>
<td>22.8 ±7.5</td>
<td>0.883</td>
</tr>
<tr>
<td>Abdomen (mm)</td>
<td>31.5 ±9.2</td>
<td>35.3 ±13.9</td>
<td>32.9 ±9.5</td>
<td>30.8 ±10.7</td>
<td>32.8 ±5.29</td>
<td>0.928</td>
</tr>
<tr>
<td>Thigh (mm)</td>
<td>19.2 ±9.4</td>
<td>23.2 ±15.6</td>
<td>22.9 ±10.7</td>
<td>20.3 ±11.4</td>
<td>18.8 ±10.4</td>
<td>0.937</td>
</tr>
<tr>
<td>Calf (mm)</td>
<td>16.4 ±9.8</td>
<td>12.5 ±5.3</td>
<td>9.4 ±4.6</td>
<td>14.9 ±8.2</td>
<td>11.4 ±4.1</td>
<td>0.331</td>
</tr>
<tr>
<td>Total body fat (%)</td>
<td>26.3 ±6.3</td>
<td>27.5 ±9.2</td>
<td>25.1 ±6.7</td>
<td>25.5 ±6.2</td>
<td>23.6 ±7.1</td>
<td>0.871</td>
</tr>
<tr>
<td>Ex smokers/Non smokers</td>
<td>5 / 4</td>
<td>3 / 6</td>
<td>2 / 7</td>
<td>3 / 6</td>
<td>4 / 4</td>
<td></td>
</tr>
<tr>
<td>Alcohol / Non alcohol consumers</td>
<td>9 / 0</td>
<td>8 / 1</td>
<td>9 / 0</td>
<td>8 / 1</td>
<td>7 / 1</td>
<td></td>
</tr>
</tbody>
</table>

P values refer to comparison between groups using Wilcoxon/Kruskal-Wallis rank test.
4.2 Dietary Intake

The results of the dietary intake are presented separately as the nutrient intake and the food intake. The mean changes in percent difference in energy and macro nutrients reported by the subjects (diet histories) and the actual consumption recorded by the subjects in a three day food record are shown in Figures 4.1 - 4.22. Figures are presented as percentage energy since the target levels are given in percentages and hence is easy to compare the target and the actual intake levels.

SD and P values of these mean changes between the intervention (weeks 4 and 8) and baseline (week 0) measures for control and intervention groups obtained from diet histories and weighed food records are given in Tables 4.2 - 4.12 which are presented in Appendix I (p. 143 – 148).

4.2.1 Nutrient Intake

4.2.1.1 Daily energy intake

Percent energy intake reported is the percent of the calculated energy requirements of the participants at Week 0, 4 and 8.

The daily energy intake reported from diet history is shown in Figure 4.1. From the figure it is apparent that the daily energy intake of the intervention groups declined at weeks 4 and 8 of intervention when compared to the baseline (week 0) consumption. Significant reductions were seen in the LG and the MF groups at both time periods. MFLG group showed a significant reduction only at week 8. In contrast to the intervention groups, the control (C) group showed an increased intake of energy during the intervention period. P values and SD of mean changes for all groups are given in Table 4.2 (Appendix I p. 143).
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Figure 4.1: Comparison of mean percent energy intake of control and intervention groups obtained from diet history at weeks 0, 4 and 8. * denotes significant changes at $P<0.05$ and ** denotes significant changes at $P<0.01$.

Figure 4.2: Comparison of mean percent energy intake of control and intervention groups obtained from food records at weeks 0, 4 and 8. * denotes significant changes at $P<0.05$ and ** denotes significant changes at $P<0.01$. 
Figure 4.2 illustrates the daily percent energy intake obtained from food record diaries. All the intervention groups showed a decline in their energy intake. Reductions in the energy intake were significant in the MFLG and the MF groups at weeks 4 and 8. The LG group demonstrated a significant decrease only at week 8. On the other hand, the control (C) group showed a significant increase at week 8. P values and SD of mean changes for all groups are given in Table 4.2 (Appendix I, p. 143).

4.2.1.2 Carbohydrate intake:

Carbohydrate intake from diet histories illustrated in Figure 4.3 shows that there was a significant increase in the HCLF, LG and the MFLG groups at weeks 4 and 8. P values and SD of mean changes in the carbohydrate intake for all groups are shown in Table 4.3 (Appendix I, p. 144).

![Carbohydrate intake from diet history](image)

Figure 4.3: Comparison of mean carbohydrate contribution to percent daily energy obtained from diet history at weeks 0, 4 and 8. * denotes significant changes at $P<0.05$ and ** denotes significant changes at $P<0.01$. 
The intake of carbohydrate obtained from weighed food records is shown in Figure 4.4. The HCLF and the MFLG groups showed a significant increase at weeks 4 and 8 of the intervention period. In contrast, the MF group displayed a decrease in their carbohydrate intake, though the change was not statistically significant. P values and SD of mean changes in the carbohydrate intake for all groups are shown in Table 4.3 (Appendix I, p. 144).

![Carbohydrate intake from food records](image)

**Figure 4.4:** Comparison of mean carbohydrate contribution to percent daily energy obtained from food records at weeks 0, 4 and 8. * denotes significant changes at \( P<0.05 \) and ** denotes significant changes at \( P<0.01 \).

### 4.2.1.3 Protein intake

Figure 4.5 displays the protein intake of control and intervention groups obtained from diet histories. The LG and the MFLG groups showed a significant increase in their protein intake throughout the intervention period. P values and SD of mean changes during the intervention period for all groups are shown in Table 4.4 (Appendix I, p. 144).
Figure 4.5: Comparison of mean protein contribution to percent daily energy obtained from diet history at weeks 0, 4 and 8. * denotes significant changes at $P<0.05$.

Figure 4.6: Comparison of mean protein contribution to percent daily energy obtained from food records at weeks 0, 4 and 8. * denotes significant changes at $P<0.05$. 
Except the control (C) group, all intervention groups showed an increased intake of protein in their food records (Figure 4.6). The increase was significant only in the MFLG and MF groups at week 4 of the intervention period. P values and SD of mean changes during the intervention period for all groups are shown in Table 4.4 (Appendix I, p. 144).

4.2.1.4 Total fat intake

The total fat intake reported from diet histories showed a decrease in all the intervention groups (Figure 4.7). SD and P values of mean changes for all groups are given in Table 4.5 (Appendix I, p. 145). The HCLF, LG and the MFLG groups showed significant decreases during the entire intervention period. On the other hand, the control (C) group showed an increase in their reported total fat intake.

![Total fat intake from diet history](image)

Figure 4.7: Comparison of mean total fat contribution to percent daily energy obtained from diet history at weeks 0, 4 and 8. * denotes significant changes at $P < 0.05$ and ** denotes significant changes at $P < 0.01$. 
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Figure 4.8: Comparison of mean total fat contribution to percent daily energy obtained from food record at weeks 0, 4 and 8. * denotes significant changes at $P<0.05$.

Total fat intake recorded in the weighed food dairies is illustrated in Figure 4.8. All of the intervention groups showed a decrease in their total fat consumption. Nevertheless, significant decreases were seen only in the HCLF group at weeks 4 and 8 and in the MFLG group at week 8 of the intervention period. SD and P values of mean changes for all groups are given in Table 4.5 (Appendix I, p. 145).

4.2.1.5 Monounsaturated fat intake

In the monounsaturated fat intake (MUFA) obtained from diet history (Figure 4.9), the HCLF LG and MFLG groups showed reductions at weeks 4 and 8 of the intervention period. However, the decrease was significant only in the HCLF and the LG group. SD and P values of mean changes for all groups are shown in Table 4.6 (Appendix I). On the other hand, the MF and the control (C) groups showed an increase in their MUFA intake at both time periods.
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Monounsaturated fat intake from diet history

Figure 4.9: Comparison of mean monounsaturated fatty acid contribution to percent fat intake obtained from diet history at weeks 0, 4 and 8. * denotes significant changes at $P<0.05$ and ** denotes significant changes at $P<0.01$.

Monounsaturated fat intake from food record

Figure 4.10: Comparison of mean monounsaturated fatty acid contribution to percent fat intake obtained from food record at weeks 0, 4 and 8. * denotes significant changes at $P<0.05$ and ** denotes significant changes at $P<0.01$. 
Figure 4.10 shows the MUFA intake obtained from the weighed food records. The MF group was the only intervention group that showed an increase in intake at both weeks 4 and 8 of the intervention period. SD and P values of mean changes for all groups are shown in Table 4.6 (Appendix I, p. 145). In contrast, the HCLF demonstrated a significant decrease in MUFA intake at both time periods.

4.2.1.6 Polyunsaturated fat intake

The intake of polyunsaturated fat intake (PUFA) reported in diet history is shown in Figure 4.11. The PUFA intake seemed to decline in the HCLF and in the MFLG groups while it increased in the LG and the MF groups. No significant changes were seen in any group. SD and P values of mean changes for all groups are shown in Table 4.7 (Appendix I, p. 146).

![Polyunsaturated fat intake from diet history](image)

Figure 4.11: Comparison of mean polyunsaturated fatty acid contribution to percent fat intake obtained from diet history at weeks 0, 4 and 8. * denotes significant changes at $P<0.05$. 
Figure 4.12: Comparison of mean polyunsaturated fatty acid contribution to percent fat intake obtained from food record at weeks 0, 4 and 8.

The PUFA intake obtained from weighed food records is shown in Figure 4.12. From the figure it can be seen that the HCLF and the LG group showed a decrease in their PUFA intake. The reverse change was observed in the MF group. No significant changes were seen in any of the groups. SD and P values of mean changes for all groups are shown in Table 4.7 (Appendix I, p. 146).

4.2.1.7 Saturated fat intake

The saturated fat intake obtained from diet histories is shown in Figure 4.13. All groups showed a decrease in their SFA intake at both weeks 4 and 8 of the intervention period including the controls. The decrease was significant in the HCLF, LG and the MFLG groups at both times, but the decrease was significant in the MF group only at week 8. SD and P values of mean changes for all groups are shown in Table 4.8 (Appendix I, p. 146).
Figure 4.13: Comparison of mean saturated fatty acid contribution to percent fat intake obtained from diet history at weeks 0, 4 and 8. * denotes significant changes at $P<0.05$ and ** denotes significant changes at $P<0.01$.

Figure 4.14: Comparison of mean saturated fatty acid contribution to percent fat intake obtained from food record at weeks 0, 4 and 8. * denotes significant changes at $P<0.05$ and ** denotes significant changes at $P<0.01$. 
Figures 4.14 shows the mean SFA consumption of control and intervention groups as obtained from their weighed food records. The HCLF and the MFLG groups showed significant reductions in their saturated fat intake at weeks 4 and 8. SD and P values of mean changes for all groups are given in Table 4.8 (Appendix I, p. 146).

4.2.1.8 GI score

The GI scores obtained from the diet histories are shown in Figure 4.15. All intervention groups demonstrated a reduction in the GI score except the MF group. The control (C) group also showed a reduction. No significant reductions were observed. SD and P values of mean changes for all groups are given in Table 4.9 (Appendix I, p. 147).

Figure 4.15: Comparison of mean glycemic index (GI) score obtained from diet history at weeks 0, 4 and 8. * denotes significant changes at $P<0.05$. 
Figure 4.16 illustrates the mean GI score obtained from food records. The HCLF, LG and the MF groups showed an increased score. However, the increase was significant only in the MF group. SD and P values of mean changes for all groups are given in Table 4.9 (Appendix I, p. 147). On the other hand, the MFLG and the control (C) group displayed a decrease in their score.

4.2.1.9 Intake of alcohol

Alcohol intake reported from diet history is shown in Figure 4.17. As seen from the figure, the control (C) and the HCLF groups increased their intake at weeks 4 and 8 of the intervention period. Significant increase was observed only in the HCLF group at week 8. SD and P values of mean changes for all groups are given in Table 4.10 (Appendix I, p. 147). In contrast, the LG and MFLG groups showed a decline in their alcohol intake.
Figure 4.17: Comparison of mean alcohol contribution to percent daily energy obtained from diet history at weeks 0, 4 and 8. * denotes significant changes at P< 0.05.

Figure 4.18: Comparison of mean alcohol contribution to percent daily energy obtained from food record at weeks 0, 4 and 8. * denotes significant changes at P< 0.05.
The alcohol intake obtained from weighed food records is shown in Figure 4.18. The control (C) group was the only group which showed an increase in their alcohol consumption at both periods. The increase at week 8 was statistically significant. SD and P values of mean changes for all groups are given in Table 4.10 (Appendix I, p. 147).

4.2.1.10 Intake of cereal fibre

The intake of cereal fibre obtained from the diet histories is shown in Figure 4.19. From the figure it can be seen that the HCLF and the LG groups showed a significant increase in their cereal fibre intake. SD and P values of mean changes for all groups are shown in Table 4.11 (Appendix I).
The cereal intake obtained from weighed food records is illustrated in Figure 4.20. The HCLF, LG and the MFLG groups showed higher intake in cereal fibre. However, no significant increases were observed. The MF group showed a significant decrease in intake at both weeks 4 and 8. SD and P values of mean changes for all groups are shown in Table 4.11 (Appendix I, p. 148).

![Cereal fibre intake from food record](image)

**Figure 4.20:** Comparison of mean cereal fibre intake obtained from food record at weeks 0, 4 and 8. * denotes significant changes at $P<0.05$.

### 4.2.1.11 Intake of non cereal fibre

Non cereal fibre intake obtained from diet histories (Figure 4.21) shows that all the intervention groups had increased their intake. Significant increase was observed in the HCLF and the LG groups. SD and P values of mean changes for all groups are shown in Table 4.12 (Appendix I, p. 148).
Figure 4.21: Comparison of mean non cereal fibre intake obtained from diet history at weeks 0, 4 and 8. * denotes significant changes at $P<0.05$ and ** denotes significant changes at $P<0.01$.

Figure 4.22 shows the non cereal fibre intake obtained from weighed food records. An increase in non cereal fibre intake at both weeks 4 and 8 was seen only in the LG group. The MF, HCLF and control (C) groups showed a decrease in their non cereal fibre intake at both these times. No significant changes were seen in any of the groups. SD and P values of mean changes for all groups are shown in Table 4.12 (Appendix I, p. 148).
4.2.1.12 Summary of nutrient intakes

The changes in the nutrient intake of the control and intervention groups are summarised in Table 4.13. The HCLF and the MFLG groups showed similar changes in their diet histories and food records. On the other hand, the LG group only reported significant changes in their diet histories. No significant changes were observed in their food records. The MF group reported similar changes only in their energy consumption and GI score.
Table 4.13: Trends in changes in nutrient intakes of the diet groups during the intervention period (weeks 4 and 8).

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>Changes shown by the groups in diet history</th>
<th>Changes shown by the groups in food record</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (%)</td>
<td>LG ↓ MFLG ↓ MF ↓</td>
<td>C ↑ MFLG ↓ MF ↓</td>
</tr>
<tr>
<td>Protein (%E)</td>
<td>LG ↑ MFLG ↑</td>
<td>MFLG ↑ MF ↑ 4W only</td>
</tr>
<tr>
<td>Carbohydrate (%E)</td>
<td>LG ↑ HCLF ↑ MFLG ↑</td>
<td>HCLF ↑ MFLG ↑ 4W only</td>
</tr>
<tr>
<td>Total fat (%E)</td>
<td>LG ↓ HCLF ↓ MFLG ↓</td>
<td>HCLF ↓ MFLG ↓ 8W only</td>
</tr>
<tr>
<td>MUFA (%E)</td>
<td>HCLF ↓ LG ↓</td>
<td>HCLF ↓</td>
</tr>
<tr>
<td>PUFA (%E)</td>
<td>HCLF ↓ 8W only</td>
<td></td>
</tr>
<tr>
<td>SFA (%E)</td>
<td>LG ↓ HCLF ↓ MFLG ↓ MF ↓ 8W only</td>
<td>HCLF ↓ MFLG ↓</td>
</tr>
<tr>
<td>Gl Score (units)</td>
<td>MF ↑</td>
<td>MF ↑ MFLG ↓ 4W only</td>
</tr>
<tr>
<td>Alcohol (%E)</td>
<td>HCLF ↓ 8W only</td>
<td>C ↑ 8W only</td>
</tr>
<tr>
<td>Cereal fibre (g)</td>
<td>HCLF ↑</td>
<td>MF ↓</td>
</tr>
<tr>
<td>Non cereal fibre (g)</td>
<td>HCLF ↑</td>
<td></td>
</tr>
</tbody>
</table>

↑ - Significant increase  ↓ - Significant decrease  
4W only - Change was seen only at week 4 of intervention.  
8W only - Change was seen only at week 8 of intervention.
4.2.2 Comparison of nutrient intake between groups

The nutrient intake obtained from diet histories and weighed food records were compared between the control and intervention groups. The P values of the results are shown in Table 4.14. From the reported intakes in diet histories, statistically significant differences were seen between the groups in carbohydrates, total fat, MUFA, SFA and cereal fibre intake at weeks 4 and 8. No significant differences were seen in the protein, PUFA, alcohol and non-cereal fibre intakes and in the GI score.

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>Reported Intake (Diet histories)</th>
<th>Actual Intake (Weighed food records)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 - 0 weeks P value</td>
<td>8 - 0 weeks P value</td>
</tr>
<tr>
<td>Energy (%)</td>
<td>0.039*</td>
<td>0.086</td>
</tr>
<tr>
<td>Protein (%E)</td>
<td>0.39</td>
<td>0.08</td>
</tr>
<tr>
<td>Carbohydrates (%E)</td>
<td>0.0004**</td>
<td>0.0002**</td>
</tr>
<tr>
<td>Total fat (%E)</td>
<td>0.002**</td>
<td>0.0001**</td>
</tr>
<tr>
<td>MUFA (%E)</td>
<td>0.005**</td>
<td>0.0001**</td>
</tr>
<tr>
<td>PUFA (%E)</td>
<td>0.33</td>
<td>0.26</td>
</tr>
<tr>
<td>SFA (%E)</td>
<td>0.029*</td>
<td>0.0004**</td>
</tr>
<tr>
<td>GI (units)</td>
<td>0.438</td>
<td>0.142</td>
</tr>
<tr>
<td>Alcohol (% E)</td>
<td>0.37</td>
<td>0.23</td>
</tr>
<tr>
<td>Cereal fibre (g)</td>
<td>0.014*</td>
<td>0.012*</td>
</tr>
<tr>
<td>Non cereal fibre (g)</td>
<td>0.172</td>
<td>0.318</td>
</tr>
</tbody>
</table>

P values are obtained using one way Anova tests. * denotes P < 0.05 and ** denotes P < 0.01.
Comparing the nutrient intake data from food records showed that significant differences were seen only in the GI score and cereal fibre at both weeks of intervention. Significant differences in carbohydrates, total fat, MUFA and SFA intake were seen only at week 8. No statistically significant differences were seen in the energy, protein, PUFA, alcohol and non-cereal fibre intake.

This comparison between the groups shows that it was feasible to attain statistically significant differences in the targeted nutrients (carbohydrates, total fat, MUFA, SFA and cereal fibre) in the study groups. A difference in the GI score was also obtained, however, a difference of 13 units was not achieved.

4.2.3 Food Intake Pattern

Figures 4.23 - 4.33 illustrate the changes in the food intake pattern obtained from semi-quantitative food frequency questionnaires. (These figures are shown in Appendix II, p. 149 - 159). Foods rich in carbohydrates (particularly low and high GI foods) and in MUFA are given importance. The main focus is on foods that are specifically modified in the intervention groups. These foods include bread, breakfast cereal, rice and pasta, milk and other dairy products, fruit, vegetables, fats and oils, meat and poultry, fish and alcohol.

4.2.3.1 Breads

Figure 4.23 in Appendix II, (p. 149) shows the bread intake pattern of control and intervention groups. With the exception of the control group (C), all the other groups had decreased the frequency of consuming white bread during the eight week intervention period. The MFLG group and the LG group had increased their frequency of consumption of fruit/raisin bread and ploughman's loaf which were some of the prescribed low GI foods. The MF and the HCLF group showed high frequency in their wholemeal bread intake. It is
interesting to note that the control group had increased their frequency of consumption of fibre-increased and brown bread during the intervention period.

4.2.3.2 Breakfast Cereal

According to the specified dietary regimen, the LG group had increased their frequency of consumption of low GI breakfast cereals ('Special K', 'Sultana Bran', 'All Bran' and Rolled oats) and decreased their consumption of 'Weet bix' and cornflakes. 'Special K' seemed to be the only popular breakfast cereal among the MFLG group. The frequency of intake of other varieties seemed to decline in this group. Frequency of eating cornflakes and ‘Rice Bubbles’ were high among the HCLF and the MF groups. In addition, the HCLF group also had a high frequency of 'Vita Brits' intake.

The frequency of consuming 'All Bran' and 'Sultana Bran' seemed to decline among the MF group. The control group (C) showed an increased frequency in the intake of all kinds of breakfast cereals. However, ‘Weet Bix’, ‘Vita Brits’, ‘Special K’ and rolled oats seemed to be more popular among the C group. Figure 4.24 in Appendix II (p. 150) illustrates the changes in the frequency of breakfast cereal consumption during the intervention period.

4.2.3.3 Rice and Pasta

Figure 4.25 in Appendix II (p. 151) indicates that the LG group had a marked increase in the frequency of consumption of low GI rice varieties such as basmati, long grain and brown rice and low GI pasta such as fettuccine, spaghetti, macaroni and other white pasta varieties. The MFLG group had a large reduction in regular white rice (high GI variety) which was substituted by basmati rice and white pasta (low GI variety).

The HCLF group showed an increase in their frequency of rice and pasta consumption. The MF group showed a noticeable shift from the intake of long grain rice to regular white rice. The control group (C) had an increased intake of white pasta, basmati and brown rice.
4.2.3.4 Milk

The change in the frequency of milk consumption is shown in Figure 4.26 in Appendix II (p. 152). An increase in the frequency of intake of 'Farmers Best' milk which is a good source of high monounsaturated fatty acids was seen among the MF and the MFLG groups with a simultaneous decrease in the frequency of low fat milk intake such as 'Lite white', 'Shape', and skim milk and skim milk powder. The HCLF group increased the frequency of consumption of 'shape', skim milk/powder and evaporated milk. A small increase in the intake of whole/full cream milk was also seen in the low fat group. The frequency of consumption of 'Lite white', skim milk/powder and soy milk increased in the LG group with a large decrease in the frequency of whole/full cream milk intake.

A negative shift was also noticed in the intake of 'Farmers Best' milk among LG and the HCLF groups. Frequency of consumption of flavoured milk decreased in the HCLF, LG and MFLG groups and no change was seen among the MF and the control group (C). The C group increased their frequency of consumption of all types of milk except skim milk/powder, which seemed to decrease.

4.2.3.5 Other dairy products

Figure 4.27 in Appendix II (p. 153) displays the changes in the frequency of consumption of cheese, ice cream, yoghurt and other dairy products. In general, the intervention groups replaced their intake of full fat dairy products with low fat ones with the exception of the control group. The HCLF group showed a positive shift in the intake of cottage/ricotta cheese and cheese spread while a negative shift was seen in the intake of cheddar cheese. The LG group also showed similar changes. The MF group increased the frequency of consumption of cheddar cheese and cheese spread but showed no change in the intake of cottage/ricotta cheese. The MFLG group raised their frequency of intake of cottage/ricotta cheese but reduced their intake of other varieties. The control group (C) also displayed a positive change in their intake of cheddar, cottage/ricotta and cheese spreads.
Low fat yoghurt seemed to be popular in all the intervention groups. The only positive shift in the intake of full fat dairy products was seen in the MF group, which increased the intake of regular yoghurt. The control (C) group showed a decreased frequency in the intake of low fat and regular yoghurt but showed an increase in artificially sweetened yoghurt. The frequency of regular/full fat ice cream intake seemed to decrease in the intervention groups and was replaced by the intake of low fat ice cream in all the intervention groups except the HCLF group. The control (C) group showed an increase in the frequency of consuming regular/full fat as well as low fat ice creams.

4.2.3.6 Fruits

In general, the frequency of fruit consumption increased in all groups including the control (C) group (Figure 4.28 in Appendix II, p. 154). The LG group had increased their frequency of intake of low GI fruits such as oranges, kiwis, grapes, apples and dried fruits. The HCLF group also showed a high frequency in the consumption of oranges, kiwis, grapes and apples equalling the LG group. The frequency of intake of avocado was raised in the MFLG and MF groups while it decreased in the HCLF and LG groups. The frequency of 100% fruit juice was increased in the MFLG group while fruit juice drinks was higher in the HCLF group. All groups had an increased frequency of intake of canned fruits in natural juices. Only the control group (C) had a high frequency of intake of watermelon (high GI fruit) when compared to other groups.

4.2.3.7 Vegetables

The change in the frequency of consumption of vegetables is shown in Figure 4.29 in Appendix II (p. 155). All groups had a high frequency of intake of salad vegetables and sweet corn including the control group (C). A decrease in frequency is observed in the consumption of hot chips, fried potatoes and other root vegetables among all groups except the control group (C). A decrease in frequency is also seen in the intake of boiled, mashed and baked potatoes except in the HCLF group and the C group. The LG group showed a high frequency in the intake of green vegetables while the MFLG and HCLF groups showed
a slight increase. The control group (C) showed a positive shift in the intake of all vegetables except the green leafy vegetables.

4.2.3.8 Fats and Oils

The change in the frequency of fats and oils is displayed in Figure 4.30 in Appendix II (p.156). According to the recommended dietary advice, the MFLG group displayed an increased frequency in the intake of sunola oil and a small increase in the intake of canola margarine. A negative change was observed in all other types of oils and fats. The MF group exhibited similar changes in addition to the increase of canola oil.

Conforming to the specified dietary regimen, the LG group altered their frequency of intake from olive oil to polyunsaturated oils and polyunsaturated margarine. The HCLF group showed only a very small change in the intake of polyunsaturated oils but demonstrated a positive change in the consumption of canola oil. The control (C) group had an increased frequency of consumption of all types of oils and margarines. In addition, only the control (C) group had a positive shift in the intake of butter.

4.2.3.9 Meat and Poultry

Figure 4.31 in Appendix II (p. 157) shows the changes in the frequency of consumption of meat and poultry. All intervention groups showed a decrease in the frequency of consumption of fatty meats such as bacon and sausages. In addition, the MFLG, HCLF and LG groups also showed a decrease in the frequency of intake of luncheon meats. The frequency of intake of chicken/turkey seemed to increase in the intervention groups. However, MF group showed no change in their poultry intake. The frequency of consumption of eggs decreased in the HCLF and the MFLG groups. The LG and MF groups showed an increase in the frequency of non-fried egg consumption. The intake of the control (C) group was on the positive side with the exception of poultry.
4.2.3.10 Fish

The increase in the frequency of consumption of fish was noticed in all the intervention groups (Figure 4.32 in Appendix II, p. 158). The control (C) group showed no change in their frequency of consumption of fresh fish or canned fish in brine, but showed a decrease in the consumption of canned fish in oil and an increase in the intake of prawns, mussels and lobsters.

4.2.3.11 Alcohol

The change in the frequency of alcohol intake is illustrated in Figure 4.33 in Appendix II (p. 159). The MFLG group decreased their frequency of intake of beer, wine and spirits. LG group increased their frequency of consumption of all types of beer, liqueur, spirit and wine. The MF group decreased their frequency of intake of beer but showed an increase in the other types of alcohol. The HCLF group showed an increase in the frequency of intake of spirits and liqueur while no changes were seen in the intake of beer and wine. The control (C) group increased the frequency of beer, liqueur and spirits intake, however, showed no change in their wine consumption.

4.2.3.12 Summary of food intake patterns

In summary, the frequency of intake of low GI foods such as fruit/raisin bread, ‘Ploughman’s loaf’, rolled oats, ‘Sultana bran’, ‘Special K’, ‘All bran’, long grain rice and pastas increased in the LG and the MFLG groups while the frequency of intake of high GI foods such as wholemeal bread, ‘Vita Brits’, ‘Weet bix’, cornflakes and potatoes increased in the HCLF and MF groups. Frequency of MUFA rich foods such as sunola, canola, olive oils and margarines, ‘Farmer’s Best’ milk, avocado and fish increased in the MFLG and MF groups. Frequency of alcohol intake decreased in the MFLG and MF groups but was high in the HCLF and LG groups.
4.3 Anthropometric and Biochemical Measurements

Anthropometric and biochemical measurements were made largely as a means of providing feedback to the participants at the end of the study on the nature of their individual responses to the diet. These data are presented in Appendices III (p. 160 – 172) and IV (p. 173 – 178).

4.3.1 Anthropometric measurements

The anthropometric measurements assessed were body weight, BMI, waist-hip ratio (WHR), systolic and diastolic blood pressures, total body fat and skinfold measurements at seven sites namely biceps, triceps, subscapular, suprailiac, abdominal, thigh and calf. Data are presented at baseline (week 0), weeks 4 and 8 of the intervention period. Changes in the anthropometric variables within the control and intervention groups are shown in Figures 4.34 - 4.46, which are presented in Appendix III (p. 160 – 172). SD and P values are given in Tables 4.15 - 4.27 (Appendix III, p. 160 – 172).

Although, several anthropometric measurements were made, this study was mainly concerned with the changes in body weight as it is directly influenced by changes in the diet and physical activity. All the groups showed a decreasing trend in body weight during the intervention period. Significant changes were seen in the HCLF group at week 8 and in the LG and MFLG groups at week 4 of the intervention period.

4.3.2 Biochemical measurements

Biochemical measurements analysed include plasma glucose, triglycerides and cholesterol, HDL and LDL concentrations and NEFA levels. Changes in the glucose and lipid concentrations of the control and intervention groups are shown in Figures 4.47 - 4.52, which are presented in Appendix IV (p. 173 – 178). SD and P values of mean changes
during the intervention period are shown in Tables 4.28 - 4.33 (Appendix IV, p. 173 - 178).

Plasma glucose levels did not change significantly in any of the groups. However, the HCLF and the MFLG groups showed an increasing trend during the intervention period. In the lipid levels, plasma triglycerides decreased significantly in the HCLF group while it significantly increased in the LG group. Plasma cholesterol levels were decreased in the MFLG group and decreasing trends were seen in the HCLF and the LG groups. On the other hand, the control (C) group showed an increasing trend.

HDL concentration was found to increase significantly in the control group at week 8 and decrease significantly in the MFLG and the MF groups at weeks 4 and 8 respectively. LDL concentrations were decreased significantly in the LG group. In contrast, an increasing trend was seen in the MF group. NEFA levels showed an increasing trend in the HCLF group while no consistent changes were seen in the other groups.

4.4 Physical Activity

The HCLF group was the only intervention group which showed a significant increase in their level of physical activity at both week 4 (P=0.008**) and at week 8 (P=0.027*) of the intervention period (Figure 4.53). The MF group showed a significant increase only at week 8 (P=0.004**). SD and P values of mean changes in the past two weeks of the physical activity for all groups are shown in Table 4.34.
Figure 4.53: Comparison of mean hours of physical activity in the past two weeks of the control and intervention groups observed at weeks 0, 4 and 8.

Table 4.34: SD and P values of mean changes in the physical activity at weeks 4 and 8 of the intervention period when the data were compared to the baseline values (week 0).

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean change 4 - 0 weeks ±SD</th>
<th>P value</th>
<th>Mean change 8 - 0 weeks ±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-0.65 ± 1.8</td>
<td>.312</td>
<td>-1.4 ± 7.55</td>
<td>.406</td>
</tr>
<tr>
<td>HCLF</td>
<td>+3.47 ± 3.01</td>
<td>.008**</td>
<td>+7.04 ± 6.95</td>
<td>.027*</td>
</tr>
<tr>
<td>LG</td>
<td>+4.28 ± 14.4</td>
<td>.219</td>
<td>+8.95 ± 14.8</td>
<td>.109</td>
</tr>
<tr>
<td>MFLG</td>
<td>+2.72 ± 17.0</td>
<td>.500</td>
<td>-1.28 ± 6.0</td>
<td>.223</td>
</tr>
<tr>
<td>MF</td>
<td>+0.42 ± 7.79</td>
<td>.410</td>
<td>+5.68 ± 4.69</td>
<td>.004**</td>
</tr>
</tbody>
</table>

P value refers to Wilcoxon signed rank t tests. * denotes P < 0.05 and ** represents P < 0.01.
4.5 Dietary Compliance

Compliance to the recommended diets was measured in three ways.

- Comparing the actual nutrient intake (from weighed food records) of the intervention groups with the target nutrient levels specified for each of the group.
- Using a diet adherence/acceptance questionnaire, which was self-administered at weeks 4 and 8 of the intervention period.
- Using focus groups to identify the difficulties faced while complying with the diets.

4.5.1 Comparison with target levels

The actual nutrient intakes obtained from weighed food records of each of the intervention group were compared with the target nutrient profile given in Table 3.1. Data obtained from weighed food records were used for this comparison as they are generally accepted as the current practical gold standard for dietary assessments.

4.5.1.1 HCLF group

Comparing the nutrient intake of the HCLF group with the target levels recommended shows that this group was able to reach the targeted carbohydrate, protein and MUFA intake at weeks 4 and 8 of the intervention period. However, this group failed to reach the targeted PUFA intake. This group also failed to reach the targeted non cereal fibre intake at week 4 but managed to reach it at week 8. On the other hand, they exceeded the target reduction in the total fat and saturated fat consumption with a higher intake of cereal fibre.

4.5.1.2 LG group

The LG group was able to reach the targeted carbohydrate, protein and MUFA levels. This group exceeded their target reduction in total fat and SFA consumption. On the other hand,
the LG group failed to reach the targeted GI score, cereal fibre and PUFA intake. The target non cereal fibre intake was achieved at week 4 but declined below the target level at week 8.

4.5.1.3 MFLG group

The MFLG group were able to reach the target level only in their protein intake at both times and non cereal fibre intake at week 4. On the other hand, this group failed to decrease their carbohydrate intake. This group also failed to increase their total fat, MUFA, PUFA, cereal fibre and GI score to the specified target levels. However, the MFLG group exceeded their target reduction in saturated fats.

4.5.1.4 MF group

The MF group was able to reach the target level in their protein intake at weeks 4 and 8 of the intervention period, MUFA intake at week 4 and non cereal fibre intake at week 8. On the other hand, this group failed to decrease their carbohydrate intake and to increase their total fat and PUFA intakes to the specified target levels. The MF group also failed to decrease their SFA consumption at week 4, but managed to decrease it at week 8. However, they had higher consumption of cereal fibre during both times of intervention.

4.5.2 Diet acceptability

Individual responses to each of the acceptability variables obtained from the diet adherence/acceptance questionnaire at weeks 4 and 8 were given scores. The average score for each acceptability variable were obtained. The averaged score gave the diet acceptability rates of the intervention groups, which is shown in Table 4.35. For ease in understanding, the highest rating for each acceptability variable is highlighted in the table. From the table, it can be seen that all the groups showed low adherence rates indicating difficulties in adhering to the recommended diets.
Table 4.35: Results of diet acceptability of the intervention groups to the prescribed diets.

<table>
<thead>
<tr>
<th>Variables</th>
<th>HCLF</th>
<th>LG</th>
<th>MFLG</th>
<th>MF</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy to follow(%)</td>
<td>38</td>
<td>88</td>
<td><strong>100</strong></td>
<td>71</td>
<td>0.033*</td>
</tr>
<tr>
<td>Satisfactory (%)</td>
<td>50</td>
<td>50</td>
<td>44</td>
<td>57</td>
<td>0.854</td>
</tr>
<tr>
<td>Adherence (%)</td>
<td>25</td>
<td>25</td>
<td><strong>33</strong></td>
<td>29</td>
<td>0.648</td>
</tr>
<tr>
<td>Acceptance (%)</td>
<td><strong>88</strong></td>
<td>75</td>
<td>67</td>
<td>57</td>
<td>0.804</td>
</tr>
<tr>
<td>Palatability (%)</td>
<td>50</td>
<td>38</td>
<td>33</td>
<td><strong>71</strong></td>
<td>0.959</td>
</tr>
<tr>
<td>Appeal (%)</td>
<td>50</td>
<td>25</td>
<td>33</td>
<td><strong>71</strong></td>
<td>0.753</td>
</tr>
<tr>
<td>Satiety (%)</td>
<td>38</td>
<td>50</td>
<td><strong>78</strong></td>
<td>57</td>
<td>0.116</td>
</tr>
<tr>
<td>Variety (%)</td>
<td>50</td>
<td>25</td>
<td><strong>78</strong></td>
<td>71</td>
<td>0.893</td>
</tr>
<tr>
<td>Ease of preparation (%)</td>
<td>63</td>
<td>25</td>
<td>22</td>
<td><strong>71</strong></td>
<td>0.261</td>
</tr>
<tr>
<td>Satisfaction of cost (%)</td>
<td><strong>50</strong></td>
<td>38</td>
<td>44</td>
<td>29</td>
<td>0.137</td>
</tr>
</tbody>
</table>

*P values are obtained from Wilcoxon/Kruskal-Wallis rank tests. * shows significant difference at $P < 0.05$.

Despite low adherence, all the intervention groups felt that the recommended diet was easy to follow except the HCLF group. However, the HCLF group showed high acceptance rate (88%) when compared to the other intervention groups. They also indicated higher satisfaction about the cost of the diet when compared to the other groups. On the other hand, the MF group showed least satisfaction about the cost of the diet.

Despite the discontent about the cost, the MF group showed better satisfaction about the diet when compared to the other groups. They also felt that the diet was more palatable, appealing and easy to prepare. The MFLG group felt that the diet specified to them was highly satiating and had more variety, however they showed least satisfaction to their diet.
compared to the other groups. No significant differences were observed between the groups except in the case of following the diet ($P=0.033^*$).

### 4.5.2.1 Overall acceptance of the diet

The overall acceptance of the diet is shown in Figure 4.54. The average score obtained from the individual responses given to the acceptability variables at weeks 4 and 8 of the intervention period was aggregated to attain the overall acceptance. On comparing the four intervention groups, it can be seen that the HCLF group displayed high compliance to the recommended diet with a mean score of 59.

![Figure 4.54: The overall dietary compliance of the intervention groups to the recommended dietary advice obtained from diet adherence/acceptance questionnaire. Scores obtained at weeks 4 and 8 of the intervention period were averaged to give the final score.](image)

The MFLG group also showed good compliance with a mean score of 54 followed by the LG group with a mean score of 53. The MF group was least compliant with a mean score of 52. The maximum score that could be obtained by any group is 68. No significant differences were seen between the groups ($P=0.077$).
4.5.3 Focus groups

Results of the focus group discussions are presented in Extracts 1 – 17, which are shown in Appendix V (p. 179 – 193). The main theme which emerged from the discussions were difficulties in adherence. The participants felt that the diets were more difficult to follow while socialising particularly, during weekends, while travelling and while eating out. Unavailability of specified foods and eating out at restaurants were said to be the main reasons for deviating from their respective diets (Extract 10, Appendix V, p. 187).

The diets were accepted moderately, however, palatability and satisfaction of the diets especially in terms of including low GI, high MUFA and low fat foods were reduced (Extract 11, Appendix V, p. 188). Difficulty in eliminating high GI foods was also emphasised.

Need for family support was stressed during the discussion. It was felt that the support of the spouse could be sought easily rather than the support and compliance of the other family members. However, it was found that the families of the participants were able to adopt the diets prescribed (Extract 13, Appendix V, p. 190).

Consciousness of fat intake was one of the main points in the discussions. Participants reduced their fat intake consciously and also chose to buy low fat foods (Extract 14, Appendix V, p. 191). The salient points mentioned during the focus group are highlighted in the discussion section (Chapter Five).
CHAPTER FIVE

DISCUSSION

This study is centered on addressing the practicality and achievability of four dietary approaches in their isolated forms and combined forms. In addition, the difficulties encountered while following these diets and methodological issues involved are explored. The diet groups will be discussed in the following order.

1. C group (control)
2. HCLF group (high-carbohydrate/low-fat diet)
3. LG group (low GI diet)
4. MFLG group (high monounsaturated-low GI diet)
5. MF group (high monounsaturated diet)

5.1 C Group (Control)

The two main purposes of the control diet group was, to provide a reference point against which to assess the diet intervention diets and to verify if any changes were made to their diet despite instructions to continue with their usual dietary intake.

The diet of the control group was anticipated to represent the usual dietary intake of Australians. In order to verify this, the contributions of carbohydrate, total fat, protein and alcohol to percent total energy intake was compared to the contributions in an average Australian diet (National Dietary Survey of Adults, 1983). It was found that the control (C)
group had an intake similar to that of the usual Australian diet specified in the survey. Hence it would be appropriate to say that the dietary intake of this group was representative of a typical Australian diet.

During the intervention period, the C group showed a tendency to increase their energy, total fat, saturated fat and alcohol intakes. Despite instructions not to make any alterations to their diet, this group showed significant increases in their actual energy and alcohol intakes at week 8 of the intervention period. These changes could be attributed to the 'intervention effect' which is often due to the research participant’s knowledge that their behaviour is being observed. Therefore, in order to assess the true results of intervention it is essential to include a control group as a reference point. In addition, providing detailed instructions and explanations on the valuable contribution of the control diets in diet intervention trials may help to minimise the ‘intervention effect’.

A significant increase seen in their HDL concentrations at week 8 may be linked with their higher alcohol consumption as found in other studies (Choudhry et al, 1994; Keil et al, 1997). However no positive associations could be made between the diet and the metabolic variables since this study was only conducted for a short duration and with a small sample size.

5.2 HCLF Group

The nutritional goals of the high-carbohydrate/low fat diet advocated to this group were met in relation to carbohydrate, protein and MUFA intake. Increasing their carbohydrate intake was not found to be difficult as they were able to increase their frequency of
consumption of high carbohydrate foods. Also, no difficulty was noticed in consuming the recommended high GI foods as it matched up with their usual consumption pattern.

In regard to their fat intake, this group was asked to reduce their total fat, MUFA and saturated fat intake. The required reduction in the total fat, MUFA and saturated fat intakes was achieved, however, the decrease exceeded the recommended amounts. Three possible reasons can be identified for this exceeded reduction. Firstly, individuals were conscious of consuming high amounts of fat and fatty foods as mentioned in the focus group discussion -

"...going to the supermarket, "too high fat", too high fat" I can’t eat that, I can’t eat that - it made a big difference, now I’m so fat conscious- it’s incredible" (Extract 14- Appendix V, p.191).

Another possible reason may be due to the intensive dietary counselling received. This can be seen from the following statement made in the focus group discussion-

"No, since I’ve been on the program ... since the day one I have not had any fat, I haven’t - I don’t fry in it, I don’t stir fry in it, I don’t have it on my bread" (Extract 14 -Appendix V, p. 191).

The third possible reason for the extreme reduction in fat intake may be due to the awareness created by public health messages and the media. The following comment in their focus group discussion shows the influence of the media -

"What I personally found out what we can eat and what we can’t eat is to buy the Weight Watchers magazine and they do a fat and fibre diet and it comes out every two months I think, and there are some wonderful recipes in there - that you can cook and make and they tell you the exact fat content...” (Extract 17 -Appendix V, p. 193).

In general, the recommended high-carbohydrate/low fat diet was highly accepted by this group as indicated by their high overall compliance and acceptance ratings (88%) in the diet
adherence/acceptance questionnaire. However, they gave the lowest rate (38%) for ease in following the diet. Despite this low rating, there were some favourable comments on the during the focus group session-

"I don’t diet, I’ve never been on a diet but I found this one easy to follow” (Extract 3 - Appendix V, p. 181).

"I’ve been dieting for many years on and off and this is the easiest I’ve found” (Extract 3 - Appendix V, p. 181).

They also gave low adherence ratings (38%) indicating difficulties in following the diet. The difficulties encountered was perhaps due to the following reasons which were mentioned during the focus group session-

"I’m happy enough but I’m going to back to some of my horrible habits.....” (Extract 1 - Appendix V, p. 179).

"I couldn’t cope.....I mean sometimes... “ (Extract 1 - Appendix V, p. 179).

"I actually found the initial part of the diet hard.....” (Extract 3 - Appendix V, p. 181).

The difficulties in adhering to the recommended high-carbohydrate/low-fat diet shown by this group emphasise the need to explore the area of difficulty so as to improve the adherence levels.

The activity levels of HCLF group increased during the intervention period. Despite instructions to continue their usual level of activity, a significant increase was observed, which emphasises the necessity of giving adequate explanations on the negative impact of changing activity levels in such dietary intervention studies.
In relation to the metabolic changes in the HCLF group, a significant decrease was seen in their triglyceride levels. Also, decreasing trends were noticed in their body weight and plasma cholesterol levels. A significant increase in their activity levels and the extreme drop in their total fat and saturated fat intake presumably contributed to these favourable changes. On the other hand, an unfavourable increasing trend in their plasma glucose and NEFA levels was seen during the intervention period. This outcome is not in line with the findings of Howard et al (1991) and other similar studies where plasma glucose levels showed a diminishing trend. This difference is may be due to the non-adherence of the participants and also due to the moderate levels of carbohydrates recommended (55%) in this study when compared to the extremely high levels (70%) suggested by Howard et al (1991). However no definite associations between the diet and the metabolic indicators could be drawn considering the small sample size and the short duration of the study.

5.3 LG Group

Dietary recommendations for the LG group involved increasing carbohydrates in the form of low GI foods and decreasing total fat and saturated fat intakes. The LG group demonstrated an exceede reduction in their total fat and saturated fat intake similar to that of the HCLF group. Conscious effort to cut down fat seemed to be the main reason for the excessive reduction in this group, which is apparent from their discussion in the focus group-

"Constantly yes - my diet so I've been eating the Ploughman's bread without any butter on it, and having my toast in the morning without any butter on it, but that doesn't worry me -like and like I just consciously removed most of the fat from my diet...." (Extract 14-Appendix V, p. 191).

"I might slow down consciously when I eat fat, but it's your conscious effort to significantly reduce fat. I have found it difficult to have toast without some fat on it, something's I've got to have on there, weight watchers or canola or something like that - but I can't do without it...." (Extract 14-Appendix V, p. 191).
Although fat intake was considerably reduced, it appears that this group struggled to consume low fat foods because they were not so tasty and enjoyable. Perhaps this contributed to the low adherence ratings (25%) given by this group in their diet acceptability questionnaire. The obvious preference for fatty foods could be seen from their responses in the focus group discussion-

"A lot of the low fat stuff just doesn’t taste the same and the low fat ice cream doesn’t taste the same as with full cream...." (Extract 7 -Appendix V, p. 184).

Oh I still use the skim milk, but I think it’s horrible. I just don’t enjoy a cup of coffee (Extract 7- Appendix V, p. 184)

"I must say I find it a little difficult on occasions to stick rigidly to. Some of the things that - you seem to have fried foods like schnitzels and cordon bleu the odd fried potato and may cooking in olive oil, those sorts of things-they might be a little bit difficult to stay away from, but you consciously diet and you try” (Extract 1 -Appendix V, p. 179).

In regard to incorporating low GI foods, this group was successful. Low GI foods were found to be enjoyable and highly palatable. This was evident from their discussion in the focus group-

"What I find particularly enjoyable is the “Ploughman’s bread” except you can’t buy it unsliced” (Extract 7-Appendix V, p. 184).

I’m actually enjoying the Sultana Bran and I’m enjoying the breakfast now (Extract 2-Appendix V, p. 180).

"It’s quite nice. It’s Thai and I use it in Thai cooking a lot - Jasmine [rice]. It’s certainly a distinct flavour, slightly different it’s not - it’s rice but it’s still slightly different , it’s very nice” (Extract 7- Appendix V, p. 184).

Although low GI foods were incorporated successfully, some difficulties in avoiding high GI foods were experienced by this group as seen from their focus group discussion,
"I mean I have - I always have fruit for breakfast anyway and as I said once I had to drop oranges that was a bit difficult for me. I’m not a wide fruit eater, a few fruits that I am very comfortable with, but finding substitute for oranges has been difficult, apples and bananas, and things have some of the ( ), and when water melon was not allowed, they were difficult to adjust to...” (Extract 11-Appendix V, p. 188).

“.....when everyone else is at home, doesn’t want the rice, want potato, but that’s not an issue” (Extract 11-Appendix V, p. 188).

This group felt that low GI foods were highly satiating which is in agreement with the findings of several studies (Holt and Brand Miller, 1994; Wolever et al, 1988). The following remark in the focus group discussion shows the satiating effect of low GI foods-

*Very filling [referring to the diet] (Extract 6 -Appendix V, p. 183).

“Certainly I haven’t felt any hunger at all, in fact I’m eating more now than I was before I started the diet. I find that quite strange” (Extract 6 -Appendix V, p. 183).

However, despite incorporating low GI foods, this group was unable to lower their GI score and therefore failed to show a 13 unit difference when compared to the HCLF and MF groups. Ironically, this group showed an increased GI score in their actual intake. This pattern has never been reported in the past studies (Brand Miller et al, 1996). Perhaps this unexpected outcome may be due to problems in establishing the GI score, which are discussed in detail later.

Another interesting finding which emerged in the study was the claim that the GI concept could be complex to understand even for health professionals, may possibly be true. This became evident in the focus group discussion-

“Always have, I have an apple and an orange every night and she [research dietitian] said - “Stop the orange” and that was a little bit of difficulty in a sense” (Extract 17-Appendix V, p. 193).
It appears that there was a misjudgment on the part of one of the student dietitians in the research team who thought that the orange was a high GI fruit. In fact, orange has a low GI value while orange juice has high GI value (Foster-Powell and Brand Miller, 1996). The subtle difference in the GI values of oranges as a fresh fruit and as a fruit juice was the cause of the misjudgment. This confirms the argument that the GI concept is too complex and may be burdensome on individuals with diabetes (Coulston and Revean, 1997) as well as on health professionals (Perlstein et al, 1997).

In regard to the alcohol intake of the LG group, a decrease was reported in their diet histories and weighed food records. However, their food intake pattern from food frequency questionnaire showed an increase in the frequency of consumption of all types of alcohol. One possible explanation for this discrepancy may be that although this group did decrease the quantity of consumption, they did not change their frequency of intake.

In regard to the metabolic changes in this group, a decreasing trend in body weight was noticed. On the other hand, an increase in WHR was seen, which could be attributed to disproportionate weight loss as observed in a study conducted by Walker et al (1996). A decreasing trend was also seen in the plasma cholesterol and HDL levels, a significant decrease in LDL levels and a significant increase in triglyceride levels were noticed. No consistent changes were seen in the glucose levels. The patterns of lipid changes demonstrated by the LG group is similar to the patterns showed by studies using a traditional high-carbohydrate/low fat diet (Hollenbeck et al, 1985) rather than the patterns shown by studies embracing low GI diets (Wolever et al 1992). Considering the outcomes, it is possible to say that the metabolic impact of this low GI diet was due to the low fat content and weight loss and not so much due the quality of carbohydrate foods. However, this is
speculative. As mentioned above, this study used only a small sample size for a short duration to test the diets and hence has limitations. Nevertheless, this is an area open for research and further studies in this area may contribute to settle the ongoing debate of incorporating the GI concept in the treatment of diabetes.

5.4 MFLG Group

Dietary advice for the MFLG group included the carbohydrate recommendations of the LG group and the fat recommendations of the MF group. The specific dietary goals were to increase their total fat and monounsaturated fat consumption and decrease their carbohydrate and saturated fat intake. Although their carbohydrate intake was restricted, they were encouraged to include low GI foods within the quantity allowed.

In regard to low GI foods, this group successfully included them in their diet. Low GI foods were incorporated in the form of breads, breakfast cereals, rice, pasta and fruits. This successful increase in low GI foods was reflected in their GI score, which reduced significantly at week 4 of the intervention period. However, despite a significant reduction, a difference of 13 units in the GI score was not achieved when compared to the HCLF and MF groups.

Although this group was able to incorporate low GI foods, they found low GI foods to be unacceptable in terms of palatability. This became apparent in the focus group discussion-

"It's - oh sorry it's really so yuk [Ploughman’s loaf]- well I usually have the two slices and I usually fill it full of salad ( ) I haven’t changed there, but( ) and that I’m full as a boot - up till tea time, so a bit of fruit is plenty" (Extract 11-Appendix V, p. 188)

"I find that bread a little bit bland, that Farmer’s..... Ploughman’s loaf" (Extract 7-Appendix V, p. 184).
"I mean it’s like eating bricks (referring to Ploughman’s loaf)” (Extract 7-Appendix V, p. 184).

".... I find it so bland [rice] put it on with the meal, but I just, - I don’t - when I have it on my meal I tend to leave - if there’s anything left it’s the rice” (Extract 11- Appendix V, p. 188).

Similar to the LG group, this group also felt that the low GI foods were highly satiating. This became evident from their highest rating for satiety (78%) in the diet adherence/acceptance questionnaire and also from their comments in the focus group discussion-

"Ploughman’s loaf is a little bit bland. To me it’s very filling to, I don’t know” (Extract 6-Appendix V, p. 183).

“I used to take four, four sandwiches to work for lunch and I only take three now because of this kind of food. It’s very hard to digest” (Extract 6-Appendix V, p. 183)

"the bread...very indigestible but both John and I suffered badly from indigestion” (Extract 17-Appendix V, p. 193)

From the above statements, it is clear that the MFLG group reported the satiating effect in a complaining manner. The words ‘indigestion’ and ‘hard to digest’ used indicates the discomfort experienced with the low GI foods. Difficulties were not only experienced in including low GI foods but also in eliminating high GI foods which became apparent in the following statements made during the focus group discussion-

"Like I say, I do my miss potatoes now and again and I don’t mind those, but haven’t had any potatoes in the six weeks....” (Extract 11 -Appendix V, p. 188)

“One thing that really, I love bananas and I’ve been told to cut right down on the bananas to about two a week, which I don’t understand, I think the shops will go out of business. I have cheated on the bananas and - not as much as I did but more than I should, but I consider this fruit, it’s still healthy” (Extract 11-Appendix V, p. 188).
The belief that including only low GI foods would severely limit food choices (Franz et al., 1994) also became evident in the focus group discussion:

"I think it was hard, the restriction on the fruit and they ask me to eat four a day - I was sick of apples and pears. I had strawberries" (Extract 4-Appendix V, p. 181).

In relation to fats, this group failed to increase their total fat and MUFA intake. Although they reported an increase in the frequency of consumption of MUFA rich foods such as sunola oil, canola margarine, Farmer’s Best milk, fish and avocados, they were unable achieve the targeted increase. Failing to reach the targeted increase is perhaps due to decreased consumption of these foods during the entire length intervention period. Unavailability of MUFA enriched foods, decreased palatability and difficulties encountered in the preparation of high MUFA foods were the reasons given for their decreased consumption. This was evident from the comments made during the focus group discussions-

"I haven’t stuck to the Farmers Best, I explained that fairly early in the piece that it was absolutely obnoxious but I’m on skimmed..." (Extract 7-Appendix V, p. 184).

"The other thing that I found, going on holidays it’s ( ) things like Farmers Best, as far as I could see they didn’t have an equivalent in Victoria or South Australia. I might be wrong there, but I couldn’t find it...... The other thing was the Canola when you go out, when you eat out you don’t always get Canola margarine" (Extract 10-Appendix V, p. 187)

"I just found it difficult to cook fish other than ( ) or different ways of cooking fish to make it more interesting........." (Extract 8-Appendix V, p. 185).

Difficulties in increasing MUFA intakes in free-living populations was also demonstrated in the feasibility study by Knapper et al (1996) indicating that more research is required in introducing high MUFA diets among free-living populations, particularly in the Western
societies. Difficulties were also faced while limiting alcohol intake. This was highlighted during the focus group discussion-

"So the only thing that I have to keep an eye on is that I don’t exceed the limit of the alcohol because if I go for a drink with people like I used to before, we were in a group, and there’s a few you have to keep an eye on it" (Extract 12 - Appendix V, p. 189).

"...but I have had my two binges out drinking this month so that is probably why I have put - seem to put it on [weight]...." (Extract 12 - Appendix V, p. 189)

Considering their dislike to low GI and MUFA enriched foods, it is not surprising that this group gave the lowest rating for satisfaction of the diet (44%), palatability (33%), appeal (33%) and ease in the preparation (22%) in their diet adherence/acceptability questionnaire.

Despite their obvious dissatisfaction to the diet, the MLFG group gave the highest rating for ease in following the diet (100%) and variety in the diet (78%). This discrepancy in reporting shows that quantitative methods alone are not adequate for extracting all the dietary information needed. It also highlights the advantages of using qualitative methods in addition to the quantitative methods. The combination of quantitative (diet adherence/acceptance questionnaire) and qualitative (focus group) methods used in this study not only improved the accuracy in data collection but also brought to light other psycho-social issues involved while making dietary changes as also pointed by Egger et al (1992). One such important issue brought to light during the focus group discussion was the need for information on the aims and objectives of the study-

"I haven't got any real problems with it. The only thing I would probably like with it at the beginning was more information and background on what was actually happening...... obviously you people know what's going on. May be it's my fault for not asking questions earlier, but ( ) talk about to do with the background on why this, why we are using this particular diet, what the aims of this diet are, where it is, the hows and whys of this particular diet so that might give us a bit more insight and give us a bit more scope with what we can eat and what we can’t eat" (Extract 17 - Appendix V, p. 193).
The above statement clearly establishes the need for detailed explanations in order to understand the significance of dietary treatment involved. Despite providing information sheets at the beginning of the study, this group felt that the information given was inadequate. Therefore while planning future studies, it may be necessary to consider an initial group session or an oral presentation explaining each diet in detail in addition to providing an information sheet.

In regard to metabolic changes, this group showed similar trends to that of the LG and the MF groups. Plasma cholesterol and HDL levels were significantly decreased in this group when compared to the LG and the MF group.

5.5 MF group

The dietary goals of the MF group included decreasing carbohydrate and saturated fat intakes while increasing total fat and monounsaturated fat intakes. This group felt that the diet recommended to them was highly palatable (71%), appealing (71%) and was easy to prepare (71%). They were also better satisfied (57%) with the diet recommended to them when compared to the other groups. However, they displayed low adherence and acceptance levels. This wide variation in the ratings is also reflected in their comments during the focus group discussion-

"Ah that was - I originally went out as a lifestyle change, with it came certain foods yes I am happy. I wouldn’t like it sort of - skim some more off it, I’m quite happy with the way its going. I’ve settled down to it, I feel a bit better now than I did” (Extract 2-Appendix V, p. 180)

"Simply disgusted with it... (Extract 2-Appendix V, p. 180)

“It wasn’t a really great change for me, it was more or less what I was eating” (Extract 2-Appendix V, p. 180).
In relation to fat intake, this group was unable to increase their total fat intake to meet the required target. However, they were successful in increasing their MUFA intake at week 4 of the intervention period, but they could not sustain their increase at week 8. Several reasons for failing to increase their fat consumption can be identified. Firstly, this group was highly conscious of consuming fats which is clear from their discussion in the focus group:

"I don’t think I will because I am not eating fatty food at all. Actually I think I eat zero fat in a normal day..... I have toast no butter, and maybe a smear of vegemite" (Extract 14-Appendix V, p. 191)

Secondly, they had a misconception that this study was a weight loss programme,

"Well what I’m really most satisfied on weight loss and something’s happened and I’ve stopped and I’m really worried about that and I’m trying to keep - to work out what I can do to regain this weight loss program" (Extract 17-Appendix V, p. 193).

"Like I was saying before - I started off to a 111 kilo and I quickly went back o 107 in four weeks and now I’ve started I haven’t lost one iota in the last two or three weeks and I nearly kick the scales....... I’m really enjoying it, but I just can’t seem to shift off it - and I haven’t changed the diet in the latter half of the diet, in first half I had a lot more exercise, I went back to work so - I’m not walking as I used to ( ) I just have shifted it and if I don’t lose another couple of kilos at least ( ) I wouldn’t support it" (Extract 15-Appendix V, p. 192).

The misconception that this study was a weight loss programme was perhaps because of the misinterpretation of the advertisements in the media at the time of recruitment. Fat modification being the major focus of their dietary counselling and the participants being blinded to the dietary treatment could have added to the misconception. Possibly these misconceptions could be avoided by providing sufficient information about the study. As suggested previously, in future studies, it may be of value to give detailed explanation on the aims and goals of these dietary treatments, possibly in the form of oral presentations.
Thirdly, they were influenced by other professional weight loss programmes,

"I lost about six kilos with the one that I was on before [referring to Easy Slim]" (Extract 17-Appendix V, p. 193)

Finally, the participants of this group had a low total fat and MUFA consumption at baseline when compared to the other groups. This probably could have contributed to the failure in increasing their fat consumption levels as it is difficult to increase fat levels in low fat eaters. This perhaps was also the reason for the difficulty in sustaining their increase throughout the intervention period. In order to avoid such problems in future studies, it is necessary to block participants based on their nutrient intake and dietary patterns, which would also, assist in promoting compliance.

In relation to decreasing the carbohydrate intake, the MF group could not reduce their carbohydrate consumption to the suggested target amounts and this could be seen from their discussion in the focus group -

"The biggest problem I have with the whole thing is when I eat is, traditionally I always had a large meal at night, with rice, pasta or I go traditional ( ) and this diet necessitated wants me to cut that back in a few sizes, and then have a smaller snack about nine-o’clock at night - well I haven’t done that and I probably never will" (Extract 1-Appendix V, p. 179).

However, this group was able to consume the suggested high GI foods which was reflected in their GI score, which increased significantly during the intervention period.

In relation to metabolic changes, this group showed a decreasing trend in body weight, triglycerides and HDL levels. However, their LDL levels showed an increasing trend. No consistent changes were observed in their plasma glucose, cholesterol and NEFA levels. The changes observed in this group were not in agreement with the findings of Garg et al (1988).
Even though both this study and the study of Garg et al had small sample sizes and were of a short duration, Garg et al supplied all the meals to the participants and hence had a strictly controlled environment in their study. These differences in findings highlight the need for further research in areas that assist in establishing the impact of high MUFA diets among free-living populations.

5.6 Methodological Issues

5.6.1 Difficulties in calculating GI scores

Several difficulties were encountered while calculating GI scores. Firstly, many of the commonly consumed foods had no GI values assigned to them. Some of the foods that were popular among the study population, which had no assigned GI value, are given below.

Breads: Garlic bread, Lebanese bread, English muffins, pancakes
Biscuits: Scotch finger biscuits, Tim Tam biscuits, chocolate coated biscuits
Milk: Low fat milks, ‘Farmer’s Best’ milk
Fruit: Mandarin
Desserts: Cheese cake, fruit cake, apple pies, Sara Lee pudding, Danish pastry.
Beverages: Coca cola, lemonade
Condiment: Tomato, Barbecue sauces
Spreads: Jam
Take away: Pizza, Macdonald’s, KFC, Doner Kebab, sausage rolls, meat pies
Other foods: Rice/prawn crackers, pappadum, taco shells, Licorice, Tabouleh
These foods have not been tested and it may not be feasible to do so, particularly processed foods, mainly because of the elaborate and expensive procedures involved in determining the GI values (Wolever et al, 1991).

In addition, alcoholic drinks had no assigned GI value. Since the study group was a heavy alcohol drinking population, an appreciable amount of carbohydrate was contributed by alcohol. Due to the unavailability of GI values, calculations for alcohol were omitted.

The absence of GI values led to missing data for major areas of consumption. The missing data was a severe disadvantage in establishing accurate GI scores, because it introduced errors by creating false lower scores, which made the diets appear to have low GI foods, whereas in fact the diets predominantly contained high GI foods. Illustrations given in Appendix VI (p. 194 – 195) show this difficulty. There was, therefore, a high possibility of misinterpreting the GI data.

Attempts were made however, to minimise the errors by cautiously substituting the GI value of one food for another despite the warning given by Brand Miller et al (1996) who state that “the GI factor of a food cannot be predicted from its composition or the GI factor of related foods”. Substitutions such as: the GI of wholemeal flour for wholemeal Lebanese bread, GI of skim milk for low fat milk and GI of orange flavoured soft drink for coca cola were made. However, only a few foods which had a single carbohydrate source could be substituted in this manner. For foods which had more than one source of carbohydrate such as jam (fruits and sugar), apple pies (apples, sugar and pastry), and commercially prepared foods such as Tim Tam biscuits (chocolate, sugar, flour), Sara Lee puddings and Danish
pastries, substituting GI value was difficult since the amount of each ingredient was not known and it was not feasible to obtain this information from the manufacturers.

Substitutions of GI values made in this manner may have introduced errors leading to inaccurate calculations in the GI scores. Hence, it was not possible to accurately measure the GI scores of participants (Perlstein et al, 1997). Due to these limitations, it is believed here that the GI can be accurately measured only in research settings where subjects are prescribed a standard diet containing locally tested foods. This belief agrees with the suggestions given by Jenkins et al (1988).
CHAPTER SIX

CONCLUSION

This pilot study has demonstrated that dietary interventions involving carbohydrate and fat modifications can be performed in free-living populations. Significant differences achieved in carbohydrate, total fat, SFA, MUFA, cereal fibre and GI score between the groups indicate that changing the nutrient intake of this study population is feasible. However, not all of these changes were in the expected direction, particularly the fat intake.

The high fat intake recommended to the MFLG and MF groups was not accomplished suggesting that increasing fat in this study population was not feasible. Similarly, increasing MUFA intake was also not feasible in these groups. Hence, in this study, it is recommended that further research in identifying appropriate methods of increasing total fat and MUFA intake in free-living populations should be conducted before undertaking larger studies. Further, innovative methods of incorporating MUFA rich foods in individuals consuming a Western style diet needs to be considered.

The incorporation of low GI foods was successful in the LG and MFLG groups. However, low GI foods were found to be less acceptable in terms of palatability. Therefore, it is suggested that the low GI foods prescribed should conform to the likes and dislikes of the study population, which would also help in enhancing adherence to the recommended diets.
Although low GI foods were successfully incorporated, the targeted 13 unit difference in the GI score was not achieved between the groups. The difficulties faced while calculating the GI scores and the missing GI data may have contributed to the problems in establishing this difference. In order to avoid such problems in future studies, it may be necessary to prescribe standard diets containing locally tested foods. However, prescribing standard diets would introduce severe restrictions on the foods consumed by individuals particularly in free-living environments. Therefore, the prospect of calculating precise GI scores in free-living environments is remote and any long-term attempt would be only at the expense of imposing severe restrictions on foods consumed.

The high carbohydrate/low fat diet recommended to the HCLF group was generally well accepted providing evidence that such diets are feasible in this study population. However, this group showed an extreme reduction in their fat intake, well below the recommended levels. Therefore, it is concluded that in future studies, care should be taken not to over-emphasise the restriction of fats. Instead, more time should be spent on improving adherence to the diet since this group displayed the least adherence level.

In order to improve adherence to the recommended diets it is necessary to provide adequate information on the diets involved. In future studies, an oral presentation on the recommended diets may help the participants to have a better understanding on the purpose and the importance of the diets. Presentations given before allocating the participants to their diet groups would be beneficial as it would keep the participants blinded to their specific diets. Explanation on the control diet during these presentations may help to prevent the ‘intervention effect’ seen in the control (C) group. Further, the negative impact of changing the activity levels in diet intervention trials could be emphasised during these
presentations. In this way, the true impact of the diet on the metabolic variables could be established.

Trends in the metabolic variables of plasma lipids were encouraging. With sufficient sample size and duration of the study clear-cut results could have been obtained. In conclusion, this study emphasises the need for adequate dietary compliance and sample size to evaluate the efficacy of recommended diets on the metabolic parameters.
LIMITATIONS OF THE STUDY

- The apparent limitation of this study was the small sample size and the short duration of the study period. However, it should be noted that the study was designed as a pilot, to explore the feasibility of similar future studies on a larger scale.

- It is recognised that focus group data are open to interpretation, as are all forms of social inquiry. The position taken by the investigator i.e. this study was to report difficulties with the diets at face value. The information from this study, however, would be useful in planning further in-depth analysis with similar social and cultural issues.

- It has also been noted that there were methodological difficulties in establishing the GI score, which could have influenced the interpretation of the GI data.

- It is understood that the dietary methods and materials used in the study may have influenced the rate of compliance of the participants.
AREAS FOR FURTHER INVESTIGATION

- The preliminary findings of this study warrants a full scale multi centre trial to establish the efficacy of the recommended intervention diets on the metabolic indicators of IRS.

- Since this study showed the difficulties in incorporating MUFA rich foods in free-living individuals consuming a Western style diet, further studies should be conducted to identify appropriate methods of incorporating MUFA rich foods.

- This study was conducted on non-diabetic individuals. It would be interesting to study the feasibility of these diets in populations with diabetes.

- The acceptability and feasibility of the recommended diets may vary for other populations particularly in different ethnic groups. Therefore, it would be interesting to study the feasibility of these diets in various ethnic populations.

- Conducting in-depth interviews in the participants may contribute invaluable information towards improving compliance and client education.
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REFERENCES


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REFERENCES


REFERENCES


Quatromoni PA, Milbauer M, Posner BM, Carballeira NP, Brunt M, Chipkin SR, (1994), *Use of focus groups to explore nutrition practices and health beliefs of urban Caribbean Latinos with diabetes*, Diabetes Care 17, p. 869-873.


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Tables 4.2 - 4.12 indicate percent differences in energy and macronutrient intakes between intervention (weeks 4 and 8) and baseline (week 0) measures for control and intervention groups obtained from diet histories and weighed food records. Data obtained from diet histories are referred as reported intakes and data obtained from food records are referred as actual intakes. P values refer to Wilcoxon signed rank t tests.

* denotes $P < 0.05$ and ** represents $P < 0.01$. 

### Table 4.2: Percent differences in energy intake between intervention (weeks 4 and 8) and baseline measures for control and intervention groups, by diet history and food records.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Reported Intake (Diet histories)</th>
<th>Actual Intake (Weighed food records)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 - 0 weeks ± SD</td>
<td>P value</td>
</tr>
<tr>
<td>C</td>
<td>+2.2 ± 20.2</td>
<td>.500</td>
</tr>
<tr>
<td>HCLF</td>
<td>-7.33 ± 26.3</td>
<td>.150</td>
</tr>
<tr>
<td>LG</td>
<td>-29.6 ± 22.6</td>
<td>.004**</td>
</tr>
<tr>
<td>MF</td>
<td>-8.37 ± 8.33</td>
<td>.004**</td>
</tr>
</tbody>
</table>
Table 4.3: Percent differences in mean carbohydrate intake (expressed as percent energy) between intervention (weeks 4 and 8) and baseline (week 0) measures for control and intervention groups, by diet history and food records.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Reported Intake (Diet histories)</th>
<th>Actual Intake (Weighed food records)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 - 0 weeks±SD</td>
<td>8 - 0 weeks±SD</td>
</tr>
<tr>
<td></td>
<td>P value</td>
<td>P value</td>
</tr>
<tr>
<td>C</td>
<td>-1.77±5.19</td>
<td>-3.0±7.74</td>
</tr>
<tr>
<td></td>
<td>.002**</td>
<td>.004**</td>
</tr>
<tr>
<td>HCLF</td>
<td>+13.1±9.7</td>
<td>+17.8±13.1</td>
</tr>
<tr>
<td></td>
<td>+13.8±11.3</td>
<td>+17.8±13.1</td>
</tr>
<tr>
<td>LG</td>
<td>+16.3±6.4</td>
<td>+15.5±6.1</td>
</tr>
<tr>
<td></td>
<td>+17.8±13.1</td>
<td>+15.5±6.1</td>
</tr>
<tr>
<td>MFLG</td>
<td>+6.8±7.7</td>
<td>+7.4±10.0</td>
</tr>
<tr>
<td></td>
<td>+7.4±10.0</td>
<td>+7.4±10.0</td>
</tr>
<tr>
<td>MF</td>
<td>+2.8±12.3</td>
<td>+0.14±9.45</td>
</tr>
<tr>
<td></td>
<td>+0.14±9.45</td>
<td>+0.14±9.45</td>
</tr>
</tbody>
</table>

* denotes P <0.05 and ** represents P < 0.01.

Table 4.4: Percent differences in mean protein intake (expressed as percent energy) between intervention (weeks 4 and 8) and baseline (week 0) measures for control and intervention groups, by diet history and food records.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Reported Intake (Diet histories)</th>
<th>Actual Intake (Weighed food records)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 - 0 weeks±SD</td>
<td>8 - 0 weeks±SD</td>
</tr>
<tr>
<td></td>
<td>P value</td>
<td>P value</td>
</tr>
<tr>
<td>C</td>
<td>0.00±6.67</td>
<td>-1.77±3.76</td>
</tr>
<tr>
<td></td>
<td>.500</td>
<td>.109</td>
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<tr>
<td>HCLF</td>
<td>+0.55±2.24</td>
<td>-0.37±4.2</td>
</tr>
<tr>
<td></td>
<td>+4.28±4.42</td>
<td>.410</td>
</tr>
<tr>
<td>LG</td>
<td>+2.22±3.2</td>
<td>+4.28±4.42</td>
</tr>
<tr>
<td></td>
<td>+4.28±4.42</td>
<td>+3.4±4.15</td>
</tr>
<tr>
<td>MFLG</td>
<td>+3.2±3.38</td>
<td>+2.33±2.82</td>
</tr>
<tr>
<td></td>
<td>+2.33±2.82</td>
<td>+3.22±3.6</td>
</tr>
<tr>
<td>MF</td>
<td>+1.75±2.6</td>
<td>-0.04±2.07</td>
</tr>
<tr>
<td></td>
<td>-0.04±2.07</td>
<td>+3.37±3.2</td>
</tr>
</tbody>
</table>

* denotes P < 0.05.
Table 4.5: Percent differences in mean total fat intake (expressed as percent energy) between intervention (weeks 4 and 8) and baseline (week 0) measures for control and intervention groups, by diet history and food records.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Reported Intake (Diet histories)</th>
<th>Actual Intake (Weighed food records)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 - 0 weeks±SD</td>
<td>8 - 0 weeks±SD</td>
</tr>
<tr>
<td>C</td>
<td>+0.77±5.14</td>
<td>+0.11±4.75</td>
</tr>
<tr>
<td>HCLF</td>
<td>-15.5±8.84</td>
<td>-19.7±10.3</td>
</tr>
<tr>
<td>LG</td>
<td>-13.8±11.5</td>
<td>-12.6±9.95</td>
</tr>
<tr>
<td>MFLG</td>
<td>-7.33±8.18</td>
<td>-7.77±8.7</td>
</tr>
<tr>
<td>MF</td>
<td>-1.5±13.6</td>
<td>0.00±7.34</td>
</tr>
</tbody>
</table>

* denotes P <0.05 and ** represents P <0.01.

Table 4.6: Percent differences in mean monounsaturated fatty acid intake (expressed as percent energy) between intervention (weeks 4 and 8) and baseline (week 0) measures for control and intervention groups, by diet history and food records.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Reported Intake (Diet histories)</th>
<th>Actual Intake (Weighed food records)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 - 0 weeks±SD</td>
<td>8 - 0 weeks±SD</td>
</tr>
<tr>
<td>C</td>
<td>+0.24±2.5</td>
<td>+0.55±3.3</td>
</tr>
<tr>
<td>LG</td>
<td>-6.2±4.99</td>
<td>-5.77±3.81</td>
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<tr>
<td>MFLG</td>
<td>-1.79±4.57</td>
<td>-2.28±5.04</td>
</tr>
<tr>
<td>MF</td>
<td>+0.93±5.4</td>
<td>+1.05±4.9</td>
</tr>
</tbody>
</table>

* denotes P <0.05 and ** represents P <0.01.
Table 4.7: Percent differences in mean polyunsaturated fatty acid intake (expressed as percent energy) between intervention (weeks 4 and 8) and baseline (week 0) measures for control and intervention groups, by diet history and food records.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Reported Intake (Diet histories)</th>
<th>Actual Intake (Weighed food records)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 - 0 weeks±SD</td>
<td>8 - 0 weeks±SD</td>
</tr>
<tr>
<td>C</td>
<td>+1.55±5.4</td>
<td>-0.33±2.32</td>
</tr>
<tr>
<td>HCLF</td>
<td>-0.91±2.84</td>
<td>-1.66±2.44</td>
</tr>
<tr>
<td>LG</td>
<td>+0.28±3.6</td>
<td>+0.60±3.1</td>
</tr>
<tr>
<td>MFLG</td>
<td>-2.16±4.05</td>
<td>-2.28±5.04</td>
</tr>
<tr>
<td>MF</td>
<td>+5.1±2.14</td>
<td>+0.64±1.8</td>
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</table>

* denotes P <0.05.

Table 4.8: Percent differences in mean saturated fatty acid intake (expressed as percent energy) between intervention (weeks 4 and 8) and baseline (week 0) measures for control and intervention groups, by diet history and food records.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Reported Intake (Diet histories)</th>
<th>Actual Intake (Weighed food records)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>4 - 0 weeks±SD</td>
<td>8 - 0 weeks±SD</td>
</tr>
<tr>
<td>C</td>
<td>-1.11±2.84</td>
<td>-0.17±2.77</td>
</tr>
<tr>
<td>HCLF</td>
<td>-22.6±22.6</td>
<td>-22.7±19.8</td>
</tr>
<tr>
<td>LG</td>
<td>-8.11±6.23</td>
<td>-7.58±5.53</td>
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<tr>
<td>MFLG</td>
<td>-4.39±3.73</td>
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<tr>
<td>MF</td>
<td>-3.0±6.96</td>
<td>-1.76±2.14</td>
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</table>

denotes P <0.05 and ** represents P <0.01.
Table 4.9: Percent differences in mean GI score (expressed as percent energy) between intervention (weeks 4 and 8) and baseline (week 0) measures for control and intervention groups, by diet history and food records.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Reported Intake (Diet histories)</th>
<th>Actual Intake (Weighed food records)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 - 0 weeks±SD</td>
<td>8 - 0 weeks±SD</td>
</tr>
<tr>
<td>C</td>
<td>-1.5±5.04</td>
<td>-4.83±7.5</td>
</tr>
<tr>
<td>HCLF</td>
<td>-1.76±5.18</td>
<td>-3.24±9.11</td>
</tr>
<tr>
<td>LG</td>
<td>-0.82±10.1</td>
<td>-2.0±10.4</td>
</tr>
<tr>
<td>MFLG</td>
<td>-3.46±8.82</td>
<td>-4.64±7.01</td>
</tr>
<tr>
<td>MF</td>
<td>+2.98±3.9</td>
<td>+4.83±4.79</td>
</tr>
</tbody>
</table>

* denotes P <0.05 and ** represents P <0.01.

Table 4.10: Percent differences in mean alcohol intake (expressed as percent energy) between intervention (weeks 4 and 8) and baseline (week 0) measures for control and intervention groups, by diet history and food records.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Reported Intake (Diet histories)</th>
<th>Actual Intake (Weighed food records)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>8 - 0 weeks±SD</td>
</tr>
<tr>
<td>C</td>
<td>+1.0±4.41</td>
<td>+4.55±9.9</td>
</tr>
<tr>
<td>ICLF</td>
<td>+1.55±2.5</td>
<td>+1.75±2.1</td>
</tr>
<tr>
<td>G</td>
<td>-4.44±11.8</td>
<td>-5.12±11.9</td>
</tr>
<tr>
<td>IFLG</td>
<td>-1.77±7.99</td>
<td>-1.00±9.27</td>
</tr>
<tr>
<td>IF</td>
<td>-3.0±5.78</td>
<td>+0.71±5.4</td>
</tr>
</tbody>
</table>

* denotes P <0.05.
Table 4.11: Percent differences in mean cereal fibre intake (expressed as percent energy) between intervention (weeks 4 and 8) and baseline (week 0) measures for control and intervention groups, by diet history and food records.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Reported Intake (Diet histories)</th>
<th>Actual Intake (Weighed food records)</th>
</tr>
</thead>
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<tr>
<td></td>
<td>4 - 0 weeks±SD</td>
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<tr>
<td>C</td>
<td>+0.44±3.12</td>
<td>.375</td>
</tr>
<tr>
<td>HCLF</td>
<td>+5.11±5.39</td>
<td>.008**</td>
</tr>
<tr>
<td>LG</td>
<td>+3.77±4.63</td>
<td>.018*</td>
</tr>
<tr>
<td>MFLG</td>
<td>+4.0±5.93</td>
<td>.098</td>
</tr>
<tr>
<td>MF</td>
<td>-2.5±4.59</td>
<td>.117</td>
</tr>
</tbody>
</table>

* denotes P <0.05 and ** represents P <0.01.

Table 4.12: Percent differences in mean non cereal fibre intake (expressed as percent energy) between intervention (weeks 4 and 8) and baseline (week 0) measures for control and intervention groups, by diet history and food records.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Reported Intake (Diet histories)</th>
<th>Actual Intake (Weighed food records)</th>
</tr>
</thead>
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<tr>
<td></td>
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</tr>
<tr>
<td>C</td>
<td>+0.44±7.2</td>
<td>.500</td>
</tr>
<tr>
<td>HCLF</td>
<td>+5.55±6.36</td>
<td>.055</td>
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<tr>
<td>LG</td>
<td>+8.77±7.06</td>
<td>.006**</td>
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<tr>
<td>MFLG</td>
<td>+0.66±10.4</td>
<td>.529</td>
</tr>
<tr>
<td>MF</td>
<td>+3.5±8.65</td>
<td>.234</td>
</tr>
</tbody>
</table>

* denotes P <0.05 and ** represents P <0.01.
APPENDIX II

FOOD INTAKE PATTERN

Figure 4.23: Change in the bread intake pattern of control and intervention groups from week 0 to week 8 obtained from food frequency questionnaire
Figure 4.24: Change in the intake of breakfast cereal in control and intervention groups from weeks 0 to week 8 obtained from food frequency questionnaire
Figure 4.25: Change in the rice and pasta intake pattern of control and intervention groups from week 0 to week 8 obtained from food frequency questionnaire
Figure 4.26: Change in the intake of milk among the control and intervention groups from week 0 to week 8 obtained from food frequency questionnaire
Figure 4.27: Change in the intake of dairy products among control and intervention groups from week 0 to week 8 obtained from food frequency questionnaire.
Figure 4.28: Change in the fruit intake pattern of control and intervention groups from week 0 to week 8 obtained from food frequency questionnaire
Figure 4.29: Change in the vegetable intake of control and intervention groups from week 0 to week 8 obtained from food frequency questionnaire.
Figure 4.30: Change in the intake of fats and oils among control and intervention groups from week 0 to week 8 obtained from food frequency questionnaire.
Figure 4.31: Change in the meat and poultry intake of control and intervention groups from week 0 to week 8 obtained from food frequency questionnaire.
Figure 4.32: Change in the fish intake pattern of control and intervention groups from week 0 to week 8 obtained from food frequency questionnaire
Figure 4.33: Change in the alcohol intake pattern of control and intervention groups from week 0 to week 8 obtained from food frequency questionnaire
APPENDIX III

RESULTS OF ANTHROPOMETRIC MEASUREMENTS

Body weight:

![Graph comparing mean body weight of control and intervention groups observed at weeks 0, 4, and 8.]

Figure 4.34: Comparison of mean body weight of control and intervention groups observed at weeks 0, 4, and 8.

Table 4.15: SD and P values of mean changes in body weight at weeks 4 and 8 of the intervention period when compared with baseline values (week 0).

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean change 4-0 weeks ±SD</th>
<th>P value</th>
<th>Mean change 8-0 weeks ±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-1.54 ±3.84</td>
<td>0.199</td>
<td>-1.85 ±3.97</td>
<td>0.127</td>
</tr>
<tr>
<td>HCLF</td>
<td>-1.70 ±2.62</td>
<td>0.064</td>
<td>-2.45 ±2.84</td>
<td>0.039*</td>
</tr>
<tr>
<td>LG</td>
<td>-1.60 ±1.95</td>
<td>0.033*</td>
<td>-0.87 ±2.0</td>
<td>0.203</td>
</tr>
<tr>
<td>MFLG</td>
<td>-1.17 ±1.46</td>
<td>0.020*</td>
<td>-1.42 ±2.29</td>
<td>0.064</td>
</tr>
<tr>
<td>MF</td>
<td>-1.05 ±2.0</td>
<td>0.137</td>
<td>-1.25 ±1.84</td>
<td>0.078</td>
</tr>
</tbody>
</table>

P values refer to mean changes within groups using Wilcoxon signed rank t tests. * denotes P < 0.05.
Body Mass Index (BMI):

Figure 4.35: Comparison of mean BMI of control and intervention groups observed at weeks 0, 4 and 8.

Table 4.16: SD and P values of mean changes in BMI during weeks 4 and 8 of intervention period when the data were compared with week 0.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean change 4 - 0 weeks ±SD</th>
<th>P value</th>
<th>Mean change 8 - 0 weeks ±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-0.53 ±1.32</td>
<td>0.219</td>
<td>-0.62 ±1.38</td>
<td>0.180</td>
</tr>
<tr>
<td>HCLF</td>
<td>-0.53 ±0.85</td>
<td>0.064</td>
<td>-0.76 ±0.88</td>
<td>0.039*</td>
</tr>
<tr>
<td>LG</td>
<td>-0.54 ±0.66</td>
<td>0.037*</td>
<td>-0.27 ±0.61</td>
<td>0.148</td>
</tr>
<tr>
<td>MFLG</td>
<td>-0.39 ±0.46</td>
<td>0.020*</td>
<td>-0.44 ±0.74</td>
<td>0.064</td>
</tr>
<tr>
<td>MF</td>
<td>-0.34 ±0.72</td>
<td>0.148</td>
<td>-0.37 ±0.54</td>
<td>0.078</td>
</tr>
</tbody>
</table>

P values refer to mean changes within groups using Wilcoxon signed rank t tests. * refers to P < 0.05.
Waist-Hip-Ratio (WHR):

Figure 4.36: Comparison of mean Waist-Hip-Ratio (WHR) of control and intervention groups observed at weeks 0, 4 and 8.

Table 4.17: SD and P values of mean changes WHR during weeks 4 and 8 of the intervention period when compared with baseline values (week 0).

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean change 4 - 0 weeks ±SD</th>
<th>P value</th>
<th>Mean change 8 - 0 weeks ±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>+0.02 ±0.03</td>
<td>0.033*</td>
<td>+0.01 ±0.03</td>
<td>0.086</td>
</tr>
<tr>
<td>HCLF</td>
<td>-0.004 ±0.02</td>
<td>0.344</td>
<td>-0.002 ±0.01</td>
<td>0.312</td>
</tr>
<tr>
<td>LG</td>
<td>+0.008 ±0.03</td>
<td>0.227</td>
<td>+0.03 ±0.06</td>
<td>0.109</td>
</tr>
<tr>
<td>MFLG</td>
<td>-0.01 ±0.04</td>
<td>0.234</td>
<td>-0.01 ±0.03</td>
<td>0.098</td>
</tr>
<tr>
<td>MF</td>
<td>+0.006 ±0.06</td>
<td>0.422</td>
<td>-0.005 ±0.02</td>
<td>0.281</td>
</tr>
</tbody>
</table>

P values refer to mean changes within groups using Wilcoxon signed rank t tests. * denotes P<0.05.
Blood pressure:

Systolic blood pressure:

![Figure 4.37: Comparison of mean systolic blood pressure of control and intervention groups at weeks 0, 4 and 8. S.B.P refers to systolic blood pressure.](image)

Table 4.18: SD and P values of mean changes in systolic blood pressure at weeks 4 and 8 of the intervention period when compared to the baseline values (week 0).

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean change 4 - 0 weeks ±SD</th>
<th>P value</th>
<th>Mean change 8 - 0 weeks ±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-11.6 ±10.63</td>
<td>0.199</td>
<td>-1.85 ±3.97</td>
<td>0.127</td>
</tr>
<tr>
<td>HCLF</td>
<td>-19.1 ±23.0</td>
<td>0.002**</td>
<td>-15.6 ±21.4</td>
<td>0.020*</td>
</tr>
<tr>
<td>LG</td>
<td>-12.7 ±8.45</td>
<td>0.002**</td>
<td>-7.91 ±8.2</td>
<td>0.027*</td>
</tr>
<tr>
<td>MFLG</td>
<td>-15.0 ±10.2</td>
<td>0.002**</td>
<td>-6.42 ±13.8</td>
<td>0.125</td>
</tr>
<tr>
<td>MF</td>
<td>-3.01 ±44.4</td>
<td>0.098</td>
<td>-1.44 ±47.3</td>
<td>0.141</td>
</tr>
</tbody>
</table>

*P values refer to mean changes within groups using Wilcoxon signed rank t tests. * denotes $P < 0.05$ and ** denotes $P < 0.01$. 
Diastolic blood pressure:

Figure 4.38: Comparison of mean diastolic blood pressure of control and intervention groups observed at weeks 0, 4 and 8. D.B.P refers to diastolic blood pressure.

Table 4.19: SD and P values of mean changes in diastolic blood pressure at weeks 4 and 8 of the intervention period when were compared with week 0.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean change 4 - 0 weeks ±SD</th>
<th>P value</th>
<th>Mean change 8 - 0 weeks ±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-4.85 ±11.2</td>
<td>0.125</td>
<td>-1.85 ±3.97</td>
<td>0.127</td>
</tr>
<tr>
<td>HCLF</td>
<td>-9.31 ±10.6</td>
<td>0.010*</td>
<td>-8.75 ±13.3</td>
<td>0.020*</td>
</tr>
<tr>
<td>LG</td>
<td>-8.85 ±5.79</td>
<td>0.002**</td>
<td>-4.38 ±4.9</td>
<td>0.039*</td>
</tr>
<tr>
<td>MFLG</td>
<td>-9.22 ±9.85</td>
<td>0.014*</td>
<td>-3.61±9.27</td>
<td>0.145</td>
</tr>
<tr>
<td>MF</td>
<td>-5.87±8.63</td>
<td>0.055</td>
<td>-7.31 ±8.34</td>
<td>0.039*</td>
</tr>
</tbody>
</table>

P values refer to mean changes within groups using Wilcoxon signed rank t tests. * denotes P <0.05 and ** denotes P <0.01.
Total body fat:

![Graph showing total body fat percentage over weeks for different groups.](image)

*Figure 4.39: Comparison of mean total body fat of control and intervention groups observed at weeks 0, 4 and 8.*

*Table 4.20: SD and P values of mean changes in total body fat at weeks 4 and 8 of the intervention period when compared to week 0.*

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean change 4-0 weeks ±SD</th>
<th>P value</th>
<th>Mean change 8-0 weeks ±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-0.2 ±3.04</td>
<td>0.285</td>
<td>+0.47 ±3.15</td>
<td>0.660</td>
</tr>
<tr>
<td>HCLF</td>
<td>-1.2 ±2.3</td>
<td>0.051</td>
<td>-1.66 ±2.59</td>
<td>0.055</td>
</tr>
<tr>
<td>LG</td>
<td>+1.35 ±2.65</td>
<td>0.125</td>
<td>-0.18 ±0.20</td>
<td>0.578</td>
</tr>
<tr>
<td>MFLG</td>
<td>+0.12 ±2.69</td>
<td>0.500</td>
<td>+0.13 ±3.0</td>
<td>0.500</td>
</tr>
<tr>
<td>MF</td>
<td>+0.55 ±1.86</td>
<td>0.680</td>
<td>-0.98 ±1.91</td>
<td>0.188</td>
</tr>
</tbody>
</table>

*P values refer to mean changes within groups using Wilcoxon signed rank t tests.*
Skinfold measurements

Skinfold measurements were taken at seven sites - biceps, triceps, subcapular, suprailiac, abdomen, thigh and calf.

Biceps:

Figure 4.40: Comparison of mean bicep skinfold of control and intervention groups at weeks 0, 4 and 8.

Table 4.21: SD and P values of mean changes in bicep skinfold at weeks 4 and 8 of the intervention period when compared to week 0.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean change 4 - 0 weeks ±SD</th>
<th>P value</th>
<th>Mean change 8 - 0 weeks ±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-1.18 ±4.47</td>
<td>0.422</td>
<td>-0.41 ±2.3</td>
<td>0.326</td>
</tr>
<tr>
<td>HCLF</td>
<td>-0.24 ±2.55</td>
<td>0.422</td>
<td>-2.75 ±1.94</td>
<td>0.004**</td>
</tr>
<tr>
<td>LG</td>
<td>-0.73 ±1.75</td>
<td>0.131</td>
<td>-2.17 ±3.73</td>
<td>0.062</td>
</tr>
<tr>
<td>MFLG</td>
<td>-2.86 ±2.58</td>
<td>0.002**</td>
<td>-2.81 ±4.5</td>
<td>0.037*</td>
</tr>
<tr>
<td>MF</td>
<td>-2.80 ±3.83</td>
<td>0.012*</td>
<td>-2.34 ±2.76</td>
<td>0.008**</td>
</tr>
</tbody>
</table>

P values refer to mean changes within groups using Wilcoxon signed rank t tests. * denotes $P < 0.05$ and ** denotes $P < 0.01$. 
Triceps:

Figure 4.41: Comparison of mean tricep skinfold of control and intervention groups at weeks 0, 4 and 8.

Table 4.22: SD and P values of mean changes in tricep skinfold at weeks 4 and 8 of the intervention period when compared with baseline values (week 0).

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean change 4 - 0 weeks ±SD</th>
<th>P value</th>
<th>Mean change 8 - 0 weeks ±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-0.28 ±6.22</td>
<td>0.500</td>
<td>-0.02 ±1.12</td>
<td>0.455</td>
</tr>
<tr>
<td>HCLF</td>
<td>-1.24 ±3.15</td>
<td>0.064</td>
<td>-1.75 ±3.97</td>
<td>0.164</td>
</tr>
<tr>
<td>LG</td>
<td>-3.48 ±2.03</td>
<td>0.002**</td>
<td>-2.51 ±2.52</td>
<td>0.008**</td>
</tr>
<tr>
<td>MFLG</td>
<td>-2.48 ±4.43</td>
<td>0.049*</td>
<td>-2.85 ±3.29</td>
<td>0.010*</td>
</tr>
<tr>
<td>MF</td>
<td>-2.72 ±3.67</td>
<td>0.039*</td>
<td>-3.42 ±5.45</td>
<td>0.031*</td>
</tr>
</tbody>
</table>

P values refer to mean changes within groups using Wilcoxon signed rank t tests. * denotes P <0.05 and ** denotes P <0.01.
Subscapular skinfold:

![Graph showing subscapular skinfold comparison at weeks 0, 4, and 8.]

Figure 4.42: Comparison of mean subscapular skinfold of control and intervention groups at weeks 0, 4 and 8.

Table 4.23: SD and P values of mean changes in subscapular skinfold at weeks 4 and 8 of the intervention period when the data were compared to the week 0 period.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean change 4 - 0 weeks ±SD</th>
<th>P value</th>
<th>Mean change 8 - 0 weeks ±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-3.31 ± 5.13</td>
<td>0.027*</td>
<td>-5.43 ± 5.98</td>
<td>0.004**</td>
</tr>
<tr>
<td>HCLF</td>
<td>-0.83 ± 5.56</td>
<td>0.320</td>
<td>-3.3 ± 3.69</td>
<td>0.004**</td>
</tr>
<tr>
<td>LG</td>
<td>-0.71 ± 3.44</td>
<td>0.484</td>
<td>-1.23 ± 4.89</td>
<td>0.273</td>
</tr>
<tr>
<td>MFLG</td>
<td>-3.55 ± 6.74</td>
<td>0.037*</td>
<td>-4.48 ± 10.4</td>
<td>0.125</td>
</tr>
<tr>
<td>MF</td>
<td>-2.0 ± 5.37</td>
<td>0.273</td>
<td>-6.97 ± 9.19</td>
<td>0.039*</td>
</tr>
</tbody>
</table>

*P values refer to mean changes within groups using Wilcoxon signed rank t tests. * denotes P <0.05 and ** denotes P <0.01.
Suprailiac skinfold:

Figure 4.43: Comparison of mean suprailiac skinfold of control and intervention groups at weeks 0, 4 and 8.

Table 4.24: SD and P values of mean changes in suprailiac skinfold weeks at 4 and 8 of the intervention period when compared to the baseline values (week 0).

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean change 4 - 0 weeks ±SD</th>
<th>P value</th>
<th>Mean change 8 - 0 weeks ±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-1.45 ±6.27</td>
<td>0.326</td>
<td>-0.50 ±5.51</td>
<td>0.500</td>
</tr>
<tr>
<td>HCLF</td>
<td>-0.71 ±2.07</td>
<td>0.164</td>
<td>-1.71 ±4.64</td>
<td>0.094</td>
</tr>
<tr>
<td>LG</td>
<td>-1.95 ±3.95</td>
<td>0.109</td>
<td>-2.83 ±4.88</td>
<td>0.125</td>
</tr>
<tr>
<td>MFLG</td>
<td>-3.30 ±5.4</td>
<td>0.037*</td>
<td>-4.2 ±6.37</td>
<td>0.074</td>
</tr>
<tr>
<td>MF</td>
<td>-2.0 ±5.37</td>
<td>0.191</td>
<td>-4.21 ±4.62</td>
<td>0.008**</td>
</tr>
</tbody>
</table>

P values refer to mean changes within groups using Wilcoxon signed rank t tests. * denotes P < 0.05 and ** denotes P < 0.01.
Abdominal skinfold:

Figure 4.44: Comparison of mean abdominal skinfold at weeks 0, 4 and 8.

Table 4.25: SD and P values of the mean changes in abdominal skinfold weeks at 4 and 8 of the intervention period when compared to the baseline values (week 0).

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean change 4 - 0 weeks ±SD</th>
<th>P value</th>
<th>Mean change 8 - 0 weeks ±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-1.73 ±5.09</td>
<td>0.150</td>
<td>-2.31 ±6.87</td>
<td>0.213</td>
</tr>
<tr>
<td>HCLF</td>
<td>-1.74 ±1.25</td>
<td>0.006**</td>
<td>-5.35 ±8.85</td>
<td>0.098</td>
</tr>
<tr>
<td>LG</td>
<td>-3.13 ±6.38</td>
<td>0.082</td>
<td>-2.85 ±5.7</td>
<td>0.125</td>
</tr>
<tr>
<td>MFLG</td>
<td>-3.01 ±2.91</td>
<td>0.010*</td>
<td>-5.81 ±5.2</td>
<td>0.002**</td>
</tr>
<tr>
<td>MF</td>
<td>-4.57 ±2.44</td>
<td>0.004**</td>
<td>-6.54 ±2.73</td>
<td>0.008**</td>
</tr>
</tbody>
</table>

P values refer to mean changes within groups using Wilcoxon signed rank t tests. * denotes P < 0.05 and ** denotes P < 0.01.
Thigh skinfold:

Figure 4.45: Comparison of mean thigh skinfold of control and intervention groups at weeks 0, 4 and 8.

Table 4.26: SD and P values of mean changes in thigh skinfold measurement at weeks 4 and 8 of the intervention period when compared to week 0.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean change 4 - 0 weeks ±SD</th>
<th>P value</th>
<th>Mean change 8 - 0 weeks ±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>+0.91 ±6.0</td>
<td>0.674</td>
<td>-1.84 ±8.16</td>
<td>0.156</td>
</tr>
<tr>
<td>HCLF</td>
<td>-1.55 ±4.15</td>
<td>0.156</td>
<td>-3.47 ±5.81</td>
<td>0.156</td>
</tr>
<tr>
<td>LG</td>
<td>-2.93 ±3.61</td>
<td>0.020*</td>
<td>-4.17 ±4.81</td>
<td>0.020*</td>
</tr>
<tr>
<td>MFLG</td>
<td>-2.17 ±4.91</td>
<td>0.148</td>
<td>-3.91 ±5.18</td>
<td>0.004**</td>
</tr>
<tr>
<td>MF</td>
<td>-4.4 ±4.58</td>
<td>0.008**</td>
<td>-4.37 ±5.94</td>
<td>0.008**</td>
</tr>
</tbody>
</table>

P values refer to mean changes within groups using Wilcoxon signed rank t tests. * denotes P < 0.05 and ** denotes P < 0.01.
Calf skinfold:

Figure 4.46: Comparison of mean calf skinfold of control and intervention groups at weeks 0, 4 and 8.

Table 4.27: SD and P values of mean changes in calf skinfold measurement at weeks 4 and 8 of the intervention period when compared to the baseline values (week 0).

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean change 4 - 0 weeks ±SD</th>
<th>P value</th>
<th>Mean change 8 - 0 weeks ±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-6.68 ±3.86</td>
<td>0.002**</td>
<td>-6.9 ±5.9</td>
<td>0.004**</td>
</tr>
<tr>
<td>HCLF</td>
<td>-3.73 ±3.27</td>
<td>0.006**</td>
<td>-3.58 ±2.55</td>
<td>0.002**</td>
</tr>
<tr>
<td>LG</td>
<td>+1.07 ±3.1</td>
<td>0.301</td>
<td>-1.22 ±3.46</td>
<td>0.156</td>
</tr>
<tr>
<td>MFLG</td>
<td>-4.88 ±8.0</td>
<td>0.014*</td>
<td>-5.42 ±6.64</td>
<td>0.020*</td>
</tr>
<tr>
<td>MF</td>
<td>-2.78 ±3.15</td>
<td>0.023*</td>
<td>-4.34 ±3.29</td>
<td>0.008**</td>
</tr>
</tbody>
</table>

P values refer to mean changes within groups using Wilcoxon signed rank t tests. * denotes P <0.05 and ** denotes P <0.01.
APPENDICES

APPENDIX IV

RESULTS OF BIOCHEMICAL ANALYSIS

Plasma glucose:

Figure 4.47: Comparison of mean plasma glucose levels of control and intervention groups at weeks 0, 4 and 8.

Table 4.28: SD and P values of mean changes in plasma glucose levels at weeks 4 and 8 of the intervention period when compared with the baseline values (week 0).

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean change 4-0 weeks ±SD</th>
<th>P value</th>
<th>Mean change 8-0 weeks ±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-0.09 ±0.29</td>
<td>0.248</td>
<td>+0.003 ±0.46</td>
<td>0.455</td>
</tr>
<tr>
<td>HCLF</td>
<td>+0.13 ±0.29</td>
<td>0.156</td>
<td>+0.357 ±0.59</td>
<td>0.066</td>
</tr>
<tr>
<td>LG</td>
<td>-0.03 ±0.23</td>
<td>0.455</td>
<td>+0.10 ±0.54</td>
<td>0.422</td>
</tr>
<tr>
<td>MFLG</td>
<td>+0.27 ±0.55</td>
<td>0.119</td>
<td>+0.03 ±0.31</td>
<td>0.410</td>
</tr>
<tr>
<td>MF</td>
<td>-0.15 ±0.24</td>
<td>0.109</td>
<td>+0.09 ±0.54</td>
<td>0.500</td>
</tr>
</tbody>
</table>

P values refer to mean changes within groups using Wilcoxon signed rank t tests.
Triglycerides:

Figure 4.48: Comparison of mean plasma triglyceride levels in control and intervention groups at weeks 0, 4 and 8.

Table 4.29: SD and P values of mean changes in plasma triglyceride levels at weeks 4 and 8 of the intervention period when data were compared to week 0.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean change 4-0 weeks ±SD</th>
<th>P value</th>
<th>Mean change 8-0 weeks ±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>+0.12 ±0.48</td>
<td>0.285</td>
<td>-0.02 ±1.12</td>
<td>0.455</td>
</tr>
<tr>
<td>HCLF</td>
<td>-1.25 ±1.18</td>
<td>0.002**</td>
<td>-0.90 ±1.21</td>
<td>0.020*</td>
</tr>
<tr>
<td>LG</td>
<td>+1.46 ±2.95</td>
<td>0.049*</td>
<td>+0.92 ±0.68</td>
<td>0.008**</td>
</tr>
<tr>
<td>MFLG</td>
<td>-0.53 ±1.56</td>
<td>0.367</td>
<td>-0.48 ±1.18</td>
<td>0.180</td>
</tr>
<tr>
<td>MF</td>
<td>-0.44 ±0.56</td>
<td>0.055</td>
<td>-0.60 ±0.72</td>
<td>0.055</td>
</tr>
</tbody>
</table>

P values refer to mean changes within groups using Wilcoxon signed rank t tests. * denotes P <0.05 and ** denotes P <0.01.
Plasma cholesterol:

![Graph showing mean plasma cholesterol levels over weeks 0, 4, and 8 for control and intervention groups.](image)

**Figure 4.49:** Comparison of mean plasma cholesterol levels of control and intervention groups at weeks 0, 4 and 8.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean change 4-0 weeks ±SD</th>
<th>P value</th>
<th>Mean change 8-0 weeks ±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>+0.05 ±0.78</td>
<td>0.500</td>
<td>+0.09±0.61</td>
<td>0.410</td>
</tr>
<tr>
<td>HCLF</td>
<td>-0.37 ±1.2</td>
<td>0.410</td>
<td>-0.54±1.34</td>
<td>0.320</td>
</tr>
<tr>
<td>LG</td>
<td>-0.70 ±0.86</td>
<td>0.020*</td>
<td>-0.60±1.15</td>
<td>0.125</td>
</tr>
<tr>
<td>MFLG</td>
<td>-0.69 ±0.39</td>
<td>0.002**</td>
<td>-0.79±0.67</td>
<td>0.004**</td>
</tr>
<tr>
<td>MF</td>
<td>-0.13 ±0.80</td>
<td>0.473</td>
<td>+0.32±0.72</td>
<td>0.469</td>
</tr>
</tbody>
</table>

_P values refer to mean changes within groups using Wilcoxon signed rank t tests. * denotes P <0.05 and ** denotes P <0.01._
HDL cholesterol:

![Graph showing comparison of mean HDL cholesterol concentration of control and intervention groups at weeks 0, 4 and 8.]

Figure 4.50: Comparison of mean HDL cholesterol concentration of control and intervention groups at weeks 0, 4 and 8.

Table 4.31: SD and P values of mean changes in HDL cholesterol at weeks 4 and 8 of the intervention period when compared with the baseline values (week 0).

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean change 4 - 0 weeks ±SD</th>
<th>P value</th>
<th>Mean change 8 - 0 weeks ±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-0.001 ±0.24</td>
<td>0.922</td>
<td>+0.13 ±0.14</td>
<td>0.014*</td>
</tr>
<tr>
<td>HCLF</td>
<td>-0.13 ±0.33</td>
<td>0.082</td>
<td>+0.04 ±0.27</td>
<td>0.406</td>
</tr>
<tr>
<td>LG</td>
<td>-0.02 ±0.40</td>
<td>0.248</td>
<td>-0.07 ±0.20</td>
<td>0.078</td>
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<tr>
<td>MFLG</td>
<td>-0.17 ±0.18</td>
<td>0.006**</td>
<td>-0.04 ±0.26</td>
<td>0.590</td>
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<tr>
<td>MF</td>
<td>-0.10 ±0.19</td>
<td>0.051</td>
<td>-0.05 ±0.05</td>
<td>0.039*</td>
</tr>
</tbody>
</table>

P values refer to mean changes within groups using Wilcoxon signed rank t tests. * denotes P <0.05 and ** denotes P <0.01.
**LDL cholesterol:**

![Graph showing comparison of mean LDL cholesterol levels of control and intervention groups at weeks 0, 4 and 8.](image)

**Figure 4.51:** Comparison of mean LDL cholesterol levels of control and intervention groups at weeks 0, 4 and 8.

**Table 4.32:** SD and *P* values of mean changes in LDL cholesterol levels at weeks 4 and 8 of the intervention period when compared with baseline values (week 0).

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean change 4 - 0 weeks ±SD</th>
<th><em>P</em> value</th>
<th>Mean change 8 - 0 weeks ±SD</th>
<th><em>P</em> value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-0.003 ±0.61</td>
<td>0.367</td>
<td>-0.03 ±0.94</td>
<td>0.633</td>
</tr>
<tr>
<td>HCLF</td>
<td>+0.32 ±1.11</td>
<td>0.213</td>
<td>-0.17 ±1.51</td>
<td>0.578</td>
</tr>
<tr>
<td>LG</td>
<td>-0.86 ±0.70</td>
<td>0.012*</td>
<td>-0.93 ±1.12</td>
<td>0.039*</td>
</tr>
<tr>
<td>MFLG</td>
<td>-0.28 ±0.82</td>
<td>0.180</td>
<td>-0.53 ±0.94</td>
<td>0.102</td>
</tr>
<tr>
<td>MF</td>
<td>+0.16 ±0.64</td>
<td>0.273</td>
<td>+0.64 ±1.12</td>
<td>0.148</td>
</tr>
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</table>

*P* values refer to mean changes within groups using Wilcoxon signed rank *t* tests. * denotes *P* <0.05.
Non esterified fatty acids (NEFA):

Figure 4.52: Comparison of mean NEFA levels of control and intervention groups at weeks 0, 4 and 8.

Table 4.33: SD and P values of mean changes in NEFA levels at weeks 4 and 8 of the intervention period when compared to baseline values (week 0).

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean change 4 - 0 weeks ±SD</th>
<th>P value</th>
<th>Mean change 8 - 0 weeks ±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-0.05 ±0.22</td>
<td>0.150</td>
<td>+0.02 ±0.08</td>
<td>0.242</td>
</tr>
<tr>
<td>HCLF</td>
<td>+0.15 ±0.23</td>
<td>0.082</td>
<td>+0.08 ±0.12</td>
<td>0.055</td>
</tr>
<tr>
<td>LG</td>
<td>-0.86 ±0.70</td>
<td>0.207</td>
<td>+0.001 ±0.26</td>
<td>0.469</td>
</tr>
<tr>
<td>MFLG</td>
<td>-0.08 ±0.32</td>
<td>0.326</td>
<td>+0.02 ±0.34</td>
<td>0.367</td>
</tr>
<tr>
<td>MF</td>
<td>-0.03 ±0.17</td>
<td>0.371</td>
<td>+0.01 ±0.17</td>
<td>0.344</td>
</tr>
</tbody>
</table>

P values refer to mean changes within groups using Wilcoxon signed rank t tests.
APPENDIX V

EXTRACTS FROM FOCUS GROUP DISCUSSION

Adherence:

HCLF  I think, I'll be on it all the time now - like I said it is starting to set... now I.... because I find it - now I will be conscious of it.....

I couldn't cope.....I mean sometimes...

I'm happy enough but I'm going to back to some of my horrible habits.....

LG  So you can actually stick to the diet within the bounds, your seafood marinara, sort of got a bit fat in there but basically you always had potato and meat and had pasta and few seafood bits, but you can actually stick to it within bounds, and I don't find it very difficult.

I must say I find it a little difficult on occasions to stick rigidly to. Some of the things that - you seem to have fried foods like schnitzels and cordon bleu the odd fried potato and may cooking in olive oil, those sorts of things-they might be a little bit difficult to stay away from, but you consciously diet and you try

MFLG  ......that was the hardest thing for me was making a break from my regular - probably harder for me because I'm a milkman.....

..............then you have a splurge and you enjoy it so much that you just splurge a bit more but I haven't stuck to this diet 100%

MF  The biggest problem I have with the whole thing is when I eat is, traditionally I always had a large meal at night, with rice, pasta or I go traditional ( ) and this diet necessitated wants me to cut that back in a few sizes, and then have a smaller snack about nine-o'clock at night - well I haven't done that and I probably never will.

Extract 1: Experiences of the participants while adhering to their respective diets.
### Extract 2: Participants’ views on satisfaction to their respective diets

<table>
<thead>
<tr>
<th>Participant</th>
<th>Feedback</th>
</tr>
</thead>
</table>
| **HCLF**    | And I’ve got more energy.  
I like it because it is helping me eat better, eat proper  
Oh yeah, I'm more than a happy person now...  
It just fits in with my family way of cooking, it really hasn’t changed that much at all, except that I am more conscious of what, I myself am eating. Cutting down on the amount of fat.  
I know my blood pressure has gone down since I’ve been on the diet. It’s normal, I could not believe it, that’s more |
| **LG**      | I’m actually enjoying the Sultana Bran and I’m enjoying the breakfast now -  
I am enjoying it. (...) better and what ever else, and I’m feeling better for it.  
I’m sleeping better, that’s one thing I have noticed, I’m sleeping better. |
| **MFLG**    | I don’t know...  
Look - I actually go to Weight Watchers and I’ve broken away because I found - like this, things like this, I’ve been on it a couple of years and I can ( ) you know - but when I told them I had to six slices of bread, they nearly died - you know - and this is how I know I have put on the weight because I have actually broken away from there diet while I’m on this but I will continue on with it..... |
| **MF**      | Ah that was - I originally went out as a lifestyle change, with it came certain foods  yes I am happy. I wouldn’t like it sort of - skim some more off it, I’m quite happy with the way it’s going. I’ve settled down to it, I feel a bit better now than I did.  
Simply disgusted with it...  
It wasn’t a really great change for me, it was more or less what I was eating. |
Ease in following the diet:

HCLF  
I don't diet, I've never been on a diet but I found this one easy to follow.

I've been dieting for many years on and off and this is the easiest I've found.

I actually found the initial part of the diet hard..........  

LG  
We lived on junk for the whole weekend, and that sort of thing - and some of the things that I'm involved in I'm going to be like that for - constant, so trying to keep onto the diet, I can't do it, I know I'm happy when I'm at home but when I go out, away it isn't easy.

MFLG  
Oh well it's alright. I don't fine.... I can't find any problems with it. Basically it is a diet so, it's entirely different way of eating before but I can handle it alright.

MF  
It's an easy lifestyle, like I knew I had to change, and I was looking for somebody to change it with. I'm so I'm fitting into it quite nicely.

Variety:

HCLF  
No, as I was saying I find on this particular diet that it is a diet and you are not really dieting and there's such a variety of things that you can eat and it's just like I have found that there's is such a ( ) really take notice of fat that you are eating that there is a variety of food that you can eat and still maintain a healthy diet....

LG  
There's meat and there's chicken and there's fish and there's plenty of vegetables, plenty of variety, you don't have to get stuck in the mould.

Well I'm happy with types of food that I am eating on the diet that is, I only think of more variety, but other than the simple difference - try and fit into the family so when I have rice, I was having boiled rice and it's always been boiled rice mixed with something else, so what I'm looking for is something different to eat with rice and make is slightly different - so I'm just looking for variety in what I am eating.

MFLG  
I think it was hard, the restriction on the fruit and they ask me to eat four a day - I was sick of apples and pears. I had strawberries.

MF  
I would like more cereal for breakfast but I ( ) substitute with a piece of toast and have more cereal - I haven't but - it's just that breaking down into smaller meals at afternoon or at night.

Extract 3: Ease in following the diets recommended to the participants.

Extract 4: Participants' views on variety in their specified diets.
Acceptance:

HCLF  
*Because I could read what I was allowed and even ate - I hate breakfast, I never ate breakfast, I didn’t want any - I wasn’t hungry when I got up, now I eat breakfast every morning ( ).*

*Oh I have a lot of vegetables and stuff like that and more control ( ) less meat and heaps more vegetables (…), so I’m having things like that. Like I said, we fit it into our lifestyle very well*

LG  
*...but I want to cut down on meat. I used to be a big meat eater, you know…*

*No not at all, and in fact half of my problem is that I consumed skimmed milk for ten years and some of the other things I have had anyway so moving to the diet wasn’t a significant change….*

*I mean I will have a cappuccino instead of having a black coffee because I don’t like having skimmed milk and that sort of thing so I - the skim in coffee is the biggest problem I’m having….... but you know the other stuff I find fine, the rice is fine the vegies are fine, I mean I have the odd potato ( ) try and avoid it that’s fine, every now and then I’ll have a bit of pork and ( ) and I would love to eat it instead of cutting the fat off it.*

MFLG  
*I’ve never been one to eat breakfast out of a cardboard box, I always used to have toast - now it’s easier for me to have, you see if I don’t have the Farmers Best on my cereal, I don’t have any milk at all.*

*Well I’ve sort of changed to apple juice which I can have, because I like orange juice and I’m making up a bit with that but I do eat a lot of fruit, but I just hate giving up my bananas.*

*…..but I didn’t like it and after a month I said “No more” I just couldn’t - take it. I really made myself sick of it…..*

MF  
*Well I was always been adjusting - it’s never been as exactly as what you ( ) you know -actually in the first three or four weeks ago I struggled to eat the amount of fruit, I mean the amount of bread but now it’s ok, but three or four weeks back I didn’t feel I was able to.*

*Well there wasn’t a great deal of change because I was trying to follow the Easy Slim before I came on this diet and like I said it was the only change in the breakfast cereal from Bran flakes to corn flakes and the milk from skim to Farmer’s Best and the same - I had to make sure that I wouldn’t have anything sweet….*

Extract 5: Participants’ feelings on the acceptability of the recommended diets
**Satiety:**

**HCLF**

*It's absolutely beautiful and it's really filling to. On a hot day - like yesterday I had one [low fat banana smoothie], and I thought “oh gee I won’t be able to eat my tea because I was feeling full, but I sort of made myself to have one sandwich about twenty minutes later because I thought, “I’ve got to eat” because ( ) at the moment but it’s so low in fat and it’s so beautiful...*  

But when I eat breakfast ( ) really hungry I will pig out - if I eat breakfast ( ) all day.......and by the time I get home I’m not hungry....

**LG**

*Very filling [referring to the diet]*

*Certainly I haven't felt any hunger at all, in fact I’m eating more now than I was before I started the diet. I find that quite strange.*

*Five or six slices of bread a day is something I've never, ever had before. I've never had so much fruit and vegies before and yet I've always felt that I had a lot of fruit and vegetables. No I've never eaten so much. I feel bloated ( ) vegetables, particularly the rice and pasta they're the nice type for me.*

*as I say eating more bread and things, I'm quite surprised that it is so generous in its food, but I'm eating more now than I was before.*

*And I would probably have a bowl of cereal at the same - no prob. So the bread size is no problem.*

**MFLG**

*Ploughman’s loaf a little bit bland. To me it’s very filling to, I don’t know.*

*I used to take four, four sandwiches to work for lunch and I only take three now because of this kind of food. It’s very hard to digest.*

*I think it’s too much....... in between business - you trying to spread you consumption over a period, but I can do without morning or afternoon tea, and still probably have a snack of a night*

**MF**

*I’m having breakfast, I’m having fruit, I’m having yogurt, and so before I get home, at work I will have - I will leave a yogurt out and I have an apple or a banana - so that sort of dampens the appetite a little bit.*

*Extract 6: Participants' feelings on satiety of the diets*
## Palatability:

### HCLF

I can’t believe it, I just boil everything, I boil ( ), just steam and boil them and the soup I make it’s just really beautiful we look forward to it.

I don’t have any butter at all. We went out for dinner last night and I got them to grill my fish in no fat, I chose to eat fish and I don’t want no oil, no butter..... and they did actually cook the fish without oil and it was quite nice.

### LG

What I find particularly enjoyable is the “Ploughman’s bread” except you can’t buy it unsliced.

Oh I still use the skim milk, but I think its horrible. I just don’t enjoy a cup of coffee.

A lot of the low fat stuff just doesn’t taste the same and the low fat ice cream doesn’t taste the same as with full cream....

It’s quite nice. It’s Thai and I use it in Thai cooking a lot - Jasmine. It’s certainly a distinct flavour, slightly different it’s not - it’s rice but it’s still slightly different, it’s very nice.

Basmati is nice.

### MFLG

I find that bread a little bit bland, that Farmer’s..... Ploughman’s loaf.

I mean it’s like eating bricks (referring to Ploughman’s loaf).

I haven’t stuck to the Farmers Best, I explained that fairly early in the peace that it was absolutely obnoxious but I’m on skimmed...

....we were on artificial eggs, we were on pretend food all the time this has actually improved our taste buds if you like because you know we get a proper egg now with a yolk in it - I haven’t had that for about a year.

### MF

I just thought that’s extra fat and I don’t have to eat. I don’t get canola or whatever - I don’t eat, I don’t taste it, it doesn’t mean anything.

I had my fish last night - I binged a little bit but not much, but I enjoyed it.

---

Extract 7: Participants’ perception on the palatability of the recommended diets
### Ease of preparation:

<table>
<thead>
<tr>
<th>Participant</th>
<th>Quote</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCLF</td>
<td><em>I am cooking the same way, I’ve never cooked with a lot of oil or fats or anything.</em></td>
</tr>
</tbody>
</table>
| LG          | *The only thing that I have really found that I’ve had problems is rice and pasta, having one or the other everyday - because its one I’m not used to it and two, trying to find a way to prepare it all the time so that it’s different and you don’t get bored with it without adding fat...*  
*That doesn’t worry me, I don’t worry about what other people eat. That’s not a problem but it’s annoying to have to go and do something different, for once it isn’t - my wife like’s Lynne she won’t cook two meals at once - see, so I have got to make my arrangements I want something different.* |
| MFLG        | *I just found it difficult to cook fish other than ( ) or different ways of cooking fish to make it more interesting.........* |
| MF          | *And KFC and all that - he eats, he only eats a main meal at night with us, and he eats takeaway through the day and if he didn’t - if I cooked anything like a stir fry or something - he would say it was Bairn food......You know -so you have got to - were restricted to cooking what you could eat but also what he could eat - you know, and sort of make his bigger sort of thing.* |

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**Extract 8:** Experiences of the participants relating to the ease of preparing the recommended diets
APPENDICES

Satisfaction of cost:

HCLF  
Cheaper, because I am not buying lots of biscuits and ice creams...I have cut down on buying butters and margarines even...
not buying convenience foods...

Even on meat, my meat is cut down, because I weigh my meat- I give myself 100 gms and...that's a lot of meat....

I personally did not find any difference...the substitute biscuits are expensive so...

I find the low fat ice creams are always cheaper than the normal ones.....

LG  
I don't, I don't think there is any difference really. Well I have this - no, probably no - that's right. It probably would be less for me because I would go around the food hall at Warrawong, you know lunch would be four or five dollars as where now I am going down to Coles and I buy a loaf of bread, and a loaf of bread would last all week and I will have a tin of salmon or whatever - no it's probably less.

Well I have found it is definitely cheaper buying more fruit fills me up - so it's not buying chocolate which is more expensive. Lunchtime four or five dollars for a takeaway meal, now it's two dollars fifty for a salad roll and I enjoy them and so it certainly has cut down on cost, and now like I am having strawberries now on my breakfast on my cereal and it might cost a bit more but it's not a lot,

I really don't notice the difference between the cost because I have always taken my lunch from home, and so I don't consciously spend money on food but you know the salad I take from home has got a slice of bread with it or the pasta, salad or whatever it's got a slice of bread with it - so it can't be a significant change either way for me.

MFLG  
I mean I love fruit, I eat a lot of fruit but most of the recommended fruit are stoned fruit which are feasible and a lot more expensive - you know - were pensioners and it does make a bit of a difference.

It's slightly dearer, it's - you know the bread for instance is probably, from the ordinary shops is about 30 cents dearer than the other..... and the Farmers Best is dearer, that's three dollars compared to ( ) I paid three dollars in the shop...

I actually found it cheaper... and pasta is quite cheap and rice is cheap and pasta sauce......

I cut back on the grog and save heaps..

MF  
....about - maybe only one or two [fruits] a day. Now it's four or five.
Much to families budget woe's - it's not cheap..... But the breakfast cereals have come down - so we are ok.

Extract 9: Participants' responses to the cost of the prescribed diets
Problems while socialising (weekends and travel):

HCLF

......even going to restaurant I eat the good food and no dessert, it's wonderful.

I certainly won't sit and have steamed vegetables in a restaurant when you can do that at home - no. No I don't go out every week, I mean I have only done - last night and the other night at the Chinese restaurant but I was good last night - you know - I had the grilled fish, salad and a glass of water.

I think if I go out I try and choose something that's basically low in fat....

LG

This weekend I spent up in Gunnedah, you would wake up in a morning and you would have bacon and egg roll for breakfast, lunch was hot dogs, tea was ....Tea was something else - yeah because where we were there was no facility to have that sort of meal, I mean I had four days of that and on the way up there we had people ( ) stop - get Pizza so it sort of threw my diet out the window for the last four days.

The other thing is on weekends is very hard because I socialise a lot on weekends and it's very hard, but I am generally not eating as much as I used to of the wrong foods so dining on the weekends is a bit hard - when I'm out but when I'm home there's no problem.

MFLG

The other thing that I found, going on holidays it's ( ) things like Farmers Best, as far as I could see they didn't have an equivalent in Victoria or South Australia. I might be wrong there, but I couldn't find it..... The other thing was the Canola when you go out, when you eat out you don't always get Canola margarine.

Only when you are on holidays, when we were travelling away from home, or you went out for tea to someone else's place and ( ) hate people talking about diets because it becomes a focus of conversation. So you don't ( ) back from saying I was on this study and took what was there, that was very rare, it was only a fortnight when we were away, that's what I noticed was the hardest.....

MF

Come the weekend I change my diet completely - I have two poached eggs in the morning instead of cornflakes, because I'm not a - I don't mind it now but I won't miss it.

Well I tried to stick to the diet until Saturday, Saturday we go out on Saturday night so that's the downfall that I have. I don't drink but it's just that we go out to different restaurants and we eat things what's there.

Extract 10: Problems faced by the participants in complying to the diets during weekends, travelling and social occasions.
Difficulty in avoiding/including low GI foods:

LG

I mean I have - I always have fruit for breakfast anyway and as I said once I had to drop oranges that was a bit difficult for me. I'm not a wide fruit eater, a few fruits that I am very comfortable with, but finding substitute for oranges has been difficult, apples and bananas, and things have some of the ( ), and when water melon was not allowed, they were difficult to adjust to.

.....when everyone else is at home, doesn’t want the rice, want potato, but that’s not an issue.

MFLG

Like I say, I do my miss potatoes now and again and I don’t mind those but haven’t had any potatoes in the six weeks....

I find that bread a little bit bland, that Farmer’s..... Ploughman’s loaf.

I find the biggest thing - I love bread, I love bread but I don’t like Ploughman’s very much, I find it very, very heavy and as somebody said at the beginning very bland - not exciting.

It’s - oh sorry it’s really so yuk [Ploughman’s loaf]- well I usually have the two slices and I usually fill it full of salad ( ) I haven’t’ changed there, but ( ) and that I’m full as a boot - up til tea time, so a bit of fruit is plenty

One thing that really, I love bananas and I’ve been told to cut right down on the bananas to about two a week, which I don’t understand, I think the shops will go out of business. I have cheated on the bananas and - not as much as I did but more than I should, but I consider this fruit, it’s still healthy

..... I find it so bland [rice] put it on with the meal, but I just, - I don’t - when I have it on my meal I tend to leave - if there’s anything left its the rice

Extract 11: Difficulties encountered by the participants while avoiding or including low GI foods
Limiting alcohol

HCLF So normally, if I go and have a few beers, but I don’t - I’ve gone off it - drinking wise. ( ) leave - Yeah I just cut down on my intake of alcohol.

LG When I’m home on the weekend ( ) I mean that’s only one way of eating food and when I do that, that’s bad because I’m in to the red wine........

MFLG So the only thing that I have to keep an eye on is that I don’t exceed the limit of the alcohol because if I go for a drink with people like I used to before, we were in a group, and there’s a few you have to keep an eye on it.

but I have had my two binges out drinking this month so that is probably why I have put - seem to put it on [weight]....

MF we used to drink day in and day out, beer and rum chasers all the time and I end up at the doctor, but he just said “you are going to have stroke the way you are going” so I quit not having my, but half the problem ( ) my social life, and I’m not going to restrict it to two or three beers.

I still go down the pub, but I say “look that’s it - you know - one beer” and I will sit on a beer........

Extract 12: Difficulties encountered while limiting alcohol intake
## Family support/compliance

<table>
<thead>
<tr>
<th>Participant</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCLF</td>
<td>My other daughter is actually trying to lose weight, she’s ( ), my husband would like to lose some weight, so it’s fitting in really well with our lifestyle.</td>
</tr>
<tr>
<td></td>
<td>I couldn’t have done it without Stephen on it, because what I – he likes to eat what I cook but with him trying and ( ).</td>
</tr>
<tr>
<td></td>
<td>I’m certainly not going to cook different things, but we are all health conscious now - low fat conscious, so it’s really helped out and my other eldest daughter has done nutrition and she bought me the latest book – you know the fat count Dr Michelle - is it?</td>
</tr>
<tr>
<td></td>
<td>Yes constantly. and interestingly the rest of the family are complying as well without any complaints, they are quite happy to do that.</td>
</tr>
<tr>
<td>LG</td>
<td>Well I think there was two things, my husband his father was a butcher and so you know - we’ve always been real big meat eaters and chicken and fish don’t worry me but it upsets the rest of the family - you know they had it so much during the week and so their - and I’m not going to cook twice, they cope whatever I give them ( ) - you know they are struggling a bit at times.</td>
</tr>
<tr>
<td></td>
<td>..........so I mean between the two there’s reinforcement of the diet..</td>
</tr>
<tr>
<td></td>
<td>Yeah, I am enjoying that same reinforcement so that helps enormously.</td>
</tr>
<tr>
<td></td>
<td>...you know - it’s got sort of a positive way “Oh darling you shouldn’t have that” it’s “Oh breaking the diet are we”? -you know - yeah I need the reinforcement</td>
</tr>
<tr>
<td>MFLG</td>
<td>That’s when it’s hard if it’s just your wife and yourself - you know - you can get into a bit of a routine, and although my wife isn’t on the diet she has changed along with it, but when all the kids are home and that it’s pretty hard. I mean for her to cook things and stick to your path - you can if you try, but it is hard, when you’ve got a heap of kids on your hands.</td>
</tr>
<tr>
<td>MF</td>
<td>....when I changed, not changed I adapted, I adapted my lifestyle, my family just moved right in, so for that to work everyone has got to be in on it, and everything has to change.</td>
</tr>
</tbody>
</table>

Extract 13: Participants' views on the importance of family support and compliance while following the diets.
Consciousness of fat intake

HCLF
...going to the supermarket "too high fat", too high fat" I can’t eat that, I
can’t eat that - it made a big difference, now I’m so fat conscious it’s
incredible.

There’s not fat in what I - what you cook - none, because it’s all vegetables
and stock cubes, it’s the best thing that could have happened to me.

I find that I’m eating 20 grams of fat a day and I’m very careful, I count
everything that I eat. I sort of aim for 25 but I find that I’m really hard put
getting to 20 grams and I eat very well

Yeah I find that... it’s surprising that everything you eat got’s fat in it
.......... How much fat, how much fat, how much fat....

We eat Kentucky Fried chicken and we take the skin off because I reckon the
skin’s got more fat than the actual chicken - I just take the skin off and eat the
chicken, but actually we eat a lot of chicken...

No, since I’ve been on the program ... since the day one I have not had any
fat, I haven’t - I don’t fry in it, I don’t stir fry in it, I don’t have it on my
bread.

...as I said before when I go shopping I look at the fat content now ( ) it’s
good, it’s good.

......Like I said I’m going to obviously to be more conscious it, so I’ve been
good while I was on, I just reduced what I was eating, but I’ll go back to
eating peanut butter

LG
Constantly yes - my diet so I’ve been eating the Ploughman’s bread without
any butter on it, and having my toast in the morning without any butter on it,
but that doesn’t worry me -like and like I just consciously removed most of
the fat from my diet, and where before whenever I picked tuna or sardines or
something, I would pick up whatever was there, now I consciously pick up
the one that has sea water in it rather than any sort of oil.

I might slow down consciously when I eat fat, but it’s your conscious effort
to significantly reduce fat. I have found it difficult to have toast without some
fat on it, something’s I’ve got to have on there, weight watchers or canola or
something like that - but I can’t do without it,

MF
I don’t think I will because I am not eating fatty food at all. Actually I think I
eat zero fat in a normal day...... I have toast no butter, and maybe a smear of
vegemite.

Extract 14: Consciousness of fat intake among the participants
Perception on weight loss

HCLF  ( ) lose kilos and you think “oh it works” I can do this ...

MFLG  Well I lost weight when I was with Weight Watchers.
     Well mine’s not changed, but my wife put weight on
     I lost 2 kilos

MF  I was nearly 90 kilos when I started, that was nearly seven weeks ago and so
     you know I actually have dropped a fair bit - I’m looking forward to reduce -
     I’m - it doesn’t matter if I don’t get to 80 kilos but I should be pretty close by
     the end of the year - if I maintain it because I am losing a little bit at a time.

     Like I was saying before - I started off to a 111 kilo and I quickly went back
     to 107 in four weeks and now I’ve started I haven’t lost one iota in the last
     two or three weeks and I nearly kick the scales...... I’m really enjoying it,
     but I just can’t seem to shift off it - and I haven’t changed the diet in the latter
     half of the diet, in first half I had a lot more exercise, I went back to work so
     - I’m not walking as I used to ( ) I just have shifted it and if I don’t lose
     another couple of kilos at least ( ) I wouldn’t support it.

     I’ve lost 4 kilos not one ounce has come off my stomach it’s all come off the
     rest of my body.

Extract 15: Participants’ perception on weight loss

Physical activity:

HCLF  I’m up at half past five every morning going for a walk ( ) together, and
     when I get home I look forward to breakfast....... 

LG  No, no - actually my husband has lost more weight than I have, my daughter
     has started on an exercise program and she has got me going for walks so
     that’s probably good, but she is quite happy to do what I am doing

MF  instead of slumping into an armchair watching TV, I got out there and went
     for a walk around the block or do a bit of exercise with the kids, or let my
     wife beat me up or something of that nature

     I might go the garage or my wife enjoys walking - she - I walk with her...

Extract 16: Participants’ views on physical activity
Other issues:

Need for more explanation and information:

MFLG  I haven't got any real problems with it. The only thing I would probably
would like with it at the beginning was more information and background on
what was actually happening..... obviously you people know what's
going on. May be it's my fault for not asking questions earlier, but ( )
talk about to do with the background on why this, why we are using this
particular diet, what the aims of this diet are, where it is, the hows and why
of this particular diet so that might give us a bit more insight and give us a bit
more scope with what we can eat and what we can't eat

MFLG  everytime I say to someone that I am a guinea pig for the University, I'm on
special diet - they all say "oh are you losing weight" they all thing that you -
you know - and they all say "well it doesn't look like you have lost any" -
and they - because that its got that - the word diet, everyone thinks that you
are on - and that's what I sort of said - what I would like is more information
about it, to define - sort of where we are going, where the other groups are
going and what the aims of it are..

Influence of professional weight loss programs:

HCLF  what I personally found out what we can eat and what we can’t eat is to buy
the Weight Watchers magazine and they do a fat and fibre diet and it comes
out every two months I think, and there are some wonderful recipes in there -
that you can cook and make and they tell you the exact fat content,

MFLG  Look - I actually go to Weight Watchers and I've broken away because I
found - like this, things like this, I’ve been on it a couple of years and I can
( ) you know - but when I told them I had to eat six slices of bread, they
nearly died - you know - because ( ) and this is how I know I have put on
the weight because I have actually broken away from thier diet while I’m on
this but I will continue on with it.....

MF  I lost about six kilos with the one that I was on before [referring to Easy
Slim].

Misconception :

MF  Well what I’m really most satisfied on weight loss and something’s
happened and I’ve stopped and I’m really worried about that and I’m trying
to keep - to work out what I can do to regain this weight loss program.

LG  Always have, I have an apple and an orange every night and she [research
dietitian] said -“Stop the orange” and that was a little bit of difficulty in a
sense.

Health problems:

MFLG  The bread, very indigestible but both John and I suffered badly from
indigestion

Extract 17: Other issues raised during the focus group discussion
APPENDICES

APPENDIX VI

ILLUSTRATIONS OF GI SCORE CALCULATION

Two actual illustrations of GI score calculations obtained from the study are given below. Illustration 1 is obtained from the C group representing a high GI diet while Illustration 2 is obtained from the MFLG diet representing a low GI diet.

<table>
<thead>
<tr>
<th>Meal</th>
<th>Foods</th>
<th>Measure/weight</th>
<th>Carbohydrate (g)</th>
<th>GI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakfast</td>
<td>White bread</td>
<td>1 slice</td>
<td>13</td>
<td>1.92</td>
</tr>
<tr>
<td></td>
<td>Margarine</td>
<td>5 g</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jam, berry</td>
<td>5 g</td>
<td>3</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Juice, orange</td>
<td>300 ml</td>
<td>24</td>
<td>2.89</td>
</tr>
<tr>
<td></td>
<td>Apple, raw</td>
<td>140 g</td>
<td>15</td>
<td>1.14</td>
</tr>
<tr>
<td>Lunch</td>
<td>Sausage roll</td>
<td>1 roll</td>
<td>32</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Coke</td>
<td>750 ml</td>
<td>78</td>
<td>11.23</td>
</tr>
<tr>
<td></td>
<td>Banana, raw</td>
<td>140 g</td>
<td>28</td>
<td>3.14</td>
</tr>
<tr>
<td></td>
<td>Chocolate, dark</td>
<td>20 g</td>
<td>13</td>
<td>1.34</td>
</tr>
<tr>
<td>Afternoon-Tea</td>
<td>Potato crisps</td>
<td>50 g</td>
<td>24</td>
<td>2.74</td>
</tr>
<tr>
<td></td>
<td>White bread</td>
<td>2 slices</td>
<td>26</td>
<td>3.85</td>
</tr>
<tr>
<td></td>
<td>Butter</td>
<td>10 g</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coke</td>
<td>375 ml</td>
<td>39</td>
<td>5.61</td>
</tr>
<tr>
<td>Dinner</td>
<td>Doner Kebab</td>
<td>1 Kebab</td>
<td>57</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Beer, lager</td>
<td>6000 ml</td>
<td>119</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total = 472</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>GI score = 33.86</td>
<td></td>
</tr>
</tbody>
</table>

Illustration 1: GI score obtained from the food record of an individual from the control (C) group at 4 weeks of intervention.

(NA - Not available)
<table>
<thead>
<tr>
<th>Meal</th>
<th>Foods</th>
<th>Measure/weight</th>
<th>Carbohydrate (g)</th>
<th>GI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakfast</td>
<td>Pineapple juice</td>
<td>250 ml</td>
<td>27</td>
<td>4.3</td>
</tr>
<tr>
<td></td>
<td>Fruit loaf, toasted</td>
<td>2 slices</td>
<td>33</td>
<td>5.4</td>
</tr>
<tr>
<td></td>
<td>Canola margarine</td>
<td>10 g</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coke</td>
<td>375 ml</td>
<td>39</td>
<td>5.61</td>
</tr>
<tr>
<td>Lunch</td>
<td>Wholemeal bread roll</td>
<td>2 rolls</td>
<td>92</td>
<td>22.19</td>
</tr>
<tr>
<td></td>
<td>Canola margarine</td>
<td>20 g</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tabouleh, Lebanese</td>
<td>90 g</td>
<td>5</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Chicken, lean, baked</td>
<td>60 g</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Afternoon-Tea</td>
<td>Beer, regular</td>
<td>375 ml</td>
<td>7</td>
<td>NA</td>
</tr>
<tr>
<td>Dinner</td>
<td>Mandarin</td>
<td>4 whole</td>
<td>20</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Chicken baked, lean</td>
<td>30 g</td>
<td>0</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Tabouleh, Lebanese</td>
<td>40 g</td>
<td>2</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Ploughman’s loaf</td>
<td>2 slices</td>
<td>39</td>
<td>6.4</td>
</tr>
<tr>
<td></td>
<td>Canola margarine</td>
<td>10 g</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Beer, regular</td>
<td>1125 ml</td>
<td>22</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total = 286</td>
<td>GI score = 43.9</td>
</tr>
</tbody>
</table>

*Illustration 2: GI score obtained from the food record of an individual from the MFLG group at week 4 of intervention.*

*(NA - Not available).*
APPENDIX VII

INFORMATION SHEETS AND CONSENT FORMS

- Information sheet for IRIS study...
- Consent form for IRIS study...
- Letter for focus group discussion...
- Information sheet for focus group discussion...
- Consent form for focus group discussion...
UNIVERSITY OF WOLLONGONG

A FEASIBILITY STUDY OF FOUR DIETARY APPROACHES
IN A PILOT INTERVENTIONTRIAL FOR THE STUDY OF DIET
AND INSULIN RESISTANCE SYNDROME

INFORMATION SHEET

Investigators: Professor Dennis Calvert, Professor of Medicine and Public Health, Medical Research Unit, University of Wollongong and Illawarra Area Health Service

Dr Linda Tapsell, Senior Lecturer, Nutrition, University of Wollongong

Ms Sunitha Vaidyanathan, Nutritionist/Dietitian/Graduate Student, Department of Public Health and Nutrition, University of Wollongong

WHY IS THE STUDY BEING DONE?

People who have excess abdominal fat may have other conditions (a slightly high blood triglyceride level, a low blood HDL cholesterol level, a high blood insulin level) are thus at increased risk of developing diabetes or heart disease in later life. We want to work out the best way of helping people not to get diabetes, or heart disease. On major part of any such strategy is to concentrate on diet.

A number of dietary changes that have been proposed involve changing either the quantity or type of dietary fat in a diet rich in fruit and vegetables. It is not at all clear what fats are important and should be changed, and how to do this. This study is being done to compare the effect of different diets (and dietary fats) in people who have a tendency to develop diabetes.
We would like to study the effect of one of the following diets to which you will be assigned:

1. A diet along the lines recommended by the American Diabetes Association (high in complex carbohydrates, low in fat) - the kind of diet also recommended to lower the risk of coronary heart disease.

2. A diet in which the total fat content is similar to that in your usual diet but substituting foods which contain particularly monounsaturated oils (sunola oil, canola oil and olive oil are largely monounsaturated) for foods containing saturated fats.

3. A diet in which foods which do not raise the blood sugar greatly after a meal are emphasised. This will be low in saturated fat.

4. A similar diet to that in (3) above, but with fat modified as in paragraph 2.

5. Your usual diet.

You will be assigned by random allocation (a chance process like the toss of a coin) involving picking out a sealed envelope. The chance of being assigned to any one diet in this pilot study is one in four. You would stay on your diet for 8 weeks. At the end of this time your diet will be reviewed and progress monitored.

WHO CAN VOLUNTEER TO TAKE PART IN THE STUDY?
People who have a degree of abdominal overweight or obesity are invited to join the study. People taking part must also be reasonably well and their normal diet must be reasonably balanced. People who have diabetes and cardiovascular diseases are excluded from this study.

WHAT HAPPENS IF ANYONE DECIDES NOT TO TAKE PART?
Participation in the study is entirely voluntary and people may not wish to be involved or may discontinue involvement at any time. A decision not to take part or to drop out from the study will
not affect anyone’s treatment by the hospital or medical or other health services including private health services or by the University.

WHAT DOES THE STUDY INVOLVE?
The pilot study lasts for 8 weeks. It involves following one of the five above mentioned dietary programs. Your diet will be individually prescribed by a dietitian working in consultation with you, to get a diet that is attractive and sustainable. You will need to spend some time practising dietary measurements and recording your diet accurately.

Your diet will be recorded by yourself in a three-day food diary before the study starts, then after a month (4 weeks), and at the end of the 8 weeks. We will ask you questions about your acceptance of each dietary program. You will try not to gain weight during this period.

At the beginning and end of the study you will be asked to have some measurements taken (weight, waist and hip girth, thickness of skinfolds at several sites, total body fat). We will also carry out some blood measurements to check on your response to diet (blood cholesterol, triglyceride, HDL cholesterol, insulin, glucose, glycosylated hemoglobin, blood proteins which may be elevated if you have an increased risk of heart disease and diabetes).

WHAT ARE THE RISKS OR DISCOMFORTS OF THE STUDY?
The potential hazards of participation in this study are minimal. Occasionally some minor bruising occurs at the site of taking blood.

FURTHER INFORMATION
If you have any further questions about this study, Professor Dennis Calvert from the Medical Research Unit, Illawarra Regional Hospital (Wollongong), telephone (042) 266594, will be happy to discuss them with you.

If you have any complaints you may contact the secretary of the Human Research Ethics Committee, University of Wollongong, Ms Karen McRae, on telephone (042) 21 4457.
UNIVERSITY OF WOLLONGONG

HUMAN RESEARCH ETHICS COMMITTEE

A FEASIBILITY OF FOUR DIETARY APPROACHES IN A PILOT INTERVENTION TRIAL FOR THE STUDY OF DIET AND INSULIN RESISTANCE SYNDROME

CONSENT FORM

This research is being conducted at the Illawarra Area Health Service, and the University of Wollongong. Similar studies are being undertaken elsewhere in Australia.

Details of the study are given in the attached Information Sheet.

You are free not to take part or to withdraw from the research at any time without penalty. Any decision not to take part or to drop out from the study will have no effect on anyone's treatment by the hospital or medical or other health services including private health services or by the University.

No data identifying individuals will be published but an account of the overall study will be published in a journal.

If you have any inquiries regarding the conduct of the research please contact the Secretary of the University of Wollongong Human Research Ethics Committee on (042) 214457

If you wish to take part in this research please sign below:

_______________________________   _____/_____/
Signature                  Date
Dear Mr/Ms xxx,

We are conducting a group discussion to find out your view on the diet you have been following for the past six weeks. More detail is given in the attached information sheet. If you would like to participate and share your ideas, please sign the consent form and mail it using the stamped envelope provided. We appreciate your co-operation. The date, location and time are given below.

**Venue:**
Medical Research Unit
108, New Dapto Road,
Wollongong.
(Close to Wollongong Hospital)

**Time:** xxx

**Date:** xxx

Time and dates can be changed to suit you provided it is convenient for the other group members.

Thanking you,

Sincerely,

\[Signature\]

Sunitha Vaidyanathan.
A diet intervention trial becomes effective only when the participant’s views on the diet are obtained. This helps in identifying the acceptability of the diet and therefore, in determining if the diet is realistic and can be applied to the general public.

The best method of obtaining the participants' perspective is through the focus group interviews. A focus group is an interview where a group of participants with common characteristics that relate to the topic are involved in an informal discussion. Each group will contain 5 or more participants consisting of both men and women. The atmosphere will be relaxed and the interviews will be conducted at a time best suited for that particular group of participants. Interviews can be conducted during weekends or after office hours.

Participants will be asked questions in relation to the diet and will be asked to discuss as a group. The discussion will be recorded on audio tapes for analysis. The tape recorded data will not be exhibited to the public. Each interview will last for about 1 - 2 hours. The role of the interviewer will be limited to asking the questions and leading the group to different topics. Refreshments will be provided for all participants.

Focus groups will give the participants an opportunity to present their views and feelings towards the diet and to share their ideas with the group members.

All information obtained will be kept confidential and any publications made will in such manner that individual participants cannot be identified.
UNIVERSITY OF WOLLONGONG

HUMAN RESEARCH ETHICS COMMITTEE

A FEASIBILITY STUDY OF FOUR DIETARY APPROACHES IN A PILOT INTERVENTION TRIAL FOR THE STUDY OF DIET AND INSULIN RESISTANCE SYNDROME

CONSENT FORM

This study is being conducted as a part of the IRIS study. It is supervised by Prof. Dennis Calvert in the Medical Research Unit (Illawarra Area Health Service/University of Wollongong) and Dr. Linda Tapsell from University of Wollongong.

An information sheet is enclosed which provides the necessary details related to the study. You are free to withdraw from all or part of this research study at any time without any affect on your relationship with the University of the Medical Research Centre.

If you have any queries regarding the conduct of the research, please contact the secretary of the university of Wollongong Human Research Ethics Committee on (02) 42214457.

I agree to participate in the group discussion which will be tape recorded. I understand that the information collected in this research will be kept confidential and any publications made will be in such a form that individual participants cannot be identified.

If you are willing to participate in this study, please sign below

_________________________  ________________________  ________________
Name                      Signature                    Date
## APPENDIX VIII

### QUESTIONNAIRES

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial contact questionnaire</td>
<td>205</td>
</tr>
<tr>
<td>Demographic details and medical history</td>
<td>207</td>
</tr>
<tr>
<td>Dietary pattern</td>
<td>214</td>
</tr>
<tr>
<td>Activity/Exercise</td>
<td>218</td>
</tr>
<tr>
<td>Food preparation</td>
<td>222</td>
</tr>
<tr>
<td>Food frequency (pattern)</td>
<td>228</td>
</tr>
<tr>
<td>Diet history interview form</td>
<td>239</td>
</tr>
<tr>
<td>Food record</td>
<td>240</td>
</tr>
<tr>
<td>Anthropometric measurements form</td>
<td>250</td>
</tr>
<tr>
<td>Diet adherence/acceptance</td>
<td>251</td>
</tr>
<tr>
<td>Focus group guideline questions</td>
<td>254</td>
</tr>
</tbody>
</table>
# THE UNIVERSITY OF WOLLONGONG

**Dietary Intervention Trial**  
**1997 IRIS (Insulin Resistance Intervention Study)**  
**AN INITIAL CONTACT QUESTIONNAIRE**

<table>
<thead>
<tr>
<th>Identification No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

1. **Name:**  
   Mr/Mrs/Ms  
   ______________________________________  
   Surname  
   Given Names

2. **Address:**  
   ______________________________________  
   Post Code ____________________________

3. **Telephone Numbers:**  
   _________________ Work  
   _________________ Home

4. **Date of Birth:**  
   _______________________

5. **Height:**  
   __________________________  
   feet and inches  
   OR  
   __________________________  
   centimetres

6. **Weight:**  
   __________________________  
   stones and pounds  
   OR  
   __________________________  
   kilograms

7. **Do you currently follow a special or modified diet?** (Please tick (√) one box).  
   [ ] No  
   [ ] Yes  
   
   If yes, please briefly describe your diet.  
   ______________________________________  
   ______________________________________  
   ______________________________________

   Who advised this diet (eg doctor, self, dietitian)?  
   ______________________________________

---

**OFFICE USE ONLY**

<table>
<thead>
<tr>
<th>BMI</th>
<th>Medical Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other</th>
</tr>
</thead>
</table>
8. Which of the following medical conditions have been diagnosed by a doctor? (Please tick (√) relevant boxes)

- High Blood Pressure
- Diabetes
- Diabetes during pregnancy (gestational diabetes)
- High Cholesterol/Triglycerides
- Kidney or Liver Disease
- Heart Disease
- Stroke
- Angina
- Hepatitis B or C
- HIV

Other, please specify ________________________________

Some of these conditions may interfere with study outcomes.

9. Please indicate all medications you are taking.

List ALL medications taken REGULARLY. Please check medication labels if necessary. Include name, dose, and how often medication is taken.

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dose</th>
<th>How Often</th>
</tr>
</thead>
<tbody>
<tr>
<td>eg Indocid</td>
<td>25mgs</td>
<td>Twice daily</td>
</tr>
</tbody>
</table>

10. If we are unable to include you in a current study, could we keep your name (in confidence) until we may have a study which is more closely suited? (For instance, we have some studies which include people with high blood pressure or diabetes, and other studies in which we exclude these conditions).

- No
- Yes

THANK YOU
THE UNIVERSITY OF WOLLONGONG

1997 IRIS - DIET INTERVENTION TRIAL
DEMOGRAPHIC DETAILS AND MEDICAL HISTORY

• We would like to know your general health status, the foods you eat and some information about yourself.
• Please answer to the best of your knowledge.
• All information obtained will be kept confidential.

1. Name : ___________________________ ___________________________
   Surname Given Names

2. Sex: □ Male □ Female

3. Age: ___________________________
   Date of birth: ___/ ____/ 19_____
   Day month year

4. Residential address: ___________________________

   (Phone No): ___________________________

5. Office address: ___________________________

   (Phone No): ___________________________

6. Your GP / Specialist / Dietitian name and address?
   Please provide the contact address.

   Name          Address          Phone No
   __________________________________________
   __________________________________________
7. Where were you born?  
(Write State or Territory if born in Australia, Write country if born overseas)

8. If you were not born in Australia, how many years have you lived in Australia?

------------------- Years

9. Marital status:  
Never married  □
Now married □
Separated but not divorced □
Divorced □
Widowed □

10. Please indicate the highest level of education you have completed.

Never attended school □
Primary school □
Some high school □
completed high school (year 12 or equivalent) □
University, C.A.E or other tertiary institution □

11. Indicate the total number of family members:  

12. Indicate the number of children you have:  

13. Do you have a full-time or part-time job of any kind?

□ Yes  □ No  If No, Go to Q 17

14. In your main job, what is your occupation?
   • Give full title. (For example - Accounts clerk, Secretary, Fast food assistant)
   • List the main tasks performed usually.

   __________________________________________________________
   __________________________________________________________
15. What is the gross income of yourself and of your partner (if applicable)?

- Include income from all sources (e.g. wages, interest, pension, Family Allowance Supplement and other benefits, tax rebates) before tax or anything else is taken out.
- Please estimate as best you can.

<table>
<thead>
<tr>
<th>Gross Income (i.e. before tax):</th>
<th>Self</th>
<th>Partner (Spouse or defacto)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Income</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>$1 to $135 per week</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>($1 to $7,000 per year)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>$136 to $173 per week</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>($7,001 to $9,000 per year)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>$174 to $212 per week</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>($9,001 to $11,000 per year)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>$213 to $250 per week</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>($11,001 to $13,000 per year)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>$251 to $289 per week</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>($13,001 to $15,000 per year)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>$290 to $327 per week</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>($15,001 to $17,000 per year)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>$328 to $365 per week</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>($17,001 to $19,000 per year)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>$366 to $404 per week</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>($19,001 to $21,000 per year)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>$405 to $442 per week</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>($21,001 to $23,000 per year)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>$443 to $577 per week</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>($23,001 to $30,000 per year)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>$578 to $769 per week</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>($30,001 to $40,000 per year)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>$770 to $962 per week</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>($40,001 to $50,000 per year)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Over $962 per week</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>(Over $50,000 per year)</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
16. Have you ever smoked cigarettes, cigars or a pipe regularly?

☐ Yes   ☐ No   If No, Go to Q 19

17. Specify the number of cigarettes smoked per day.

18. Have you given up smoking lately?

Yes, I gave up smoking   ☐
No, I still smoke   ☐

19. How often do you usually drink alcohol?

I don't drink alcohol   ☐   Go to Q 22
Less than once a week   ☐
1 or 2 days a week   ☐
3 or 4 days a week   ☐
5 or 6 days a week   ☐
Every day   ☐

20. On a day when you drink alcohol, how many drinks do you usually have?

1 or 2 drinks   ☐
3 or 4 drinks   ☐
5 to 8 drinks   ☐
9 to 12 drinks   ☐
13 to 20 drinks   ☐
More than 20   ☐

21. Indicate the most frequently consumed alcohol.

22. Which of the following best describes your usual way of eating?

(Please tick ☑ one box only)

No special diet   ☐
Vegetarian   ☐
Weight reduction diet   ☐
Fat modified diet   ☐
Any other   ☐ Please specify  

Office use only
23. Height: --------------Ft-------------Inches OR ------------------Cms

24. Weight: --------------St-------------lbs OR ------------------Kgs

25. Blood group (if known):

26. Are you currently undergoing any medical treatment?
   Yes □ No □

27. If Yes, please describe

________________________________________________________________
________________________________________________________________
________________________________________________________________

28. Are you under any medication at present? If yes, please indicate the medications taken and the dosage.

   List all medications taken regularly. Please check medication labels in necessary. Include name, dose and how often medication is taken.

   Medication  Dose  How Often
   e.g. Indocid  25 mgs  Twice daily

   List all other medications taken irregularly (e.g. pain killers, hayfever tablets, indigestion powders).

   Medication  Dose  How Often

   □ 37
   □ 38
   □ 39
   □ 40
   □ 41
29. How often do you take Aspirin? (e.g. Aspro, Bex, Disprin, Solprin, Vincent's powders)

☐ Never ☐ Occasionally ☐ Daily

30. Which of the following medical conditions have been diagnosed by a doctor? (Please tick one or more boxes).

☐ High blood pressure ☐ Arthritis
☐ Diabetes ☐ Asthma
☐ Heart disease ☐ Gout
☐ Angina ☐ Kidney or liver disease
☐ Stroke ☐ Hepatitis B or C
☐ Overweight ☐ HIV
☐ Migraine ☐ None of the above

31. If you have a medical condition not listed in question 8, please briefly describe the condition(s).

------------------------------------------------------------------------------------

------------------------------------------------------------------------------------

32. What is your opinion about your body weight?

Normal ☐ Over weight ☐ Obese ☐

33. Are you under any special treatment for weight reduction?

Dieting ☐ Weight reducing drugs ☐
Starvation dieting ☐ Aerobics ☐
Diet formulas ☐ Severe exercise ☐
34. Do you supplement your diet with any of the following? (Please tick ☐ one or more boxes)

☐ Vitamins and/or Minerals
☐ Cod Liver Oil/Fish Oil capsules
☐ Evening Primrose Oil
☐ Other
☐ I do not supplement my diet

If you do supplement, please specify brand name, and dosage:

________________________________________________________________________

35. How often do you exercise? (Please Tick ☐ one box)

☐ Never
☐ Occasionally
☐ More than once a week but not daily
☐ Daily

36. Which of these statement best describes your exercise? (Please Tick ☐ one box)

☐ I do not exercise
☐ Light - (eg slow walking, light gardening, bowls, golf)
☐ Moderate - (eg, fast walking, heavy gardening, swimming, tennis, moderate cycling)
☐ Heavy - (eg skipping, fast jogging, running, fast swimming, squash, basketball, etc)

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE.
1997 IRIS - DIET INTERVENTION TRIAL
DIETARY PATTERN

- This section contains questions (37 - 55) relating to your dietary habits.
- Please answer to the best of your knowledge

37. Have you changed your dietary habits recently?

   Yes □        No □

38. If yes, specify the modification made.

   __________________________
   __________________________
   __________________________

39. Do you avoid/include any foodstuff for any specific reason?

<table>
<thead>
<tr>
<th>Foods included</th>
<th>Foods avoided</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
40. Have you been under any special diet for any specific reason? (ex. low salt, vegetarian, weight loss).

__________________________________________

41. Are you currently increasing or decreasing your intake of any particular foods or beverages (such as foods high in fibre, caffeine, alcohol etc)?

Yes □ No □
If yes, describe with reason

__________________________________________

42. Does your meal pattern vary from week to week? (due to shift work, sport activities, week ends etc).

__________________________________________

43. Do you use sugar?

Yes □ No □

44. If yes, specify which foods/beverages you add it to (such as cereal, fruit, coffee, tea, others)

__________________________________________

45. Do you use artificial sweetener in any food/beverage?

Yes □ No □

46. If Yes, specify which food/beverage you add it to and also specify the brand name of the artificial sweetener you use.

__________________________________________
47. Do you add salt to your food?
   Yes □ No □ If No, go to Q 52

48. If yes, how often?
   Always □ Occasionally □

49. How would you rate the amount of salt you add?
   Light □ Moderate □ Heavy □

50. Do you use fortified salt? If yes, specify the brand name.

51. Do you regularly use other salt seasonings at the table such as chicken salt, onion salt, garlic salt etc? Specify kind(s).

52. Do you eat out often?
   Yes □ No □
   If yes, how often?
   Every weekend □ Fortnightly □
   Once in two days □ Monthly □

53. How often do you give/attend parties and other social gathering?
   Every weekend □ Fortnightly □
   Once in two days □ Monthly □
54. Who usually prepares meals at home? Please indicate relationship.

<table>
<thead>
<tr>
<th>Relationship</th>
<th>☐</th>
<th>☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self</td>
<td>☐</td>
<td>Spouse</td>
</tr>
<tr>
<td>Parent</td>
<td>☐</td>
<td>Others</td>
</tr>
</tbody>
</table>

If others, please specify.

55. Indicate below your meal and snack pattern:
- For each meal state the usual time you eat it, for example breakfast at 7.30am and then state the number or times a week you would eat it at home etc.
- Repeat this for each meal time.

<table>
<thead>
<tr>
<th>Usual time of meal</th>
<th>Eat at home</th>
<th>Take from home</th>
<th>Buy from Takeaway Cafeteria, Cafe/Restaurant</th>
<th>Do not eat</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morning meal (Breakfast)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morning snack</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noon meal (Lunch)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Afternoon snack</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evening meal (Dinner)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evening snack (Supper)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1997 IRIS - DIET INTERVENTION TRIAL
ACTIVITY/EXERCISE

• We want to find out about the exercise you had during the PAST 2 WEEKS.
• As a means of transport
• For recreation, sport or health-fitness purposes.
• As part of your task at work and around the house.
• Please distinguish between vigorous exercise which made you breathe harder or puff and pant, and less vigorous exercise.

I. AS A MEANS OF TRANSPORT

56. In the past 2 weeks, how many times did you walk specifically as a means of transport to get to or from places for 10 minutes or more continuously?

----------- number of times

57. How long would you estimate you spent walking in this way in the past 2 weeks?

----------- minutes ----------- hours

58. When you walked specifically as a means of transport, did you usually walk:

☐ not at all vigorously
☐ a little
☐ moderately
☐ very vigorously
II. RECREATION, SPORT OR HEALTH-FITNESS

59. In the past 2 weeks, did you engage in vigorous exercise - exercise which made you breathe harder or puff and pant?

(e.g. vigorous sports such as football, netball, tennis, squash, athletics; jogging or running; aerobics; vigorous swimming; etc)

No □
Yes □

60. If Yes, how many sessions of vigorous exercise did you have over the 2 week period?

-----------------/------------------

61. Please estimate the total time spent exercising vigorously during the past 2 weeks.

------------------------/------------------

hours minutes

62. In the past 2 weeks, did you engage in less vigorous exercise for recreation, sport or health/fitness purposes which did not make you breathe harder or puff and pant?

No □
Yes □

63. If yes, how many sessions of less vigorous exercise did you have over the 2 week period?

-----------------------------------------------------------------

-----------------------------------------------------------------
64. Please estimate the total time spent exercising less vigorously during the past 2 weeks.

----------------------------------/---------------------

hours       minutes

65. In the past 2 weeks, did you walk for recreation or health or fitness?

No □

Yes □

66. If Yes, how long would you estimate you spent walking in this way and how many times per week?

------------------------------- minutes  ----------------------- hours

------------------------------- times/ week

67. When you walked purely for recreation or fitness, did you usually walk

□ not at all vigorously
□ a little
□ moderately
□ very vigorously

III. VIGOROUS TASKS AT WORK AND AROUND THE HOUSE
(Paid or unpaid work)

68. In the past 2 weeks, did you engage in vigorous activity, apart from exercise, which made you breathe harder or puff and pant?

(e.g. Carrying loads, heavy gardening, scrubbing the floor, labouring at home, during employment or anywhere else.)

No □

Yes □
69. If Yes, how many sessions of these types of vigorous activity did you have over the 2 week period?

------------------------------------------------------------

70. Please estimate the total time spent in these types of vigorous activity during the past 2 weeks.

----------------------/------------------
hours minutes
1997 IRIS - DIET INTERVENTION TRIAL
FOOD PREPARATION QUESTIONNAIRE

- This questionnaire is to be completed by the person who usually prepares the food in your home. If this is not possible then please fill the form out as best you can.

- This questionnaire is important for analysis of dietary component of the study. If you have any difficulty filling this questionnaire, please ask before you fill it.

71. What relationship are you to the participant?

- [ ] Self
- [ ] Parent
- [ ] Spouse
- [ ] Other, specify

72. Do you add any type of sweetener to the following foods?

<table>
<thead>
<tr>
<th>Food item</th>
<th>Sugar added</th>
<th>Artificial sweetener added (specify name)</th>
<th>Other eg Honey, Golden syrup</th>
<th>None added</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh juices</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fresh fruit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canned fruits</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beverages (tea, coffee, milk drinks)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breakfast cereal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baked goods (cakes, biscuits etc)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Custard/creamed rice</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others (Specify)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
73. Tick ☐ whether salt or salt substitute is usually added in preparing the following foods:

<table>
<thead>
<tr>
<th></th>
<th>Salt</th>
<th>Salt substitute</th>
<th>Seasoning salts</th>
<th>None added</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pasta, such as noodles, spaghetti, etc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rice</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potatoes, hot chips</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other vegetables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meat/Fish</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eggs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (Specify)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If salt substitute is used, specify kind/brand: ..............................................................

74. Are the following cooking oils/fats and spreads used (please tick):

I). Butter □ Yes □ No Specify □ regular □ salt reduced □ diet/reduced fat

II). Margarine □ Yes □ No Specify □ regular □ salt reduced □ diet/reduced fat

Type of margarine

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Specify</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canola</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polyunsaturated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Olive</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Specify the brand(s) used:
........................................................................................................
........................................................................................................
### III. Type of Oil used

<table>
<thead>
<tr>
<th>Type of Oil Used</th>
<th>Yes</th>
<th>No</th>
<th>Specify brands used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canola</td>
<td>□</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>Polyunsaturated</td>
<td>□</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>Olive</td>
<td>□</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>Sunola</td>
<td>□</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>Safflower</td>
<td>□</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>Sunflower</td>
<td>□</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>Cotton/Linseed</td>
<td>□</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>Rapeseed</td>
<td>□</td>
<td>□</td>
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</tbody>
</table>

### IV. Oil Sprays (eg Pure and Simple, Golden Canola etc)

- □ Yes □ No Specify brand used
  - Specify brands used
  - Specify brands used

### V. Solid oils/fats (eg Frymaster, Fairy, Copha, Tulip etc)

- □ Yes □ No Specify types/brands used
  - Specify types/brands used
  - Specify types/brands used

### VI. Other cooking fats (such as lard, ghee, beef dripping etc)

- □ Yes □ No Specify types/brands used
  - Specify types/brands used
  - Specify types/brands used
75. Tick ☑ the type of oil/fat most often used in preparing each of the following foods:

<table>
<thead>
<tr>
<th>BUTTER</th>
<th>Margarine</th>
<th>OIL SPRAY</th>
<th>Vegetable oil</th>
<th>SOLID FATS</th>
<th>SOLID ANIMALS</th>
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</thead>
<tbody>
<tr>
<td>C O P</td>
<td>A L O N</td>
<td>A U A</td>
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<tr>
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<td>Y U L E</td>
<td>N N F I N L</td>
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<tr>
<td>O L A</td>
<td>U N S A</td>
<td>O O F V F Y</td>
<td>L L L E L U</td>
<td>FATS</td>
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<tr>
<td></td>
<td></td>
<td>R R T D E</td>
<td>E A E</td>
<td>tulip,</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>fry</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>master</td>
<td></td>
</tr>
</tbody>
</table>

Egg, fried
Eggs, scrambled
Toast/Sandwiches
Potatoes, mashed
Potatoes, baked
Hot chips
Green Vegetables
Other Vegetables
Beans, lentils
Gravy
Sauces, eg. white, mushroom
Pastry
Meat/Chicken
Fish
Rice
Other (Specify)
76. Indicate the most usual method of preparing each of the following. If you fry any of them, comment on whether the item is dipped in flour or batter or crumbed before frying and what oil/fat is used for frying. Also tick ☐ whether gravy or sauce is prepared. If sauce is prepared state what type it is (e.g., Maggi satay packet mix, Masterfoods, chilli sauce, homemade etc...)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>METHOD OF COOKING</th>
<th>KIND OF FAT USED (please mention if no fat is used)</th>
<th>GRAVY OR SAUCE</th>
<th>IF SAUCE SPECIFY TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potato</td>
<td></td>
<td></td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Hamburger</td>
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<tr>
<td>Steaks</td>
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<tr>
<td>Chops</td>
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<tr>
<td>Chicken</td>
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<tr>
<td>Fish</td>
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<tr>
<td>Shellfish (prawn, lobster etc)</td>
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<tr>
<td>Liver, Kidney etc</td>
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<tr>
<td>Other (Specify)</td>
<td></td>
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</tr>
</tbody>
</table>

77. If you prepare gravies, do you usually use:

☐ cornflour  ☐ flour  ☐ Packet mix eg Gravox

Is the liquid usually.....

☐ milk  ☐ water  ☐ other specify ..........................

78. Tick ☑ how much fat is usually trimmed from the meat before cooking or eating:

☐ trim most of all  ☐ trim some  ☐ usually don’t trim
79. Tick ☑ the type of salad dressing most often used with the following salads (specify brand(s) where possible):

<table>
<thead>
<tr>
<th></th>
<th>Regular mayonnaise such as Praise, Kraft</th>
<th>Reduced fat mayonnaise such as Kraft Light, Weight Watchers</th>
<th>Oil free dressing such as Praise No Oil, Fountain No oil, Kraft fat free</th>
<th>Other - specify type eg. Italian, Thousand Island etc. - or Homemade (list ingredients)</th>
<th>Don’t use salad dressing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potato salad</td>
<td></td>
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<tr>
<td>Coleslaw</td>
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<tr>
<td>Tossed salad</td>
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<tr>
<td>Pasta salad</td>
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<tr>
<td>Other (specify)</td>
<td></td>
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</tbody>
</table>
**THE UNIVERSITY OF WOLLONGONG**

**1997 IRIS - DIET INTERVENTION TRIAL**
**FOOD FREQUENCY (PATTERN) QUESTIONNAIRE**

- Please estimate how often you eat the following foods by ticking ☑ the appropriate box.
- Include diet foods and other special products in the general food categories. For example, include low calorie beer with beer.
- If they are diet/special products please indicate this in the comments section. You may also use the comments section for details such as seasonal variation, whether commercial or home made or low fat, wholemeal/fibre increased or any other relevant information.
- Feel free to use the bottom of each page for any additional comments.

<table>
<thead>
<tr>
<th>BREADS</th>
<th>Daily</th>
<th>4-6 times a week</th>
<th>1-3 times a week</th>
<th>1-3 times a month</th>
<th>1-3 times a year or never</th>
<th>Brand/Product Name</th>
<th>Comments - seasonal variation, low fat, homemade/commercial.</th>
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<tbody>
<tr>
<td>White bread/roll</td>
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<tr>
<td>Whole meal bread/roll</td>
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<td>Fibre increased</td>
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<td>Fruit/raisin bread</td>
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<tr>
<td>Fruit/Bran Muffins</td>
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<td>BREADS (continued)</td>
<td>Daily</td>
<td>4 - 6 times a week</td>
<td>1 - 3 times a week</td>
<td>1 - 3 times a month</td>
<td>1 - 3 times a year or never</td>
<td>Brand/Product Name</td>
<td>Comments - seasonal variation, low fat, homemade/commercial</td>
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<td>1 - 3 times a week</td>
<td>1 - 3 times a month</td>
<td>1 - 3 times a year or never</td>
<td>Brand/Product Name</td>
<td>Comments - seasonal variation, low fat, homemade/commercial.</td>
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</tr>
<tr>
<td>Rice Bubbles</td>
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<td>DAIRY PRODUCTS</td>
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<tr>
<td>Whole/Full cream milk</td>
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<tr>
<td>Skim milk/powder</td>
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<td>Lite white</td>
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<td>Yoghurt, Natural</td>
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### DAIRY PRODUCTS (continued)

<table>
<thead>
<tr>
<th>Item</th>
<th>Daily</th>
<th>4 - 6 times a week</th>
<th>1 - 3 times a week</th>
<th>1 - 3 times a month</th>
<th>1 - 3 times a year or never</th>
<th>Brand/Product Name</th>
<th>Comments - seasonal variation, low fat, homemade/commercial</th>
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<tbody>
<tr>
<td>Yoghurt, Natural low fat</td>
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<td>Yoghurt, flavoured, low fat</td>
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<td>Avocado</td>
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<tr>
<td>Orange, apple, grapes, mandarin, kiwi etc</td>
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<td>Dried fruits - apricots, prunes, raisins, dates</td>
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<td>FRUIT AND FRUIT JUICES (continued)</td>
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<td>4-6 times a week</td>
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<td>1-3 times a month</td>
<td>1-3 times a year or never</td>
<td>Brand/Product Name</td>
<td>Comments - seasonal variation, low fat, homemade/commercial</td>
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<td>Green vegetables - broccoli, cauliflower, spinach, beans, cabbage etc.</td>
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<td>Root vegetables - carrots, beetroot etc</td>
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<td>1 - 3 times a month</td>
<td>1 - 3 times a year or never</td>
<td>Brand/Product Name</td>
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<td><strong>MEAT, POULTRY, FISH</strong></td>
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<td>Luncheon meats - ham, Devon, salami, corned beef, siver side etc.</td>
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<td>MEAT, POULTRY, FISH (continued)</td>
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<td>4 - 6 times a week</td>
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<td>1 - 3 times a month</td>
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<td>Type of Cut</td>
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<tr>
<td>Variety/Organ meats - liver, tongue, kidney etc</td>
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<td>Fish, fresh or frozen - perch, salmon, hake, cod, sole, etc</td>
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<td>Tuna canned in brine/spring water</td>
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<td>Tuna canned in oil</td>
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<td>Shellfish, fresh or canned - lobster, prawn, crab, mussels, scallops etc.</td>
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<td>Meat Pie/hot dogs/ sausage rolls/Fish-fingers etc.</td>
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<td>Canned beans, lentils, split peas, lima, kidney, baked beans</td>
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<td>Soy protein foods such as tofu</td>
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<td>FATS &amp; OILS</td>
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<td>FATS &amp; OILS (continued)</td>
<td>Daily</td>
<td>4 - 6 times a week</td>
<td>1 - 3 times a week</td>
<td>1 - 3 times a month</td>
<td>1 - 3 times a year or never</td>
<td>Brand/Product Name</td>
<td>Comments - seasonal variation, low fat, homemade/commercial</td>
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<td>1 - 3 times a week</td>
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<td>Frozen dinners eg. McCain, Findus</td>
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<td>Peanuts/ almonds/ cashew nuts</td>
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<td>Soy crackers</td>
<td></td>
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<tr>
<td>Rice cakes</td>
<td></td>
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<td>Biscuits</td>
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<td>Pop corn</td>
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<tr>
<td>Cookies</td>
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<td>Others Specify:</td>
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<tr>
<td>MISCELLANEOUS</td>
<td>Daily</td>
<td>4 - 6 times a week</td>
<td>1 - 3 times a week</td>
<td>1 - 3 times a month</td>
<td>1 - 3 times a year or never</td>
<td>Brand/Product Name</td>
<td>Comments - seasonal variation, low fat, homemade/commercial</td>
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<tr>
<td>Vegemite/Marmite</td>
<td></td>
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<td>Fish paste</td>
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<td></td>
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<tr>
<td>Pickles, relish, chutneys</td>
<td></td>
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<tr>
<td>Olives</td>
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<tr>
<td>Steak sauces, mustard, tomato, chilli sauce</td>
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<td>Soy sauce, teriyaki sauce</td>
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<td>Mayonnaise</td>
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<td>Spreads- Jam, honey, syrup, marmalade</td>
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<td>Chocolate bars</td>
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<td>BEVERAGES</td>
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<tr>
<td>Coffee - regular or decaffeinated</td>
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<tr>
<td>Coffee substitute (eg Ecco, Caro)</td>
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<tr>
<td>Tea - regular, decaf, herbal</td>
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<tr>
<td>Drinking chocolate, Milo, Ovaltine etc</td>
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<tr>
<td>Beer, ale</td>
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<td>Spirits, cocktails</td>
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<td>Liqueur, Port, Brandy</td>
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<td>Wine, dry or sweet</td>
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<tr>
<td>Soft drinks</td>
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<tr>
<td>BEVERAGES (continued)</td>
<td>Daily</td>
<td>4 - 6 times a week</td>
<td>1 - 3 times a week</td>
<td>1 - 3 times a month</td>
<td>1 - 3 times a year or never</td>
<td>Brand/Product Name</td>
<td>Comments - seasonal variation, low fat, homemade/commercial</td>
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<tr>
<td>Diet soft drinks</td>
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<tr>
<td>Cordial (regular or low joule)</td>
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<td>SUGAR FREE PRODUCTS</td>
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<tr>
<td>Artificial sweeteners, chewing gums, lollies, chocolate, jams etc</td>
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<tr>
<td>DIETARY SUPPLEMENTS</td>
<td></td>
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<tr>
<td>Vitamins and/or minerals</td>
<td></td>
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<tr>
<td>Bran</td>
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<tr>
<td>Wheat germ/ Malt</td>
<td></td>
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<tr>
<td>Other supplements</td>
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<tr>
<td>Specify:</td>
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</tr>
<tr>
<td>OTHER COMMONLY CONSUMED FOODS OR BEVERAGES NOT GIVEN IN PREVIOUS GROUPS</td>
<td></td>
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<tr>
<td>Specify:</td>
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</tbody>
</table>
THE UNIVERSITY OF WOLLONGONG

DIET HISTORY INTERVIEW

CLIENT CODE: ________________ INTERVIEWER: ________________

MORNING MEAL
(Breakfast)

MIDDAY MEAL
(Lunch)

EVENING MEAL
(Tea/Dinner)

MORNING TEA

AFTERNOON TEA

SUPPER

Additional comments:
(Check for shift work, eating out, take away, quantity, type of milk, bread etc.)
INSTRUCTIONS FOR KEEPING A FOOD RECORD

[ 3 DAYS]

NAME:  

CLIENT CODE:  

RECORD SHEET

PLEASE READ THESE IMPORTANT INSTRUCTIONS CAREFULLY

* Please record All food and drinks consumed

* Please record the food at the time of eating and NOT from memory at the end of the day

* You should include all meals & snacks, plus sweets, drinks (including water) etc

* Remember to include any additions to foods already recorded such as: sauces, dressings or extras e.g. gravy, salad dressings, stuffing, sugar, honey, syrups etc., butter or margarine (e.g. added to bread, crackers, vegetables)

* If you do not eat a particular meal or snack, simply draw a line across the page at this point. This will show that you definitely have not eaten anything.

DEscribing Food and Drink - Guidelines

1. Please give details of the method of cooking all foods (e.g. fried, grilled, boiled, roasted, steamed, poached, stewed).

    e.g. EGGS

    Are they fried, boiled, poached or scrambled?
2. Give as many details as possible about the type of food that you eat wherever applicable

brand name: (e.g. Miracle margarine)

type of:
- Breakfast cereal (e.g. Weet bix)
- Milk (e.g. whole milk or 'Lite white')
- Cake or biscuit (e.g. fruit cake, wheatmeal biscuit)
- Fruit (e.g. fresh, canned, dried, stewed, baked)
- Soft drink (e.g. regular or low calorie/diet)

3. Name the type of cheese, fish or meat (e.g. cheddar, tuna in brine, loin of pork)

Farmers Best.

Cheddar.

RECORDING THE AMOUNTS OF FOODS YOU EAT

It is also very important to record the quantity of each food and drink you consume.

Here are some suggestions on how to record amounts:

- IN HOUSEHOLD MEASUREMENTS

For many foods such as vegetables, cereals and canned or stewed fruit, a household measurement is adequate.

e.g. STATE THE NUMBER OF TEASPOONS (tsp), TABLESPOONS (tbsp), CUPS etc. State whether spoons are level, rounded or heaped.

level

rounded

heaped

Butter and margarine can be measured in teaspoons or tablespoons if you find this an easy method.
• **WEIGHTS MARKED ON PACKAGES**

All convenience foods have their weight marked on the packaging and this can be quoted e.g. half a 425 g can of baked beans.

• **BREAD** - indicate the size of the slices (e.g. sandwich, medium, toaster).

• **CHEESE, MEAT & FISH**

Please use the pictures on the attached sheets to indicate what sort of portion sizes you eat. e.g. you might have 1 portion of spaghetti size A, 1 portion of meat size B or 2 slices of cheese size C.

• **MEASURING CUPS, SPOONS, WEIGHING SCALES**

Please use the measuring cups, spoons and weighing scales provided. e.g. 1 cup milk or 3/4 cup rice or 60 gms potato.

**IT IS VERY IMPORTANT THAT YOU DO NOT ADJUST WHAT YOU EAT AND DRINK BECAUSE YOU ARE KEEPING A RECORD. THIS IS VERY EASY TO DO, BUT REMEMBER, WE ARE INTERESTED IN YOUR EATING HABITS, NOT THE PERFECT DIET!!!**
HOW TO FILL IN RECORD SHEET

- Please record all the food and drink item that you consume during the day including sweets, snacks, ‘nibbles’, sauces and dressings.

- Please record: Method of cooking (e.g boiled pasta)
  Type of food (e.g boiled whole grain pasta)
  Quantity of food (e.g. 6 heaped tbsp of boiled wholegrain pasta)

- Please select a normal routine day. Do not select a day when you have parties or when you eat at restaurants. Record 2 weekdays and 1 weekend day.

<table>
<thead>
<tr>
<th>Meal/ Snack</th>
<th>Food and Drink Items</th>
<th>Details of Food and Drink</th>
<th>Quantity Eaten grams/litre</th>
<th>Leave Blank</th>
</tr>
</thead>
<tbody>
<tr>
<td>BREAKFAST</td>
<td>Sanitarium Weet bix</td>
<td>with sugar and milk</td>
<td>2 Weet bix</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lite white milk</td>
<td></td>
<td>1 teaspoon sugar</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Toast (Wonder white)</td>
<td>unsalted butter</td>
<td>1 cup milk</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Apple</td>
<td></td>
<td>1 slice</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 tsp butter</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 fresh</td>
<td></td>
</tr>
<tr>
<td>LUNCH</td>
<td>Bran muffin</td>
<td></td>
<td>1 small (40 g)</td>
<td></td>
</tr>
<tr>
<td>MORNING</td>
<td>Coffee with Lite white milk</td>
<td>coffee sugar milk</td>
<td>1 tsp</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 tsp</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1/4 cup (60 ml)</td>
<td></td>
</tr>
<tr>
<td>Meal/ Snack</td>
<td>Food and Drink Items</td>
<td>Details of Food and Drink</td>
<td>Quantity Eaten grams/litre</td>
<td>Leave Blank</td>
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<td>-------------</td>
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<td>--------------------------</td>
<td>----------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>LUNCH</td>
<td>Bread (wholemeal)</td>
<td></td>
<td>4 slices 2 tsp</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Margarine (Gold'n canola)</td>
<td></td>
<td>2 portion size A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roast beef</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Salad</td>
<td>tomato</td>
<td>4 slices</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>cucumber</td>
<td>6 slices</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>lettuce (chopped)</td>
<td>20 g</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fruit yoghurt</td>
<td></td>
<td>1 tub (200 g)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Diet Lite)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>AFTERNOON</td>
<td>Arnott's Morning Coffee</td>
<td></td>
<td></td>
<td>2 biscuits</td>
</tr>
<tr>
<td>TEA/SNACKS</td>
<td>Coffee with</td>
<td>coffee</td>
<td>1 tsp</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lite white milk</td>
<td>milk</td>
<td>50 ml</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>sugar</td>
<td>1 tsp</td>
<td></td>
</tr>
<tr>
<td>Meal/ Snack</td>
<td>Food and Drink Items</td>
<td>Details of Food and Drink</td>
<td>Quantity Eaten grams/litre</td>
<td>Leave Blank</td>
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<tr>
<td>-------------</td>
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<td>--------------------------</td>
<td>----------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>DINNER</td>
<td>Chicken</td>
<td>grilled and sprinkled with salt and pepper</td>
<td>1 portion size B</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Potatoes</td>
<td>boiled</td>
<td>1 medium</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Peas</td>
<td>boiled</td>
<td>1/4 cup</td>
<td></td>
</tr>
<tr>
<td></td>
<td>carrots</td>
<td>boiled</td>
<td>50 g</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fruit juice</td>
<td></td>
<td>1 cup (250 ml)</td>
<td></td>
</tr>
<tr>
<td>SUPPER/ SNACKS</td>
<td>Ice cream (Dairy Bell)</td>
<td>peach (fresh)</td>
<td>2 scoops of ice cream and 4 slices of peach</td>
<td></td>
</tr>
</tbody>
</table>
**FOOD RECORD**

- Please record all the food and drink item that you consume during the day including sweets, snacks, 'nibbles', sauces and dressings.

- Please record: Method of cooking (e.g. boiled pasta)  
  Type of food (e.g. boiled whole grain pasta)  
  Quantity of food (e.g. 6 heaped tbsp of boiled wholegrain pasta)

- Please select a normal routine day. Do not select a day when you have parties or when you eat at restaurants. Record 2 weekdays and 1 weekend day.

<table>
<thead>
<tr>
<th>Day:-----------</th>
<th>Date:--------------------------</th>
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</thead>
<tbody>
<tr>
<td><strong>Meal/Snack</strong></td>
<td><strong>Food and Drink Items</strong></td>
</tr>
<tr>
<td>B R E A K</td>
<td></td>
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<tr>
<td>F A S T</td>
<td></td>
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<tr>
<td>M I D M O R N I N G</td>
<td></td>
</tr>
<tr>
<td>Meal/ Snack</td>
<td>Food and Drink Items</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>LUNCH</td>
<td></td>
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<tr>
<td>AFTERNOON</td>
<td></td>
</tr>
<tr>
<td>TEA / SNACKS</td>
<td></td>
</tr>
<tr>
<td>Meal/ Snack</td>
<td>Food and Drink Items</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Dinner</td>
<td></td>
</tr>
<tr>
<td>Supper</td>
<td></td>
</tr>
<tr>
<td>Snacks</td>
<td></td>
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</tbody>
</table>
PHOTOGRAPHS FOR ESTIMATING THE SIZE OF THE PORTION OF FOOD THAT YOU EAT.

ALL PHOTOGRAPHS SHOW FOOD ON 22cm DIAMETER PLATES, UNLESS OTHERWISE STATED.

PHOTOGRAPH 1    CHICKEN

PHOTOGRAPH 2    CHEESE 18cm diameter plates
PHOTOGRAPH 9  POTATO

PHOTOGRAPH 10  MARMITE OR VEGEMITE
PHOTOGRAPH 12  MUESLI (1/4, 1/2 & 3/4 cup)
PHOTOGRAPH 13 CAULIFLOWER

PHOTOGRAPH 14 CARROTS
PHOTOGRAPH 17  LETTUCE SALAD

A  B  C
ADDITIONAL INFORMATION

If you have made any major changes to your eating habits during the past few months, please describe them here:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

THANKYOU FOR YOUR CO-OPERATION IN FILLING OUT THIS FORM. WE ARE VERY GRATEFUL FOR YOUR TIME AND EFFORT.

If you have any comments or suggestions, please write them below.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
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________________________________________________________________________
THE UNIVERSITY OF WOLLONGONG

ANTHROPOMETRIC MEASUREMENT FORM

OFFICE USE ONLY

(To be completed during examination)

Name: ___________________________  Code: ___________________________

Date of examination: _____________  Visit: ___________________________

Age: ___________________________  Date of birth: _______________________

Height: _________________________cm  Weight: ________________________kg

Waist circumference:
1st reading: ______________________cm
2nd reading: ______________________cm
Average: _________________________cm

Blood pressure:
Systolic: ________________________mm Hg
Diastolic: ________________________mm Hg

Skinfold measurements:

<table>
<thead>
<tr>
<th>Readings</th>
<th>Biceps mm</th>
<th>Triceps mm</th>
<th>Subscapula mm</th>
<th>Superiliac mm</th>
<th>Abdominal mm</th>
<th>Thigh mm</th>
<th>Calf mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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</tbody>
</table>
THE UNIVERSITY OF WOLLONGONG

1997 IRIS - DIET INTERVENTION TRIAL
DIET ADHERENCE / ACCEPTANCE QUESTIONNAIRE

- Please indicate your answer by ticking the appropriate box ☐ or by writing your answer in the space provided.
- Please indicate only one answer for one question.

1. How easy was it to follow the eating suggestions that has been recommended?
   - ☐ Always
   - ☐ Most of the time
   - ☐ Sometime
   - ☐ Very rarely
   - ☐ Not at all

2. How often did you feel satisfied about your diet?
   - ☐ Very Satisfied
   - ☐ Satisfied
   - ☐ Fairly satisfied
   - ☐ Not very satisfied
   - ☐ Not at all satisfied

3. How often did you follow your diet exactly?
   - ☐ Always
   - ☐ Most of the time
   - ☐ Sometimes
   - ☐ Very rarely
   - ☐ Not at all

4. How acceptable was the diet?
   - ☐ Very acceptable
   - ☐ Fairly acceptable
   - ☐ Slightly acceptable
   - ☐ Not very acceptable
   - ☐ Not at all acceptable
5. How would you rate the diet for the following categories? (Please ☑ in the appropriate column)

<table>
<thead>
<tr>
<th>Categories</th>
<th>Very Good</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
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<tbody>
<tr>
<td>Taste</td>
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<td>Appearance</td>
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<td>Appeal (Colour)</td>
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<tr>
<td>Satiety (Feeling of fullness)</td>
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<td>Variety</td>
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<td>Flexibility</td>
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6. How would you rate each meal of the diet? (Tick ☑ the appropriate column. Mark one only)

<table>
<thead>
<tr>
<th>Meal</th>
<th>Very Light</th>
<th>Light</th>
<th>Moderate</th>
<th>Heavy</th>
<th>Very Heavy</th>
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<tbody>
<tr>
<td>Breakfast</td>
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<td>Mid morning</td>
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<tr>
<td>Lunch</td>
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<tr>
<td>Afternoon tea</td>
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<tr>
<td>Dinner</td>
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<tr>
<td>Dessert</td>
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</tbody>
</table>
7. What is your opinion of the cost of diet?

- □ Very costly
- □ Fairly costly
- □ Slightly costly
- □ Not very costly
- □ Not at all costly

8. Do you think you would be able to follow this diet regularly even after the study?

- □ Yes
- □ No

Give reasons:

________________________________________________________________________

________________________________________________________________________

9. Would you prefer to make changes in the diet?

- □ None
- □ Do not know
- □ Yes

If Yes, Please specify the changes along with the reason for each change.

________________________________________________________________________

________________________________________________________________________

THANK YOU FOR YOUR CO-OPERATION
FOCUS GROUP-GUIDELINE QUESTIONS

Information About the Focus Group

<table>
<thead>
<tr>
<th>Date of Focus Group</th>
<th>/ / 19</th>
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<tbody>
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<td>Location of Focus Group</td>
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<tr>
<td>Type of Focus Group</td>
<td>Experimental I / Experimental II / Experimental III / Experimental IV.</td>
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<tr>
<td>Number of Participants</td>
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Q1. What do you think of the recommended diet that you have been following for the past few weeks?

<table>
<thead>
<tr>
<th>Brief Summary/Key Points</th>
<th>Notable Quotes</th>
</tr>
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</table>
Q2. What kind of changes did you notice in the recommended diet when compared to your original eating habits?

<table>
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<th>Notable Quotes</th>
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Q3. How happy are you with the recommended diet?

<table>
<thead>
<tr>
<th>Brief Summary/Key Points</th>
<th>Notable Quotes</th>
</tr>
</thead>
<tbody>
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</table>

Q4. How happy were you with your original eating habits before you came to this study?

<table>
<thead>
<tr>
<th>Brief Summary/Key Points</th>
<th>Notable Quotes</th>
</tr>
</thead>
<tbody>
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</table>
Q5. How do you feel about sticking to the recommended diet?

<table>
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<tr>
<th>Brief Summary/Key Points</th>
<th>Notable Quotes</th>
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</table>

Q6. What do you think of the cost of the recommended diet?

<table>
<thead>
<tr>
<th>Brief Summary/Key Points</th>
<th>Notable Quotes</th>
</tr>
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Q7. What do you feel about the adequacy of the recommended diet?

<table>
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<tr>
<th>Brief Summary/Key Points</th>
<th>Notable Quotes</th>
</tr>
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<tbody>
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Q8. What changes would you prefer to make to the recommended diet so that it is suitable for you?

<table>
<thead>
<tr>
<th>Brief Summary/Key Points</th>
<th>Notable Quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>

Follow-up questions:

Would you explain further?

Can you give me an example to what you mean?

Reasons for a particular view.
APPENDIX IX

DIETARY HANDOUTS

- Dietary guidelines and recipes given to the HCLF group 259 - 267
- Dietary guidelines and recipes given to the LG group 268 - 280
- Dietary guidelines and recipes given to the MFLG group 281 - 292
- Dietary guidelines and recipes given to the MF group 293 - 303
- Guideline for alcohol intake 304
- Sample meal plan form 305
DIETARY GUIDELINES
AND RECIPES
GIVEN TO THE
HCLF GROUP
DIETARY GUIDELINES

- Eat 6 meals per day (ie. 3 main meals and 3 snacks)
- Variety is an important aspect of any diet, choose foods from the lists below:

**BREADS:**
Consumne at least 5-6 slices of bread per day. Low fat crackers may be used for snacks.

- White, Wholemeal, White Rolls, Wholemeal Rolls, Water Crackers, Cruskits, Crackerbreads, Ryvita

**BREAKFAST CEREALS:**
1 serve of breakfast cereals should be consumed with breakfast each day.

- Cornflakes, Weet Bix, Vita Brits, Rice Bubbles, Puffed Wheat

**RICE/ GRAINS/ PASTA:**
These foods may replace potato 2-3 times per week.

- Calrose Rice, Sunbrown Quick Rice, Polenta, Couscous, White Pasta (eg. Spaghetti Macaroni etc)

**DAIRY PRODUCTS:**
Consume 2 serve of dairy products each day. Avoid creams and full-fat custards.

- Skim Milk, Reduced Fat Milk, Low Fat Yoghurt, Low Fat Cheeses, Low Fat Ice-cream

**FRUIT:**
Consume at least 3 pieces of fruit per day. Avoid avocados. Include plenty of fresh fruit salads.
**VEGETABLES:**
Consume at least 2 cups of vegetables per day, (1 cup = 250 g). Include plenty of green vegetables and salads.

**MEATS:**
Eat 80-100 grams of leaf beef, veal, pork or chicken. Trim off any fat and remove skin from chicken. Do not fry meats. Cool casseroles and stew then skim off any fat on surface before reheating.

**FISH:**
Eat 80-100 grams of fish. Use canned tuna or salmon in spring water or brine.

Avoid frying fish and meat. Instead grill, poach, steam, bake or microwave.

**MARGARINES/ OILS:**
Use polyunsaturated reduced fat margarines and polyunsaturated oils.

Meadow Lea Light, Flora Light, Becel Light, Polyunsaturated Blended Oil
**PINK BANANA SHAKE**

1 banana
1 cup orange juice
6 strawberries
1/3 cup low fat berry flavoured yoghurt

Puree together and serve in a tall glass.

KJ = 577  
g Carbohydrate = 28  
g Fat = 0.32  
g Fibre = 2.22

**FRUITY MILKSHAKE**

2 cups skim milk
½ cup fresh (or drained, canned) apricots
½ cup low fat natural yoghurt
1 banana
1 passionfruit

Puree together first 4 ingredients. Stir in pulp of passionfruit and serve in a tall glass.

KJ = 581  
g Carbohydrate = 21  
g Fat = 2.11  
g Fibre = 2.24
HOME-STYLE BURGERS

400g very lean mince

½ cup fresh wholemeal breadcrumbs (preferably made from 1-2 day old bread)

1 Tbsp finely chopped onion

1 Tbsp chutney

1 Tbsp chopped parsley

6 bread rolls, split

1 Tbsp tomato relish (or chutney)

6 canned beetroot slices, drained

2 tomatoes, sliced

6 lettuce leaves

6 canned pineapple slices in natural juice, drained

½ cucumber, thinly sliced

Combine mince, breadcrumbs, onion, chutney and parsley in a bowl. Shape mixture into 6 patties. Barbecue or grill patties for 4 minutes each side or until cooked as desired. Grill rolls until lightly browned. Spread base of each roll with relish. Top with patties, beetroot, tomatoes, lettuce, pineapple and cucumber. Top with remaining roll half. Serve with a salad.

KJ = 1770 g Carbohydrate = 64 g Fat = 8 g Fibre = 10
VEAL CASSEROLE

1 tsp canola margarine
4 (500g) veal chops, trimmed of visible fat
1 onion, sliced
125g button mushrooms, quartered
2 carrots, sliced
2 sticks celery, sliced
1 zucchini, sliced
1 red capsicum, seeded and chopped
425g canned tomatoes, undrained
1 cup chicken stock
½ cup dry white wine
1 Tbsp tomato paste
2 Tbsp chopped fresh basil
freshly ground black pepper to taste
1 Tbsp cornflour blended with ¼ cup water


SERVES 4

KJ = 2008  g Carbohydrate = 66  g Fat = 5  g Fibre = 6.17cc
**Chicken Tikka Kebabs**

**Serves 4**

- 500g skinless, boneless chicken breasts, trimmed of visible fat and cut into 2cm cubes
- 1 tbsp paprika
- 1 tbsp soy sauce
- 1 tsp ground turmeric
- ¼ cup lemon juice
- 100 g low fat natural yoghurt
- 4 cloves garlic, finely chopped
- 1 ½ tsp ground cumin
- ¼ tsp garam masala

Combine the chicken, paprika, soy sauce, turmeric and lemon juice in a bowl. Mix well, cover, and refrigerate for 30 minutes.

In a small bowl, combine the yoghurt, garlic, cumin, and garam masala and whisk until blended. Stir this into the chicken mix, cover and return to the fridge for 4 hours (or overnight).

Thread the chicken onto soaked wooden skewers and barbecue or grill, turning frequently until cooked through (8-10 minutes).

Information per serve:

Energy: 675 KJ

Fat: 3g
Strawberry Yoghurt Ice-cream

Serves 6
1 punnet strawberries, hulled
2 tsp gelatine
2 tbsp orange juice
2 tbsp honey
500g non-fat natural yoghurt
2 egg whites
1 tbsp sugar

Process berries until smooth. Combine gelatine and orange juice in a cup and place cup in a bowl of hot water, stir until gelatine dissolves. Place honey and yoghurt in a bowl, stir in gelatine mixture. Beat egg whites until soft peaks form. Add sugar gradually, beating well after each addition, until mixture is thick and glossy. Gently fold yoghurt and puree into beaten egg whites. Pour into freezer container and freeze until firm around edges. Remove from freezer, transfer to a large mixing bowl and beat with electric mixer until thick and creamy. Return to freezer and freeze overnight or until firm. Remove from freezer and place in refrigerator 1 hour before serving. Serve with fruit salad or berries.

Fat per serve: less than 1g
DIETARY GUIDELINES
AND RECIPES
GIVEN TO THE
LG GROUP
DIETARY GUIDELINES

- Eat 6 meals per day (ie. 3 main meals and 3 snacks)
- Variety is an important aspect of any diet, choose foods from the lists below:

**BREADS:**

Consume at least 5-6 slices of bread per day.

- Pumpernickel, Mixed Grain Bread, Oat Bran, Fruit/Raisin Loaf, Ploughman’s Loaf, Barley Kernel bread, Rye Kernel Bread

**BREAKFAST CEREALS:**

1 serve of breakfast cereal should be consumed with breakfast each day.

- All-Bran, Rolled Oats, Porridge, Rice Bran, Special K, Sultana Bran

**RICE/ GRAINS/ PASTA:**

Consume 1 cup of rice or pasta every day.

- Long Grain Rice, Brown Rice, Basmati, Egg Fettuccine, Ravioli, Spaghetti, Macaroni, Vermicelli

**DAIRY PRODUCTS:**

Consume 2 serve of dairy products each day.

- Skim Milk, Reduced Fat Milk, Low Fat Yoghurt, Low Fat Cheeses, Low Fat Ice-cream

**FRUIT:**

Consume at least 3 pieces of fruit per day. Avoid watermelon, pineapple, rockmelon and avocados. Drink apple and/or pineapple juice instead of orange juice and fruit cordials.
**VEGETABLES:**
Consume at least 2 cups of vegetables per day, (1 cup = 250 g). Restrict root vegetables, except sweet potato.

**MEATS:**
Eat 100-150 grams of leaf beef, veal, pork or chicken. Trim off any fat and remove skin from chicken.

**FISH:**
Eat 100-150 grams of fish. Use canned tuna or salmon in spring water or brine.

Avoid frying fish and meat. Instead grill, poach, steam, bake or microwave.

**MARGARINES/OILS:**
Use polyunsaturated reduced fat margarines and polyunsaturated oils.

Meadow Lea Light, Flora Light, Becel Light, Polyunsaturated Blended Oil
Breakfast Menu

HONEY BANANA SMOOTHIE (Serves 2)

The ‘smoothie’- a quick, but sustaining breakfast. Many variations are possible using different combinations of fruits, milks and yoghurts.

Ingredients:

1 large, ripe banana
1 cup (250 ml) skim milk, chilled
¼ cup (125 ml) evaporated skim milk, well chilled
2 teaspoons honey
Few drops of vanilla essence

Method of preparation:

Peel banana and chop roughly.

Combine with remaining ingredients in a blender and blend for 30 seconds or until smooth and thick.

Serve immediately

Nutrients per serve:

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Amount</th>
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<tbody>
<tr>
<td>715 kJ</td>
<td>Fat......0.5 g</td>
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<tr>
<td></td>
<td>Proteins.........11 g</td>
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<tr>
<td></td>
<td>Carbohydrate.........32 g</td>
</tr>
<tr>
<td></td>
<td>Fibre..............1.54 g</td>
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</table>
PORRIDGE WITH BANANA AND RAISINS  (SERVES 2)

A tasty porridge variation.

Ingredients:

2/3 cup (60 g) rolled oats
1 cup (250 ml) skim milk
1 large ripe banana, mashed
1 heaped tablespoon raisins

Method of preparation:

Place the oats in a saucepan or large microwave jug. Add sufficient water to cover plus about 2/3 cup of the milk.

Bring to a boil and boil 2 minutes or microwave (100% power) for 1 to 2 minutes.

Add the banana and cook 1 to 2 minutes more.

Add the remaining milk to make a smooth consistency and stir through raisins.

<table>
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<th>Nutrients per serve:</th>
<th>1056 kJ</th>
<th>Fat..........3 g</th>
<th>Proteins..........9.5 g</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Carbohydrate...48 g</td>
<td>Fibre............4.2 g</td>
</tr>
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</table>
QUICK HAM AND BEANS (Serves 4)

Team baked beans with a toast for a substantial breakfast, if desired.

Ingredients:

2 large slices ham
1 teaspoon of polyunsaturated oil
440 g can baked beans
1/2 cup (60 g) grated low-fat cheddar cheese
1 tablespoon chopped fresh parsley

Method of preparation:

Chop the ham into small dice. Brush the base of a saucepan with the oil and heat. Add the ham and cook lightly.

Add the baked beans and heat gently.

Remove from heat and stir in the cheese. Serve on toast, if desired, sprinkled with parsley to garnish.

Nutrients per serve: 611 kJ Fat........5.7 g Proteins..........12 g
Carbohydrate.........12 g Fibre..............5 g
LENTIL SOUP (Serves 4 to 6)

A very tasty winter soup, filling and warming - makes a meal in itself.

Ingredients:

- 1 tablespoon polyunsaturated oil
- 1 large onion (150 g), finely chopped
- 2 cloves garlic, crushed, or 2 teaspoons minced garlic
- ½ teaspoon turmeric
- 2 teaspoons curry powder
- ½ teaspoon ground cumin
- 1 teaspoon minced chilli
- 6 cups (1.5 litres) water
- 1½ cups (375 ml) prepared chicken stock
- 1 cup (200 g) red lentils
- ½ cup (100 g) pearl barley
- 425 g can tomatoes, undrained and mashed
- Freshly ground black pepper
- Chopped fresh parsley or coriander, to serve

Method of preparation:

Heat the oil in a large saucepan. Add the onion, cover and cook gently for about 10 minutes or until beginning to brown, stirring frequently.

Add the garlic, turmeric, curry powder, cumin and chilli an and cook, stirring, for 1 minute.

Stir in the water, stock, lentil, barley, tomatoes, and salt (if required) and pepper to taste. Bring to a boil cover and simmer about 45 minutes or until the lentils and barley are tender.

Serve sprinkled with parsley or coriander.

<table>
<thead>
<tr>
<th>Nutrients per serve:</th>
<th>767 kJ</th>
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<th>Proteins..........11 g</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Carbohydrate........25 g</td>
<td>Fibre..............7 g</td>
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Salads

PASTA AND RED BEAN SALAD (SERVES 4)

A summer salad full of flavour. Easy to prepare with canned beans.

Ingredients:

1 cup (150 g) cooked pasta
1 cup (about 200 g) cooked or canned red kidney beans, well drained
3 green shallot, finely chopped
1 tablespoon finely chopped fresh parsley

Dressing:

1 tablespoon polyunsaturated oil
1 tablespoon wine vinegar
1 teaspoon Dijon mustard
1 clove garlic, crushed
Freshly ground black pepper

Method of preparation:

Combine the pasta, beans, shallots and parsley in a serving bowl.

For the dressing, combine the oil, vinegar, mustard, garlic and pepper in a screw-top jar: shake well to combine.

Pour the dressing over the pasta mixture and toss well.

<table>
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<th>Nutrients per serve:</th>
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<tr>
<td></td>
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<td>Carbohydrate.....16 g</td>
<td>Fibre..............4 g</td>
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Mains and Accompaniments:

CHICKEN AND BASMATI RICE PILAU (SERVES 2)

This a flavoursome one-pot meal, best served with a salad.

Ingredients:

1 teaspoon polyunsaturated oil
2 chicken thigh fillets (about 250 g), skinned and sliced
2 teaspoons polyunsaturated margarine
1 large (150 g) purple Spanish onion, sliced
1/2 medium red capsicum (75 g), sliced
1 cup (200 g) Basmati rice
2 cups (500 ml) prepared chicken stock

Method of preparation:

Heat the oil in a medium to large saucepan, add the chicken and cook, stirring, over medium heat for about 10 minutes or until beginning to brown. Transfer to a plate.

Melt the margarine in the same pan, add the onion and capsicum and cook for about 5 minutes or until soft.

Add the rosemary and cook a further 3 minutes or until the onion is lightly browned, Return the chicken to the pan, add the rice and stir.

Pour the cold stock over the chicken and rice mixture and bring to a boil. Cover with a tight- fitting lid and simmer gently for 20 minutes or until the rice is tender and the liquid is absorbed.

<table>
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<th>Nutrients per serve:</th>
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<th>Proteins..........35 g</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Carbohydrate...85 g</td>
<td>Fibre...............4 g</td>
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VEAL, VEGETABLE AND PASTA STIR - FRY (Serves 6)

Loaded with vegetables, this high carbohydrate dish is a very low-fat main meal.

**Ingredients:**

- 400 g spaghetti pasta
- 200 g cauliflower, cut into florets
- 2 teaspoons polyunsaturated oil
- 1 large carrot (150 g), chopped
- 1 medium onion (120 g) chopped
- 200 g broccoli, chopped
- 1 tablespoon grated fresh ginger or 1 tablespoon minced ginger
- 350 g flat mushrooms, sliced
- 1 clove garlic, crushed, or 1 tablespoon minced garlic
- 1 bunch fresh asparagus, chopped
- 1 small green capsicum (100 g), chopped
- 200 g veal steaks, cut into thin strips
- 1 medium red capsicum (150 g), chopped
- 1 stick celery 980 g), sliced
- ¾ cup black bean sauce
- 1 small green capsicum (100 g), chopped
- 1 tablespoon salt - reduced soy sauce
- 1 medium red capsicum (150 g), chopped
- 3/3 tablespoons cornflour
- 2/3 cup (165 ml) water

**Method of preparation:**

Add the spaghetti to a large saucepan of boiling water, boil, uncovered, until just tender; drain and keep warm.

Heat the oil in a wok or large non stick frying pan. Add the onion, ginger, garlic and veal. Stir-fry over medium heat for about 3 -5 minutes or until the veal is almost cooked.

Add the remaining vegetables and stir-fry until just tender, sprinkling in a little water if necessary.

Stir in the blended sauces, cornflour and water. Stir until the mixture boils and thickens.

Add the spaghetti; stir until heated through. Serve immediately.

**Nutrients per serve:**

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<th>Amount</th>
</tr>
</thead>
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<td>Fat</td>
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<td></td>
<td>Protein</td>
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<td></td>
<td>Carbohydrate</td>
</tr>
<tr>
<td></td>
<td>Fibre</td>
</tr>
</tbody>
</table>
**SPAGHETTI BOLOGNESE (Serves 4)**

To keep the fat content down, use a minimum amount of oil and the leanest possible minced beef.

**Ingredients:**

- 1 tablespoon polyunsaturated oil
- ½ cup (60 ml) dry red wine
- 1 very small onion (80 g), finely chopped
- ½ cup (60 ml) beef stock
- 1 carrot (100 g), grated
- ¼ teaspoon dried oregano leaves
- 1 stick celery (80 g), sliced
- Freshly ground black pepper
- 1 rasher (40 g) bacon, fat removed, finely chopped
- 1 bay leaf
- 2 cloves garlic, crushed, or 2 teaspoons minced garlic
- 2 pinches grated nutmeg
- 375 g spaghetti pasta
- Chopped fresh parsley, to serve (optional)
- 300 g lean minced beef
- Grated Parmesan cheese
- 2 tablespoons tomato paste

**Method of preparation:**

Heat the oil in a saucepan or fying pan, add the onion, carrot, celery, bacon and garlic and cook for about 10 minutes, or until the onion is very soft, stirring frequently. Cover if drying out too much.

Increase the heat and add the beef. Cook for about 5 minutes, stirring constantly until the beef is crumbly and browned.

Add the tomato paste, tomatoes, wine and stock. Bring to a boil. Add the oregano, pepper, bay leaf and nutmeg and stir thoroughly. Cover and simmer for 1 hour, stirring frequently to prevent sticking. Remove bay leaf.

Meanwhile, add the spaghetti to a large saucepan of boiling water and boil, uncovered, until just tender; drain.

Serve the beef sauce over the spaghetti. Sprinkle with parsley and serve with Parmesan cheese, if desired.

<table>
<thead>
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<th>Nutrients per serve:</th>
<th>1493 kJ</th>
<th>Fat..........15 g</th>
<th>Proteins..........24 g</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Carbohydrate.....30 g</td>
<td>Fibre..........5 g</td>
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</table>
CREAMED RICE WITH SLICED PEARS (Serves 4)

A yummy variation on creamed rice.

Ingredients:

2 cups (500 ml) water
1 cup (200 g) Basmati rice
3/4 cup evaporated skim milk
3/4 cup (55 g) firmly packed brown sugar
1 teaspoon vanilla essence
440 g can pear slices

Method of preparation:

Bring the water to a boil in a saucepan, add the rice and boil for 15 minutes; drain

Return the rice to the saucepan with the milk. Stir over low heat until all the milk is absorbed. Stir in the sugar and vanilla essence; cool.

Using an ice cream scoop, serve scoops of rice with the pear slices.

Nutrients per serve: 1300 kJ  Fat.........0.5g  Proteins......... neg
Carbohydrate...............69 g  Fibre............ .3 g
BAKED APPLES

Tender cooked apples, stuffed with plump dried fruits makes an yummy dessert.

**Ingredients:**

- 4 large golden delicious apples (800 g)
- 1 tablespoon currants
- 1 tablespoon sultanas
- 4 prunes, pitted and chopped
- 4 dried apricots, chopped
- ½ teaspoon grated lemon zest
- ½ teaspoon ground cinnamon
- 1 tablespoon apricot jam
- 1 tablespoon unsaturated margarine
- ¼ cup (960 ml) honey
- 4½ tablespoons (90 ml) orange juice
- ½ teaspoon grated nutmeg

**Method of preparation:**

Core the apples, keeping them whole.

Remove the peel form around one end and in strips around each apple (to give a striped appearance).

Combine the currants, sultanas, prunes, apricots, lemon zest, cinnamon and jam in a small bowl. Stuff the mixture into the apple centres.

Place the apples in a baking dish just large enough to hold them.

Combine the margarine, honey, orange juice and nutmeg in a small saucepan. Stir over low heat until the margarine is melted. Pour over the apples. Bake in a moderate oven (180° c), for about 40 minutes, or until the apples are tender but not mushy, basting with juices every 10 minutes.

Serve the apples drizzled with some of the juices from the dish.

**Nutrients per serve:**

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Amount</th>
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<tbody>
<tr>
<td>1065 kJ</td>
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<td>Fat ........</td>
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<td>Carbohydrate</td>
<td>56 g</td>
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<tr>
<td>Fibre ..........</td>
<td>6.5 g</td>
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Adapted from ‘THE G.I FACTOR’
by
Brand Miller, Powell, Colagiuri
Pg. 138 - 194
DIETARY GUIDELINES
AND RECIPES
GIVEN TO THE
MFLG GROUP
DIETARY GUIDELINES

• Eat 6 meals per day (ie. 3 main meals and 3 snacks)
• Variety is an important aspect of any diet, choose foods from the lists below:

BREADS:
Consume at least 5-6 slices of bread per day.

Pumpernickel, Mixed Grain Bread, Oat Bran, Fruit/Raisin Loaf, Ploughman’s Loaf, Barley
Kernel bread, Rye Kernel Bread

BREAKFAST CEREALS:
1 serve of breakfast cereal should be consumed with breakfast each day.

All-Bran, Rolled Oats, Porridge, Rice Bran, Special K, Sultana Bran

RICE/ GRAINS/ PASTA:
Consume 1 cup of rice or pasta every day.

Long Grain Rice, Brown Rice, Basmati, Egg Fettuccine, Ravioli, Spaghetti,
Macaroni, Vermicelli

DAIRY PRODUCTS:
Consume 2 serve of dairy products each day.

Farmers Best Milk, Yoghurt (fruit / natural), Farmers Best Ice-cream,
Cheddar cheese, Stilton Cheese, Swiss Cheese

FRUIT:
Consume at least 3 pieces of fruit per day. Include Avocados. Avoid watermelon, pineapple
and rockmelon. Drink apple and/or pineapple juice instead of orange juice and fruit cordials.
**VEGETABLES:**
Consume at least 2 cups of vegetables per day, (1 cup = 250 g). Restrict root vegetables, except sweet potato.

**MEATS:**
Eat 100-150 grams of leaf meat per day.

| Chicken (no skin), Turkey, Pork, Veal, Beef (choose cuts such as Round Steak, Topside Steak, Fillet Steak, Ribeye Steak, Brisket) |

**FISH:**
Try to replace meat with fish 2-3 times per week. Include tuna in canola oil.

**EGGS:**
Choose Omega 3 enriched eggs, such as Chanteclair, Barter New Start.

**MARGARINES:**
Use only Canola margarine. Margarine may be spread on toast, bread, crackers etc.

| Meadow Lea Canola, Flora Canola, Gold’n Canola, Miracle Canola |

**OILS:**
Use Sunola oil for cooking. Sunola oil may be used as a salad dressing (Combine with a little vinegar and herbs if desired).
PORRIDGE WITH BANANA AND RAISINS

2/3 cup rolled oats
1 cup (250mL) Farmers Best milk, approximately
1 small ripe banana, mashed
1 heaped Tbsp raisins

Place the oats in a saucepan or large microwave jug. Add sufficient water to cover plus about 2/3 cup milk.
Bring to a boil and boil for 2 minutes or microwave for 1 to 2 minutes (100% power).
Add the banana and cook 1 to 2 minutes more.
Add the remaining milk to make a smooth consistency and stir through raisins.
SERVES 2

<table>
<thead>
<tr>
<th>KJ</th>
<th>g Carbohydrate</th>
<th>g Fat</th>
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<tr>
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<td>44</td>
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TOMATO AND BASIL SOUP

1 tsp Sunola oil
2 medium orange sweet potatoes (about 750g), peeled and chopped
1 large onion (150g), coarsely chopped
2 cups (500mL) tomato juice
1 cup (250mL) dry white wine
2 cups (500mL) prepared chicken stock
1 bunch fresh basil
freshly ground black pepper

Heat the oil in a saucepan, add the potato and onion and cook over medium heat for 5 minutes.
Add the tomato juice, wine and stock, simmer, covered, for about 20 minutes, or until the potato is soft.
Add the basil leaves and puree the soup in a food processor or blender. Return to the pan, add pepper to taste and reheat.

SERVES 8

KJ = 440  g Carbohydrate = 17  g Fat = 1  g Fibre = 2
**CURRY RICE WITH CHICKEN SAUCE**

boned chicken breasts (about 375g), skin removed
1 Tbsp Sunola oil
large onion, finely chopped
1 stick celery, sliced
medium carrot, grated
6 sprigs fresh parsley, finely chopped
ice
3 cups water
½ cups (300g) Basmati rice

½ cup dry white wine
2 tsp tomato paste
½ cup prepared chicken stock
freshly ground black pepper
1 bay leaf
2 Tbsp grated Parmesan cheese
1 tsp margarine
1 tsp curry powder

1. Cut the chicken into 1 cm cubes.
2. Heat the oil in a saucepan or non-stick frying pan. Add the vegetables and parsley and cook gently for 10 minutes, stirring frequently.
3. Add the chicken and cook, stirring, for 4-5 minutes. Add the wine and boil quickly until it evaporates. Stir in the combined tomato paste and stock. Season with pepper and add the bay leaf. Bring to the boil, reduce the heat and simmer gently for 15 minutes. Remove the bay leaf.
4. Meanwhile, cook the rice. Bring the water to the boil in a saucepan, add the rice and simmer, covered, for about 18-20 minutes or until all the water is absorbed. Drain and rinse well under hot water. Return to the saucepan, add the margarine and curry powder, stir until combined.
5. Place the rice into a warmed serving dish, top with the chicken sauce and sprinkle with the Parmesan cheese.

SERVES 4

<table>
<thead>
<tr>
<th>KJ</th>
<th>g Carbohydrate</th>
<th>g Fat</th>
<th>g Fibre</th>
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<tbody>
<tr>
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<td>26</td>
<td>20</td>
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VEAL, VEGETABLE AND PASTA STIRFRY

400g spaghetti pasta
2 tsp Sunola oil
1 medium onion, chopped
1 Tbsp grated fresh ginger
1 clove garlic, crushed
200g veal steaks, cut into thin strips
1 stick celery, sliced
1 small yellow capsicum, chopped
1 medium red capsicum, chopped

200g cauliflower, cut into florets
1 large carrot, chopped
200g broccoli, chopped
350g flat mushrooms, sliced
1 bunch fresh asparagus, chopped
1 Tbsp soy-sauce
¾ cup black bean sauce
1 ½ Tbsp cornflour
2/3 cup water

1. Add the spaghetti to a large saucepan of boiling water, boil, uncovered, until just tender; drain and keep warm.

2. Heat the oil in a wok or large nonstick frying pan. Add the onion, ginger, garlic and veal. Stir-fry over medium heat for about 3-5 minutes or until the veal is almost cooked.

3. Add the remaining vegetables and stir-fry until just tender, sprinkling in a little water if necessary.

4. Stir in the blended sauces, cornflour and water. Stir until the mixture boils and thickens.

5. Add the spaghetti, stir until heated through. Serve immediately.

SERVES 6

KJ = 1491  g Carbohydrate = 58  g Fat = 3  g Fibre = 10
CHICKEN AND BASMATI RICE PILAU

1 tsp Sunola oil
2 chicken thigh fillets (about 250g), skinned and sliced
2 tsp margarine
1 large purple Spanish onion, sliced
½ medium red capsicum (75g), sliced
½ tsp dried rosemary leaves
1 cup (200g) Basmati rice
2 cups prepared chicken stock

1. Heat the oil in a medium saucepan, add the chicken and cook, stirring, over medium heat for about 10 minutes or until beginning to brown. Transfer to a plate.
2. Melt the butter in the same pan, add the onion and capsicum and cook for about 5 minutes or until soft.
3. Add the rosemary and cook a further 3 minutes or until the onion is lightly browned. Return the chicken to the pan, add the rice and stir.
4. Pour the cold stock over the chicken and rice mixture and bring to a boil. Cover with a tight fitting lid and simmer gently for 20 minutes or until the rice is tender and the liquid is absorbed.

SERVES 2

Serve with steamed vegetables or a salad.

KJ = 2225  g Carbohydrate = 83  g Fat = 12  g Fibre = 3
BAKED CAPSICUM WITH RICE AND TUNA

4 red or green capsicums
½ brown onion
1 stick celery
½ Tbsp oil
2 cups cooked rice
2 Tbsp chopped parsley
freshly ground black pepper
185g can tuna (in spring water or brine)

Preheat oven to 200C.

Open capsicums by cutting of a slice from the longest edge of each. Chop these four slices finely. Discard seeds and wash capsicums under tap. Place capsicums in a roasting dish just large enough to hold them and roast in preheated oven for 20 minutes.

Peel and chop onion. Wash and dice celery.

Brush a saucepan with oil. Add chopped capsicum, onion and celery and cook on medium heat for about 5 minutes, until vegetables are almost soft. Add rice and chopped parsley and season with a little pepper. Stir on low heat for 2 minutes then remove from heat and stir in drained tuna, broken into small pieces.

Pack this preparation fairly tightly into the capsicums and bake for a further 10 minutes. By that time, the rice and tuna should be hot and the capsicum soft.

SERVES 4

g Carbohydrate = 27  g Fat = 7  g Fibre = 13.7
SALMON AND BARLEY CASSEROLE

1 cup quick cook barley (200g)
1 tsp dried basil leaves
1 Tbsp olive oil
1 medium onion, chopped finely
1 clove garlic, crushed
400g can tomatoes
1 cup frozen peas (125g)
400g can salmon in brine/spring water, drained and flaked
250g ricotta cheese
2 eggs
½ cup evaporated skim milk (125mL)
1 tsp paprika

Cook barley according to packet directions, adding basil leaves to cooking liquid.
Heat oil and cook onion and garlic over a moderate heat for 3-4 minutes. Add tomatoes, peas and salmon.
Beat together ricotta, eggs and milk.
Place the barley in a greased, shallow casserole dish, cover with tomato mixture and pour the ricotta mixture over the top. Sprinkle top with paprika and bake in a moderate oven for 45 minutes, or until set. Leave to stand for 5 minutes.

Serves 6

g Carbohydrate = 26  
g Fat = 16  
g Fibre = 5.8
PINEAPPLE RICE PUDDING

1 cup ricotta cheese
200g low fat natural yoghurt
1 tsp vanilla essence
2 cups drained, finely chopped, canned unsweetened pineapple
4 cups cooked rice

Place ricotta cheese, yoghurt and vanilla essence in a bowl. Beat until creamy.
Combine pineapple and rice. Fold in ricotta mixture. Spoon into a 6cup capacity mould or individual moulds. Cover. Refrigerate for at least 4 hours. Just before serving, unmould. Serve with blueberries or strawberries.

SERVES 8

KJ = 168  g Carbohydrate = 35  g Fat = 4  g Fibre = 2.23
APPLE CUSTARD CRISP

4 medium to large Granny Smith apples (about 650g)
juice of 1 lemon
8 dried apricot halves, chopped
¼ cup raisins or sultanas
1 Tbsp custard powder
2 tsp sugar
¾ cup Farmers Best milk
40g margarine
1 ½ Tbsp honey
1 cup rolled oats
¼ cup plain flour, sifted
1 tsp ground cinnamon
½ tsp ground allspice

1. Peel and core the apples and cut into thin slices. Drizzle with lemon juice.
   Microwave (100% power) for 5-8 minutes, or lightly stew in a saucepan, until just
tender.
2. Add the apricots and raisins. Place into a well- greased ovenproof dish.
3. Blend the custard powder and sugar with a little of the milk in a saucepan or
   microwave jug. Add the remaining milk and heat gently, or microwave (100%
   power), until the custard boils and thickens. Pour over the apple mixture.
4. Melt the margarine and honey in a small saucepan or in the microwave. Combine
   with the rolled oats, flour, spices and nuts. Sprinkle over the apple and custard
   mixture.
5. Bake in a moderate oven (180C) for about 30 minutes or until the topping is
   browned.

SERVES 6

KJ = 1089  g Carbohydrate = 45  g Fat = 7  g Fibre = 4
DIETARY GUIDELINES
AND RECIPES
GIVEN TO THE
MF GROUP
DIETARY GUIDELINES

• Eat 6 meals per day (ie. 3 main meals and 3 snacks)

• Variety is an important aspect of any diet, choose foods from the lists below:

**BREADS:**

Consume at least 5-6 slices of bread per day. Low fat crackers may be used for snacks.

| White, Wholemeal, White Rolls, Wholemeal Rolls, Water Crackers, Cruskits, Crackerbreads, Ryvita |

**BREAKFAST CEREALS:**

1 serve of breakfast cereals should be consumed with breakfast each day.

| Cornflakes, Weet Bix, Vita Brits, Rice Bubbles, Puffed Wheat |

**RICE/ GRAINS/ PASTA:**

These foods may replace potato 2-3 times per week.

| Calrose Rice, Sunbrown Quick Rice, Polenta, Couscous, White Pasta (eg. Spaghetti Macaroni etc) |

**DAIRY PRODUCTS:**

Consume 2 serve of dairy products each day.

| Farmers Best Milk, Yoghurt (fruit / natural), Farmers Best Ice-cream, Cheddar cheese, Stilton Cheese, Swiss Cheese |

**FRUIT:**

Consume at least 3 pieces of fruit per day. Include Avocados.
**VEGETABLES:**
Consume at least 2 cups of vegetables per day, (1 cup = 250 g). Include plenty of green vegetables and salads.

**MEATS:**
Eat 100-150 grams of leaf meat per day.

<table>
<thead>
<tr>
<th>Chicken (no skin), Turkey, Pork, Veal, Beef (choose cuts such as Round Steak, Topside Steak, Fillet Steak, Ribeye Steak, Brisket)</th>
</tr>
</thead>
</table>

**FISH:**
Try to replace meat with fish 2-3 times per week. Include tuna in canola oil.

**EGGS:**
Choose Omega 3 enriched eggs, such as Chanteclair, Barter New Start.

**MARGARINES:**
Use only Canola margarine. Margarine may be spread on toast, bread, crackers etc.

<table>
<thead>
<tr>
<th>Meadow Lea Canola, Flora Canola, Gold'n Canola, Miracle Canola</th>
</tr>
</thead>
</table>

**OILS:**
Use Sunola oil for cooking. Sunola oil may be used as a salad dressing (Combine with a little vinegar and herbs if desired).
BUBBLE AND SQUEAK

1 mashed pumpkin  
1 cup mashed potato  
1 Tbsp fresh parsley  
1 Tbsp fresh chives  
pepper to taste  
2 Tbsp Parmesan cheese  
1 tsp Sunola oil

Combine potato, pumpkin, parsley, chives, pepper and cheese. Shape mixture into 4 patties. Lightly brush or spray a non-stick frying pan with oil. Heat. Add patties. Cook for 2 minutes each side or until brown. Alternatively cook patties under a hot grill until brown on both sides. Serve on toast with grilled tomatoes.

SERVES 4

KJ = 322  
g Carbohydrate = 11  
g Fat = 2  
g Fibre = 1.44

BREAKFAST OMELETTE

1 egg  
1 Tbsp Farmers Best milk  
1 tsp chopped parsley  
pepper to taste  
2 egg whites  
1 tsp canola margarine  
2 Tbsp finely chopped tomato  
1 green shallot, chopped

Whisk together whole egg, milk, parsley and pepper in a bowl. Beat egg whites in a separate bowl, until soft peaks form. Fold into egg mixture. Melt half the margarine in a non-stick frying pan. Pour in half the egg mixture. Cook until just set. Scatter half the tomato and shallot over omelette. Cook under a hot grill until just brown. Repeat to make a second omelette. Serve with toast or crusty bread.

SERVES 2

KJ = 309  
g Carbohydrate = 1  
g Fat = 4  
g Fibre = 0.35
CRAB AND AVOCADO PARCELS WITH TOMATO YOGHURT SAUCE

250g canned crab meat, drained
1 avocado, chopped
½ cup low fat ricotta cheese
2 tsp lemon juice
1 Tbsp tomato sauce
dash Tabasco sauce
8 sheets filo pastry
Sunola oil for brushing

Tomato Yoghurt Sauce
½ cup low-fat natural yoghurt
2 Tbsp tomato paste
1 tsp lemon juice
dash Worcestershire sauce

Combine crab meat, avocado, ricotta cheese, lemon juice, tomato sauce, and tabasco sauce in a bowl. Layer 2 sheets of filo pastry on work bench, short ends towards you. Brush lower half of pastry with a thin layer of oil. Fold pastry in half. Place one-quarter of the crab mixture along one end of the pastry, leaving 3cm on each side to allow for folding. Fold sides over filling. Roll up. Place parcel on a lightly greased baking tray. Repeat with remaining ingredients to make four parcels. Bake at 190-200C for 20-25 minutes or until golden. Serve with tomato yoghurt sauce and salad.

Sauce
Combine all ingredients in a bowl.

Serves 4

KJ = 1245  g Carbohydrate = 19  g Fat = 17  g Fibre = 1.4
BURRITOS

2 Tsp Sunola oil
1 onion, chopped
1 Tbsp ground cumin
1 Tbsp sweet paprika
1 Tbsp ground coriander
500g very lean beef mince or shredded, grilled chicken breasts
2 Tbsp bottled mild taco sauce
420g canned red kidney beans, rinsed and drained
6 soft tortillas
12 lettuce leaves, shredded
3 tomatoes, chopped
3 carrots, grated
1 small avocado, chopped
½ cup low fat natural yoghurt
½ cup grated reduced-fat mozzarella cheese

Heat oil in a large non-stick frying pan. Add onion. Cook until soft. Add cumin, paprika and coriander. Cook for 2 minutes. Add mince. Cook, stirring for 5 minutes or until mince is well browned. Use a fork to break up any lumps. Transfer to a bowl. Cool. Cover and refrigerate until cold. Remove and discard fat that sets on the surface.

Heat a non-stick frying pan. Add mince mixture, taco sauce and beans. Cook for 5 minutes or until mixture thickens.

To serve, cut tortillas in half. Divide mixture evenly between tortillas. Top with lettuce, tomatoes, carrots, avocado, yoghurt and cheese. Roll up to enclose filling.

KJ = 2796   g Carbohydrate = 72   g Fat = 24   g Fibre = 12
ORIENTAL GLAZED FISH

2 Tbsp dry sherry
1 tsp soy-sauce
¼ tsp five spice powder
1 tsp grated ginger
1 Tbsp hoisin (or plum) sauce
½ tsp sesame oil
1 tsp honey
1 Tbsp sesame seeds
4 (about 500g) fish fillets (eg. Tuna, ocean trout, Spanish mackerel, warehou, bream, snapper, gemfish)

Combine all ingredients except fish in a bowl. Add fish. Turn to coat. Transfer fish to a lightly oiled baking dish. Cook under a hot grill for 3-4 minutes each side, brushing several times with marinade. Serve with rice and stirfried vegetables.

SERVES 4

KJ = 6841  g Carbohydrate = 192  g Fat = 41  g Fibre = 23
BAKED SALMON WITH ROASTED CAPSICUM SAUCE

4 (about 500g) salmon (ocean trout, perch, John Dory) fillets, skin and bones removed
fresly ground black pepper to taste
2 Tbsp lime (or lemon) juice
100g salmon trimmings, skin and bones removed (or uncooked prawn meat)
2 Tbsp low fat natural yoghurt (or ricotta cheese)
1 egg white
2 tsp chopped fresh parsley (or coriander)
1 tsp chopped fresh dill

Roasted Capsicum Sauce
2 red capsicums, roasted and chopped
1 Tbsp red wine vinegar
1 Tbsp champagne (or white wine) vinegar
freshly ground pepper to taste

Place each fillet in the centre of a 40cm square piece of baking paper. Sprinkle with
pepper and lime juice. Place salmon trimmings in a food processor. Process to make a
fine paste. Add remaining ingredients. Using the pulse button process to combine.
Spoon one quarter of the pureed mixture onto each salmon fillet. Fold paper over to
enclose fillets. Place parcels on a baking tray. Bake at 180-190C for 8-10 minutes or
until cooked. Serve with roasted capsicum sauce, boiled rice and steamed vegetables.

Sauce Puree all ingredients in a food processor.

SERVES 4

KJ = 907 g Carbohydrate = 3 g Fat = 6 g Fibre = 0.63
SEAFOOD CASSEROLE

1.5 L fish stock
few threads of saffron
500g potatoes, diced
1 red and 1 green capsicum, seeded and diced
800g can tomatoes
300g broccoli, broken into small pieces
500g boneless fish fillets, cut into 2.5 cm (1 in) cubes
250g mussels, scrubbed and beard removed
250g green prawns, peeled
½ cup chopped parsley (20g)
½ cup fresh basil (20g)
½ cup chopped fresh coriander (20g)
2 Tbsp lemon juice
freshly ground black pepper
6 slices French stick

Heat stock and add saffron and potatoes. Simmer, covered for 10 minutes.

Add capsicum, tomatoes, broccoli, fish and mussels and cook for 3-5 minutes.
(Mussels should open in this time and fish should be cooked; discard any mussels that do not open.) Add prawns and cook only until they turn pink (2-3 minutes). Add parsley, basil, coriander, lemon juice and pepper.

Place a slice of toast in each of six deep bowls and fill bowls with fish mixture.

SERVES 6

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<th>% Energy =</th>
<th>Protein- 47</th>
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<tr>
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<td></td>
<td>g Fibre- 41</td>
</tr>
<tr>
<td>Carbohydrate- 40</td>
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</tbody>
</table>
FRESH APPLE PUDDING

1 egg
1/4 cup sugar
1/3 cup Sunola oil
1 tsp vanilla essence
2 tsp grated orange rind
1/4 cup orange juice
3/4 cup SR flour
1/4 cup ground almonds
4 green apples, peeled, roughly chopped
2 tsp lemon juice
2 Tbsp brown sugar
1 tsp ground cinnamon

Place egg and sugar in a bowl. Beat until light and thick. Beat in oil, vanilla essence, orange rind and juice. Combine flour and ground almonds. Fold into egg mixture. Toss apples in lemon juice. Spread over base of a greased 20cm round or square ovenproof dish. Combine sugar and cinnamon. Sprinkle half over apples. Spread with remaining sugar mixture. Bake at 180C for 35-40 minutes or until golden and pudding starts to come away from sides of dish.

SERVES 8

KJ = 979  g Carbohydrate = 30  g Fat = 12  g Fibre = 2.39
APRICOT MOUSSE

1/3 cup chopped dried apricots
425g canned apricots in natural juice, drained, juice reserved
1/2 cup low fat ricotta cheese
2 tsp gelatine
1/2 cup evaporated milk, well chilled
2 Tbsp flaked almonds

Place dried apricots in a bowl. Cover with boiling water. Soak for 30 minutes or until soft. Drain.

Purée canned and soaked apricots and ricotta cheese in food processor. Transfer to a bowl. Place 1/4 cup reserved liquid in a bowl. Sprinkle over gelatine. Stand in hot water until gelatine dissolves. Stir in apricot mixture. Place milk in a bowl. Beat until thick and frothy. Fold into apricot mixture. Pour into 6 serving glasses or bowls. Refrigerate until set. To serve decorate with almonds.

SERVES 6

KJ = 493  
g Carbohydrate = 12 
g Fat = 5  
g Fibre = 2.38
Do not consume more than 4 standard drinks each day.

**Examples of Standard Drinks**

**Beer**
- Full Strength- 1 middie (285mL)
- Reduced Alcohol (3.3%)- 1 can (375mL)
- Light (2.2%)- 2 middies (570mL)
- Low Alcohol (0.9%)- 5 middies (4 cans)

**Table Wine (12%)**- 100mL (1/2-2/3 glass)

**Sherry (18%)**- 60mL

**Spirits (40%)**- 1 nip (30mL)

**Cocktails**- 1-3 standard drinks
SAMPLE MEAL PLAN

BREAKFAST

MORNING SNACKS/TEA

LUNCH

AFTERNOON SNACKS/TEA

DINNER

SUPPER SNACKS
APPENDIX X

METHODS USED IN BIOCHEMICAL ANALYSIS

- Triglyceride Assay 307
- Total Cholesterol Assay 309
**Triglyceride Assay**

**Principle of Method**
Enzymatic hydrolysis of triglycerides with subsequent determination of the liberated glycerol by colorimetry.

Reaction produced is read optically at 500 nm and compared to a known protein standard curve. Sample blanks are automatically done on all samples.

**Specimen Type**
Plasma or serum with EDTA. Samples should be fresh or if analysis is delayed, then kept refrigerated for up to 7 days, thereafter they maybe frozen at -80°C.

**O.C Material**
Boehringer Mannheim (i) Precinorm L cat no L 781827  
(ii) Precipath L cat no L 1285874

These are prepared using 3 ml redistilled water. Pipet 100 µl of each sample into 0.5 ml Blu top and Green top analyser cups respectively and store away in -80°C freezer for future use.

**O.C Material Values**
Boehringer Mannheim  
position 44 Precinorm L 1650 µmol/L  
(range 1305 - 1995)  
position 45 Precipath L 4650 µmol/L  
(range 3675 - 5625)

**Calibrator (Standard)**
Roche Control serum Lipid cat no 2023624

Make up standard using 5 ml distilled water. Mix well, allow to stand for 30 min, gently swirl around - ready to use. 200 µl of standard are aliquoted into Yellow top analyser cups and frozen at -80°C. Standards are thawed and diluted for assay use.

**Calibration:**
Pipet 200 µl of thawed standard into a Cobas cup and place cup in position as shown
Dilute sample in position 15, 1:2 as serial dilution till position 11 (100 µl : 100 µl)

**Procedure:**

(a) Reagents:
Connect one bottle 1 to one bottle 2 with one of the adapters provided in the kit and flush several times to ensure complete dissolution of the lyophilisate.

Reagent solutions from different bottles maybe pooled for large series.
Reagent stable for 2 weeks at +2 to 8 C
2 days at + 15 to 25 C
Place reagent in reagent rack no position .

(b) Pipet 100 µl specimen into FARA sample cups and load onto FARA sample rack.
(c) Program machine as described.
(d) Record values of Controls in Yellow folder.
Cholesterol Assay

**Principle of Method:**
Enzymatic hydrolysis of cholesterol esters with subsequent determination of the liberated cholesterol by colorimetry.

Reaction produced is read optically at 520 nm and compared to a known protein standard curve. Sample blanks are automatically done on all samples.

**Specimen Type:**
Plasma or serum with EDTA with no preservatives added. Samples should be fresh or if analysis is delayed, then kept refrigerated at +4°C (max 7 days) or at -80°C (for future use).

**Q.C Material:**
Boehringer Mannheim (i) Precinorm L cat no L 781827
(ii) Precipath L cat no L1285874

These are prepared using 3ml redistilled water. Pipet 100 μl of each sample into 0.5 ml Blue top and Green top analyser cups respectively and store away in -80°C freezer for future use.

**Q.C Material Values:**
Boehringer Mannheim
position 44  Precinorm L  4610 μmol/L  (range 3635 - 5585)
position 45  Precipath L  9300 μmol/L  (range 7350 - 11250)

**Calibrator (Standard)**
Roche Control serum Lipid cat no. 2023624.

Make up standard using 5ml distilled water. Mix well, allow to stand for 30 min, gently swirl around - ready to use. 200 μl of standard are aliquoted into Yellow top analyser cups and frozen at -80°C. Standards are thawed and diluted for assay use.

**Calibration (Standard Curve)**
Pipet 200 μl of thawed standard into a Cobas cup and place cup in position as shown.
Dilute sample in position 15; 1: 2 as serial dilution till position 11 (100 μl :100μl)

Procedure:
(a) To reagent bottle provided, pipet 100ml of distilled water. Allow to stand for 30 min, and mix well. Reagent ready to use after thorough mixing.

Reagent stable for 2 weeks at +2 to 8 C
2 days at +15 to 25 C

(b) Pipet 100 μl specimen into FARA sample cup and load onto FARA sample rack.
(c) Program machine as described
(d) Record values of Controls into yellow folder.