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The nutritional status and energy and protein intakes of MOW clients and the need for further targeted strategies to enhance intakes

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Abstract

There is a paucity of literature about the nutritional status and energy and protein intakes of Meals on Wheels (MOW) clients. The current study aimed to determine the nutritional status and the adequacy of energy and protein intakes of MOW clients. Forty-two clients were recruited from two MOW services in the Illawarra region of Australia for assessment of their nutritional status, using the Mini Nutritional Assessment (MNA®). Estimated energy and protein intakes for a MOW day were compared to a non-MOW day and average daily energy and protein intakes were assessed against estimated daily requirements. A single dietitian performed all assessments and home based interviews to explore the client's perception of the service. Mean daily energy intake (7593 (±2012) kJ) was not significantly different to estimated requirements (7720 (±975) kJ) (P ¼ 0.480), while mean daily protein intake was higher (78.7 (±23.4) g) than calculated requirements (68.4 (±10.8) g; P ¼ 0.009). However 16 clients were identified as at risk of malnutrition and 2 were malnourished; consuming 2072 kJ (P ¼ 0.000) less energy and 20.4 g less protein (P ¼ 0.004) per day compared to well-nourished clients. MOWclients are at risk of being poorly nourished and meals delivered by the service provide an important contribution to overall intakes. These findings support the need for regular nutrition screening and dietary monitoring in this high risk group, to identify those for whom additional strategies may be indicated.

Keywords

status, energy, protein, intakes, nutritional, mow, need, clients, enhance, further, strategies, targeted

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Title Page

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Abstract

There is a paucity of literature about the nutritional status and energy and protein intakes of Meals on Wheels (MOW) clients. The current study aimed to determine the nutritional status and the adequacy of energy and protein intakes of MOW clients. Forty-two clients were recruited from two MOW services in the Illawarra region of Australia for assessment of their nutritional status, using the Mini Nutritional Assessment (MNA®). Estimated energy and protein intakes for a MOW day were compared to a non-MOW day and average daily energy and protein intakes were assessed against estimated daily requirements. A single dietitian performed all assessments and home based interviews to explore the client's perception of the service. Mean daily energy intake (7593 (±2012) kJ) was not significantly different to estimated requirements (7720 (±975) kJ) (P=0.480), while mean daily protein intake was higher (78.7 (±23.4) g) than calculated requirements (68.4 (±10.8) g; P=0.009). However 16 clients were identified as at risk of malnutrition and 2 were malnourished; consuming 2072 kJ (P=0.000) less energy and 20.4 g less protein (P=0.004) per day compared to well-nourished clients. MOW clients are at risk of being poorly nourished and meals delivered by the service provide an important contribution to overall intakes. These findings support the need for regular nutrition screening and dietary monitoring in this high risk group, to identify those for whom additional strategies may be indicated.

Introduction

Australia has an ageing population, with 24% of the population expected to be aged over 65 years in 2056, compared to 13% in 2007 (ABS 2009). The demand for community based services such as Meals on Wheels (MOW) will increase in the future and it is estimated that 10-30% of people residing in the community are malnourished, with the prevalence rates likely to be higher for some groups, including the aged (Watterson et al 2009). Malnutrition is associated with reduced functionality, increased risk of illness, reduced quality of life, and increased independence and mortality in older people (Johansson et al, 2009; Keller et al, 2004; Vetta et al, 1999).

Meals on Wheels is a community-based organization that has operated since 1952 in Australia. The organization's logo in Australia, *'More than just a meal'*, reflects its aim to provide a nutritious meal, in the context of increased social interaction, in order to support independence and to allow people to remain at home for as long as possible. Over 14.8 million meals are delivered annually to approximately 53,000 clients in Australia (http://www.mealsonwheels.org.au/About-Us/About-Us.aspx). The service also allows clients to customize both the number of meals delivered per week and the type of meal (hot, chilled or frozen). Clients are often referred to the service as a result of ill

health or social circumstances placing them at increased nutritional risk, as their ability to access adequate meals may be reduced (Krassie et al, 2000).

Despite being a group at high nutritional risk, there is a paucity of information on the dietary intakes, usage and storage of meals by MOW clients. A few small studies from Australia (Galea et al 2013; Charlton et al 2013; Winterton et al 2013), New Zealand (Wilson et al 2011) and Ireland (O'Dwyer et al, 2009) highlight a need for further evaluations of MOW services and better marketing to health professionals and potential clients, as well as a range of strategies to enhance dietary intakes. The aims of this exploratory study were to: determine the nutritional status of MOW clients and to estimate the adequacy of their daily protein and energy intakes.

Materials and methods

A convenience sample of forty-two clients from two Meals on Wheels services in New South Wales, Australia agreed to take part in the study in early 2011. These MOW services obtain a range of frozen meals, soups and desserts from three commercial suppliers via and order form. MOW clients can order their preferences for delivery in the heated or frozen state as required. Hot meals are available on weekdays and frozen meals are delivered to clients each week. Dishes may include pumpkin soup or minestrone soup; roast lamb and vegetables or beef and bacon casserole and vegetables; and blueberry sponge crumble and custard or baked rice pudding. Clients choose their meals; whether they want the hot or frozen type and what days of the week they require deliveries.

The managers from each of the services distributed participant information sheets and consent forms to eligible clients via volunteer MOW drivers and then followed up telephonically. Consenting clients were visited in their homes once by a single dietitian (FM) at a convenient time and couples were interviewed together. Exclusion criteria included those with a terminal illness and non-English speaking clients. We have previously reported on the views and perceptions of MOW clients, which involved in-depth interviews with the same clients and is a companion to the current paper (Evans et al 2014).

Assessment of Nutritional Status

The validated Mini Nutritional Assessment-Full Form (MNA®) was used to determine the nutritional status of each client aged 65 years and over (Guigoz et al 1996). The MNA® includes a review of anthropometry, living situation, mobility, diet, medical history and self-perception of health and provides a score out of a possible 30, with less than 17 indicating malnutrition, 17-23.5

indicating ‘at risk’ and 24 and above indicating ‘nourished’ (Guigoz et al 1996). Subjective Global Assessment (SGA) was used to determine nutritional status for each client aged less than 65 years. This valid assessment method involves a review of weight history, dietary intake, gastrointestinal symptoms, functional capacity and physical examination. Scoring is categorical to determine if a patient is ‘A’ well nourished, ‘B’ moderately malnourished or ‘C’ severely malnourished (Detsky et al 1987). Both methods of assessment involved taking some physical measurements (e.g. weight, height, review of interosseous muscle and scapula for SGA and calf circumference for the MNA®); and also asking clients questions about themselves (e.g. In comparison to other people of a similar age, how would the person rate their health? - MNA, and Over the last month how would you rate your activity? - SGA).

Dietary Assessment

An interviewer administered combined diet history interview and 24 hour recall was conducted by a single dietitian (FM). As the dietitian was keen to obtain information about MOW days and non-MOW days, components of a 24 hr recall was used at times to prompt intakes from the most recent day, usually a MOW day, which was often of a similar format, and to compare to intakes on a non-MOW day. These methods have been used by others to estimate dietary intakes in older adults who may have some memory deficits (O’Dwyer et al 2009; Soini et al 2006; Galea et al 2013). Estimation of usual energy and protein intakes from foods and beverages were determined for days on which a MOW meal was delivered (MOW day), a non-MOW day and the average daily intakes were also determined. At times, couples were interviewed, and on occasion a client had a partner, or other family member present, who would also add to the interview discussion regarding dietary assessment and the assessment of nutritional status.

Estimating Dietary Protein and Energy Requirements and Intakes

All dietary intake data were analysed using FoodWorks nutrient analysis software (Version 6.2: 2006; Highgate Hill, QLD) to estimate the daily energy and protein intakes of the clients on an average MOW day, average non-MOW day and an average day overall. Estimated daily energy requirements were calculated using the Schofield Equation with an average physical activity level (PAL) factor of 1.4 applied (NHMRC 2006). Recommended Dietary Intakes (RDIs) for protein for men (1.07g/kg) and women (0.94g/kg) above 70 years were used to determine estimated daily protein requirements for each client in that age group. Age and gender appropriate RDIs for protein were used for the younger clients (NHMRC 2006).

Data analyses

Descriptive statistics (mean±SD) were calculated. Differences between the mean dietary intakes of energy and protein on a MOW day and a non-MOW day; as well as comparison to the estimated daily requirements were determined for individuals, men, women and total group. Paired t-tests for normally distributed data and the Wilcoxon Signed Rank test for non-parametric data were undertaken for differences between the MOW day, non-MOW day and estimated requirements. Comparisons were also made for energy and protein intakes, as well as MNA scores for those 'at risk' and malnourished compared to those who were nourished, with independent t-tests used for the parametric data and Mann-Whitney U tests for the non-parametric data. All data were normally distributed, with the exception of the estimated energy requirement (EER) for men, the age and the BMI scores for the comparison between nourished, and malnourished/'at risk' groups. The level of significance was set at $p<0.05$. The Statistical Package for the Social Sciences (SPSS V17.0:2009, SPSS Inc. Chicago II, USA) was used for all analyses. The number of individuals meeting their personally estimated daily energy and protein requirements were also determined and reported.

Ethics approval was obtained from the University of Wollongong Human Research Ethics Committee (HREC. No.10/417) and written informed consent was obtained from all clients and/or their next of kin.

Results

Forty-two MOW clients from the Illawarra region of New South Wales took part in the study; 26 women and 16 men. Mean age was 81.9 (±9.4) years, ranging from 50-91 years. Only four clients were younger than 65 years (50, 59, 61 and 63 years). Most (28/42) clients reported eating their meals alone, and six clients had some degree of cognitive impairment, but took part in the study and were accompanied at the interview by a partner or family member. Their usage of MOW varied from 6-14 meals per fortnight, with the mean being 10 meals per fortnight.

Nutritional Status

The mean (±SD) MNA score was 23.6 (±3.4), range = 14.5 - 29.5, out of a possible score of 30. Fifty-seven percent (24 clients) were well nourished, 38% were at risk (16 clients) and 5% were malnourished (2 clients). Of the clients classified as under 65 years of age; three had an SGA result of 'A' indicating they were well nourished and one client had a score of 'B' indicating moderate

risk of malnutrition. The mean BMI was 27.1 (±5.6) kg/m^2, ranging from 18.7- 47.7 kg/m^2, and 8 clients (from 39 clients) over 65 years (21 %) had a BMI of less than 23 kg/m^2.

Estimated Daily Protein and Energy Requirements and Intakes

Table 1 summarises the estimated daily energy requirements, mean intakes for the MOW day, non-MOW day and the average daily energy intakes for all clients, women and men. The mean estimated daily energy intake of 7593 (±2012) kJ was not significantly different (7720 (±975) kJ) (P = 0.650). However only 18 (from 42) clients (43%) met their estimated energy requirements on a MOW day and 16 (from 33 with available data on a non-MOW day) (48%) on a non-MOW day. Only 6 (of 14) men and 12 (of 19) women met their estimated energy requirements on the MOW day, while 7 men and 9 women met their estimated energy requirements on the non-MOW day. There was a statistically significant difference between estimated energy intakes by women on a MOW day compared to a non-MOW day (P=0.045, 530 kJ). There were no statistically significant differences for men, or overall.

Table 1

Table 2 summarises the estimated daily protein requirements, mean intakes for the MOW day, non-MOW day and the average daily protein intakes for all clients, women and men. Overall the mean daily protein requirement of 68.4 (±10.8) g was significantly lower than the mean estimated daily intake of 78.7 (±23.4) g (P = 0.009; Paired t-test). Yet only 28 (from 42) clients (67%) met their individual estimated protein requirement on a MOW day and 25 (from 33 with available data on a non-MOW day) (76%) on a non-MOW day. Men fared better, with 12 of the 14 male clients who provided non-MOW day data meeting their estimated protein requirements on a MOW day and also on a non-MOW day. Statistically significant results for the men were reported as follows; mean daily intake to estimated mean daily requirement: +15.1 (P=0.015, Paired t-test); mean MOW day intake to estimated mean daily requirement: +12.2 (P=0.026, Paired t-test) and mean non-MOW daily intake to estimated mean daily requirement: +24.7 (P=0.003, Wilcoxon signed rank test). There was no significant difference between the estimated protein intakes for men between a MOW day and a non-MOW day (+12.5 g, P=0.140).

Table 2

Comparison between the Malnourished/'At Risk' and Nourished Clients

Table 3 compares the findings between the malnourished/'at risk' clients and the well nourished clients. Mean BMI did not differ between malnourished/'at risk' (n = 18) 26.9 (±5) kg/m^2 and well nourished (n = 24) (27.4 (±6.2) kg/m^2) clients; P=0.790, indicating the importance of not relying on BMI alone to assess nutritional status. Malnourished/'at risk' clients consumed 2072 kJ (P=0.000) and 20.4 g of protein (P=0.004) less per day, on average, than the well-nourished clients and 6 of the 8 clients with a BMI less than 23kg/m^2 were in the malnourished/'at risk' group.

Table 3

Discussion

These findings will inform future interventions to maximise the nutritional health of MOW clients. In the present study, 38% of clients were found to be 'at risk' and 5% were malnourished, which is consistent with findings from other studies. In Ireland, O'Dwyer et al (2009) reported 27% of MOW clients to be 'at risk' and 9.5% malnourished, with a mean BMI of 25.8 (±5.4) kg/m^2. Soini et al (2006) reported an average BMI of 27.4 kg/m^2 and that 48% of home care clients in Finland were 'at risk', while 3% were malnourished. It is acknowledged that a range of nutritional screening and assessment tools have been used which limits comparability between studies. Available evidence indicates that the many community living people that utilise home care services, or are about to commence such services are likely to be at nutritional risk (Coulston et al 1996; Soini et al 2006; O'Dwyer et al 2009).

It is important to note that the use of BMI alone, assuming an optimal BMI for older people to be between 22-27 kg/m^2 (Watterson et al 2009), would have underestimated the risk of under-nutrition in this population. That is, since the BMI range for malnourished clients has previously been reported between 18.7 and 40.8 (Soini et al 2006; O'Dwyer et al 2009). The use of BMI alone is insufficient for screening malnutrition risk and further highlights the need for regular screening with a validated tool, good referral networks between hospital and community care, alongside timely referral for nutritional assessment and support where needed. Winter et al (2014) recently highlighted through a meta-analysis, the higher mortality risk for older people with a BMI less than 23 kg/m^2. Eight clients in the present study had a BMI below this level; six of whom were found to be malnourished/'at risk' of malnutrition via the Mini Nutritional Assessment.

While both mean energy and protein intakes were adequate, the actual energy and protein intakes were suboptimal for many of the clients in the current study on the MOW day, and for many, particularly the women, these intakes were worse on the non-MOW day. Although the sample size was small and the range was large, men on average, appeared to consume additional energy (a non-significant difference of 499 kJ) and protein on anon-MOW day (a non-significant difference of 12.5 g between the two days (P=0.106) and a mean of 24.7 g protein extra on a non-MOW daily intake compared to estimated mean daily requirement (P=0.003)). This may have been in part due to social occasions on non-MOW days where clients were taken out to lunch, as we reported elsewhere (Evans et al 2014).

The statistically significant difference in the current study for estimated mean energy intakes by women between MOW days and non-MOW days, as well as the differences in mean intakes for malnourished/nutritionally at risk clients compared to others flags the need to be able to further investigate what MOW clients consume and the behaviours influencing mealtimes and dietary intakes. Our qualitative paper by Evans et al (2014) highlights that behaviours such as meal skipping and the symptoms of a reduced appetite were evident and that clients reported a reduced interest in meals. . Many clients were unable to shop, prepare and cook meals and thus contributing to a reduced total intake over the day. The physical constraints that can limit food access and intake contribute to the explanation about the disparity between energy intakes on MOW compared to non-MOW days.

There is a need for further individually targeted interventions amongst MOW clients. Improved referral patterns and better communication between healthcare providers across levels of healthcare is indicated in order to allow clients efficient access to the MOW service and to facilitate dietetic follow up regarding ongoing assessment and monitoring. Ultimately pilot testing of nutritional screening on entry to MOW services, subsidised referrals to dietitians for nutritional assessments and support, as well as planning what other services may be available to assist their dietary intakes needs more detailed review with the clients themselves. In recent years Meals on Wheels Australia has revised its logo and slogan to include different models of food service (hot meal and frozen meals), added snacks and breakfasts, as well as mealtime encouragement and assistance being available from some MOW services. Many researchers have highlighted the need for ongoing evaluation and for Meals on Wheels services to be flexible and adaptable enough to keep pace with clients changing needs so as to best support clients to stay in their homes as long as possible (Buchannan et al 2009; Galea et al 2013; Winterton et al 2013). While meal variety was generally

acknowledged as very good, the accompanying client interviews supported the need for further expansion of offerings, and the variety of meals for those clients on therapeutic diets, such as texture modified diets (Evans et al 2014).

Potential benefits of receiving a meal delivery service may extend beyond the nutritional contribution of the meal itself. MOW clients value their interaction with volunteers who deliver the meal and this social aspect is regarded as highly as the meal delivery itself. The social role that the MOW service fulfils has been acknowledged by others (Timonen and O'Dwyer 2010).

Due to the heterogeneity in functional ability of recipients of the MOW service, and the multifactorial causes contributing to an increased nutritional risk in this age group, including poor appetite, a compromised health status, socioeconomic hardship, loneliness, bereavement and impaired mobility, a range of strategies may be required to improve dietary intakes. Our study and others (O'Dwyer et al, 2009) have confirmed that MOW clients are nutritionally compromised, therefore early identification of nutritional risk through referral to a dietitian may be of benefit. However, evidence supporting the cost-benefit of such activities is required to lobby for governmental support to be allocated for nutrition-related services to be conducted.

Additional potential strategies that could be implemented by MOW services include the fortification of meals with additional protein and energy, and the integration of regular nourishing snacks (e.g. cheese and biscuits, milk based desserts and cakes) to enhance the intakes of people who only manage small meals. Such interventions need careful planning and pilot testing with meal production suppliers to ensure acceptability of flavour, appearance and texture, as well as to ensure retherm properties and food safety aspects of the meals are maintained. Food fortification has previously been successful in hospitals for patients with small appetites (Barton et al 2000), while a previous trial providing snacks (in addition to meals) to MOW clients for six months found improvements in MNA scores (Krester et al 2003). The types of nourishing snacks that are acceptable to clients' also need careful investigation. The cost of snacks, variety of choices, serving sizes, storage requirements and ease of opening of the packaging are considerations for such an add-on service.

Better referral systems between hospital discharge staff, General Practitioners and community health care providers may facilitate an increased uptake of the MOW service by older adults at nutritional risk (Winterton et al 2013). A study from New Zealand highlighted a lack of knowledge

about available MOW services and poor understanding about eligibility to access the service (Wilson et al 2011). Concerns exist about limited meal choices, menu repetition and a lack of culturally appropriate meals and these factors are barriers in both GPs who are reluctant to refer their patients for MOW, and in older adults themselves. On the other hand, the nutrition support provided and the opportunities for increased socialisation were viewed as positive attributes of the service (Wilson et al 2011).

Limitations of the present study include reliance on memory to gain dietary intake data and the need to obtain some details from family members, in a small number of cases where clients had some level of cognitive impairment. Two methods, a combined diet history and twenty-four hour recall, were used in attempt to enhance the completeness of dietary intake data and to be able to compare intakes on a MOW day and a Non-MOW day. We were unable to obtain complete dietary intake data for some non-MOW days from 7 women and 2 men due to client fatigue. Further, the sample size for this exploratory study was small which influences the statistical power; particularly when comparing women and men. There was no control group in the present study as all participants were active clients of an existing MOW service, who were reliant on the meals provided. Finally only two MOW services were included from a single geographical location in regional New South Wales, Australia which limits generalizability to other MOW services. Consenting participants may not represent the frailest individuals and thereby provide an underestimation of nutritional risk in MOW clientele.

The number of clients 'at risk' of malnutrition and malnourished highlights the need to conduct larger studies to explore models of practice to include malnutrition screening; monitoring of their energy and protein intakes; subsidised referrals to home visiting or MOW centre based dietitians for nutritional assessment and targeted dietary interventions. Opportunities exist to explore the impact of nourishing snacks, food fortification and further social interaction as strategies to enhance protein and energy intakes, particularly for people with reduced appetites. Optimising the nutritional health, functionality and quality of life of the community based ageing population depends on it.

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Table 1: Comparison of estimated energy requirements and intakes

ENERGY	Daily Energy Requirement (kJ) Mean (±SD)	Daily Energy Intake (kJ) Mean (±SD)	MOW Day Energy Intake (kJ) Mean (±SD)	Non-MOW Day Energy Intake (kJ) Mean (±SD)
Overall N = 42 N=33 for Est. Intake & Non-MOW day	7720 (±975)	7593 (±2012)	7608 (±1947) 18 met individual requirement	7577 (±2203) 16 met individual requirement
Women N = 26 N= 19 for Est. Intake & Non-MOW day	7114 (±520)	6939 (±1874)	7052 (±1875) 12 met individual requirement	6522 (±1743) 9 met individual requirement
Men N = 16 N=14 for Est. Intake & Non-MOW day	8703 (±693)	8656 (±1807)	8510 (±1760) 6 met individual requirement	9009 (±1977) 7 met individual requirement

Table 2: Comparison of estimated protein requirements and intakes

PROTEIN	Daily Requirement Protein (g) Mean (±SD)	Daily Protein Intake (g) Mean (±SD)	MOW Day Protein Intake (g) Mean (±SD)	Non –MOW Day Protein Intake (g) Mean (±SD)
Overall N = 42 N=33 for Est. Intake & Non-MOW day	68.4 (±10.8)	78.7 (±23.4)	78.2 (±23.1) 28 met individual requirement	80.9 (±28) 25 met individual requirement
Women N = 26 N=19 for Est. Intake & Non-MOW day	63.9 (±9.3)	71.4 (±24.4)	72.3 (±24.98) 16 met individual requirement	66.5 (±21.6) 13 met individual requirement
Men N = 16 N=14 for Est. Intake & Non-MOW day	75.6 (±9.3)	90.7 (±16.2)	87.8 (±16.03) 12 met individual requirement	100.3 (±24.1) 12 met individual requirement

Table 3: Comparison between Malnourished/At Risk and Nourished Clients

Groups Comparison	**Age (yr) Mean (±SD) Range**	**BMI (kg/m^2) Mean (±SD) Range**	**Energy (kJ) Mean (±SD) Range**	**Protein (g) Mean (±SD) Range**
Malnourished and 'At Risk'	82.2 (±9.9)	26.9 (±5)	6409 (±1664)	67.1 (±22.8)
Well Nourished	81.5 (±9.3)	27.4 (±6.2)	8481 (±1803)	87.5 (±20.2)
Difference Statistical result	-0.7 NS$^{\neq}$	0.5 NS$^{\neq}$	2072 P=0.000*	20.4 P=0.004*

Legend: NS indicates Not Significant, * indicates Independent t-test and $^{\neq}$ Mann Whitney U test