

Nutritional Status and Associated Risk Factors amongst Older Adults in Al Madinah Al Munawarah

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Abstract

The percentage of older adults increased dramatically over the past years. The aging process is accompanied by many physiological, physical and psychological changes that could have adverse effect on the old person's nutritional status. Hence, the assessment of their nutritional status becomes important for the prevention of many diseases. The main aim of the study was to assess the nutritional status of older adults and determine the factors that might affect their nutritional status. An epidemiological, cross sectional, community-based study was conducted. Participants were selected from different places in Al Madinah Al Munawarah, Saudi Arabia including religious schools and Mosques.

Nutritional screening was carried out using the Mini Nutritional Assessment-Short Form. Weight, height and the mid upper arm circumference were measured twice. Body composition of lean and fat mass percent was analyzed. The psychologic and physiological status, activities of daily living and quality of life were assessed. Two 24-hour recall records were collected for the estimation of energy and selected nutrients. Dietary data was analyzed by Diet Organizer version 3.1. Statistical analysis was conducted using SPSS version 20.

A total of 114 older people aged between 65 - 100 years (Mean age: 69 ± 6.1 years) were included; of these 82 (72%) were women. Participants (28.9%) were at risk of malnutrition and 3.5% were malnourished. Overweight and obesity were common among the study group. Older people consumed lower energy, calcium, fibre and water compared to their recommended daily allowances. Age, educational level, psychological and physiological status and sleeping status affected their nutritional status.

Large number of the older adults in this study were not malnourished. Nutritional education campaigns are needed for them and their families targeting their dietary intake, body weight and physical activity levels.

Keywords: Old People; Nutritional Status; Associated Factors; Quality of Life; Al Madinah Al Munawarah

Abbreviations

ADL: Activities of Daily Living; BMI: Body Mass Index; CVD: Cardiovascular Disease; MNA: Mini Nutritional Assessment; MNA-SF: Mini Nutritional Assessment Short Form; MUAC: Mid-upper Arm Circumference; OPQOL-brief questioners: Older People's Quality of Life brief Questionnaire; PUFAs: Polyunsaturated Fatty Acids; SFAs: Saturated Fatty Acids; WHO: World Health Organization; WHO-5: The 5-item World Health Organization Well-Being Index

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Introduction

Old persons can be defined as those who are aged ≥ 65 years [1]. In 2016, The number of the older adults in Al-Madinah was 57,745 men and women [2]. One of the possible reasons associated with this increase is related to the improvements in the current medicine which aided in treating many chronic medical conditions. The nutrition and health status of this age group are usually ignored [3] and this can put the old people at increased risk for malnutrition. In this research paper, "Malnutrition" is defined as a state of nutrition in which a deficiency or excess (or imbalance) of energy, protein and other nutrients causes measurable adverse effects on tissue/body form (body shape, size and composition), function and clinical outcome [4] as well as weakening the immune system and reducing the bone mass [5]. Malnutrition affects the nation in many ways and 5% of the global income maybe lost due to the direct health care costs [6]. Thus, it is important to know the extent of malnutrition in this age group to be able to set goals, policies and targeted interventions.

The aging process is accompanied with many physiological, physical and psychological changes that could have adverse effect on the old person's nutritional status [7,8], life satisfaction and quality of life [9]. Due to the ageing stage, chewing and swallowing may be painful because of a sore mouth or dentition. Also, impaired sense of smell and/or taste, atrophic gastritis and constipation may affect the appetite due to pain thus increasing the risk of malnutrition directly or indirectly [10,11]. In addition, psychological distresses can lead to harmful habits such as smoking and alcohol consumption which affect micronutrients' levels [12].

Literature search revealed that there is no published research focusing on the assessment of the nutritional status of older people living in community settings in Al Madinah and the factors that affect it. The current research is a pilot study with a general aim to assess the old population's nutritional status and determine the factors that influence their nutritional status. The specific objectives of the study were to: a) screen the elderly people living in different community settings nutritionally; b) measure selected anthropometric measures (height, weight, MUAC and body composition of fat and lean mass and compare findings with standard references; c) estimate the dietary intake of the older people and compare their intake with the recommended dietary allowances; d) determine the relationship between the older people's nutritional status and selected associated factors. It is hypothesized that the older adults may be at greater risk of malnutrition or malnourished and that certain factors are associated with their nutritional status.

Materials and Methods

Study design

An epidemiological, cross sectional, descriptive, community-based study was conducted. Saudi men and women aged ≥ 65 years old living in Al Madinah Al Munawarah, Saudi Arabia, were recruited from different community dwellings between January and April 2018.

Sampling

The study included different community settings. These included older men's gathering places such as Mosques (researchers waited outside to recruit them since they are not allowed to enter male section of Mosques), known neighbours and relatives. Older women were recruited from religious schools such as Dar Eleman Religious school. Most of the data collection was carried out during afternoon hours (4:00 pm - 7:00 pm). Researchers found difficulty in recruiting men due to cultural issues and that women are not allowed to enter men's clubs or their gathering places. Thus, the sample was selected following a convenient sampling method by visiting the previously stated community settings. In this pilot study, older adults who agreed to take part in the study and either signed a consent form or gave an oral consent if they were illiterate, were included. A total of 120 old adults were screened.

Data collection tools

Socio-demographic data included age, gender, social status (married, divorced, widow, single), educational status, (none, did not complete primary, completed primary, completed secondary, completed tertiary, university or above), employment status (employed, unemployed), living status (living alone, living with relatives, the house is rented or owned), sleeping hours (> 5 or < 5 hours, continuous or

intermittent) and smoking habits (smoker, ex-smoker, non-smoker). Information was also obtained about the presence of any or all of the following physiological disorders: presence of chronic disorders (participants chose from a list of common diseases in the community such as Diabetes Mellitus, Hypertension, Coronary Heart Disease), swallowing difficulties, teeth loss, smell and taste difficulties, dizziness, dysphagia, vomiting, nausea, diarrhoea and constipation as well as the presence of any food allergies. Information about the number of medications consumed daily was also assessed (none, 1 - 2, 3 - 4 and .4).

Body composition was analyzed by body fat analyzer machine (MODEL BT-905, Taiwan). Body fat percent was interpreted as either being ideal, average or above average. Height was measured twice by a stadiometer (Seca 0123, Germany). The readings were taken to the nearest 0.1 cm). Weight was measured twice using an electronic scale (Beurer GmbH type PS 07, China) and readings were taken to the nearest 0.1 kg. Standard measuring protocols were followed [13]. Body Mass Index (BMI) was then calculated. Measures were taken twice to reduce any measurement bias.

The Mini Nutrition Assessment (MNA)-Short Form was used to assess the nutritional status of the older people. The MNA has been designed and validated in other studies as a tool to provide a single, rapid assessment of nutritional status amongst older adults in out-patient clinics, hospitals and nursing homes [14]. Old adults were categorized as being malnourished (score 0 - 7), at risk of malnutrition (score 8 - 11) or well nourished (score 12 - 14). Furthermore, their independence and ability to perform six functions of living (bathing, dressing, toileting, transferring, continence, and feeding) were assessed using Katz Index scale of Independence in the Activities of Daily Living (ADL) [15]. In addition, the World Health Organization (WHO-5) well-being questionnaire was used for the subjective assessment of psychological well-being. The OPQOL-brief questionnaire was used to assess the quality of life.

Dietary intake of energy (kcal), protein (% Energy), fat (% Energy), carbohydrates (% Energy), thiamine (mg), riboflavin (mg), pyridoxine (μg), folate (mg), cobalamin (μg), phosphors (mg), vitamin D (μg), phosphorus (mg) and calcium (mg) was estimated using repeated 24-hour recall records ($n = 2$). Fibre (g) and water (ml) consumption were also assessed. One of the recalls was conducted face-to-face and the second one on the phone. Participants recalled all the foods and drinks consumed during the previous day with portion sizes estimated using local utensils and photographs carried out during data collection. Two recalls were collected to avoid day-to-day variations. Those participants with wide variations in their day 1 and day 2 intakes, a third recall was collected to reduce any bias. Dietary supplements' consumption was recorded. Intakes were compared with dietary guidelines of American 2015 - 2020 [16].

Data analysis

Dietary data was analyzed using Diet Organizer version 3.1 software. Statistical Package for the Social Sciences (SPSS) version 20 was used for data analysis. Descriptive statistics was used to obtain the mean, standard deviation, standard error of the mean and frequencies. Pearson's correlation was used to determine the association between nutritional status and associated factors. One-way ANOVA and independent Student t-test were used to determine the differences between men and women. The significance level was set at < 0.05 .

Ethical issues

The study protocol has been approved by the Faculty of Applied Medical Sciences' ethical committee on human research. Ethical permission was obtained from the Ethical Committee at the Faculty of Applied Medical Sciences at Taibah University and from the organizations and the religious schools for the older adults selected for the study.

Old persons have given their written or verbal informed consent prior to the start of the study. They were assured that the information obtained will only be shared between the researchers and that they were free to withdraw from study at any time without any pressure on them. Participants were identified by codes and never by their real names.

Results and Discussion

Background information and demographic characteristics

Older people (n = 114) aged between 65-100 years were included in the study. Participants (n = 6) were excluded due to incomplete data or withdrawal from the study. Women (n = 82, 71.9%) and men (n = 32, 28.1%) were included. Men were older (71 ± 6.4 years) than women (68.7 ± 6 years, P = 0.04). Most of the women (95%) were unemployed. Moreover, nearly half of the women were widow and were either illiterate or went to religious schools compared to men who had university education. Large number of participants were living with their family or relatives and owned their houses (Table 1).

Variable	Men n (%)	Women n (%)	Total n (%)	P-value#
Age in years				0.04
Mean ± sd	71 ± 6.4	68.7 ± 6	69 ± 6.1	
Marital status n (%)				0.001
Married	30 (93.8)	42 (51.2)	72 (63.1)	
Widow	2 (6.2)	39 (47.6)	41 (36)	
Divorced	0	1 (1.2)	1 (0.9)	
Educational level n (%)				0.67
Religious schools or illiterate	7 (21.9)	56 (68.2)	63 (55.2)	
Primary /secondary or senior school	12 (37.5)	20 (24.4)	32 (28.1)	
University education	13 (40.6)	6(7.4)	19 (16.7)	
Employment status n (%)				0.04
Employed	7 (21.9)	4 (4.9)	11 (9.6)	
Unemployed	25 (78.1)	78 (95.1)	103 (90.4)	
Living status n (%)				0.53
Living alone	4 (12.5)	14 (17.1)	18 (15.8)	
Living with family or relatives	28 (87.5)	68 (82.9)	96 (84.2)	
House ownership n (%)				0.45
Renting	11(34.4)	22 (26.8)	33 (28.9)	
Owner	21 (65.6)	60 (73.2)	81 (71.1)	

Table 1: Socio-demographic characteristics of older people (n = 114).

Nutritional status and anthropometric measurements

In term of their nutritional status, most of the participants had normal nutritional status and very few were malnourished. There were no significant differences between men and women regarding their nutritional status based on the MNA scores (Table 2). The prevalence of malnutrition amongst the older adult was 3.5% and 28.9% being at risk of malnutrition. This prevalence was higher than the study conducted in Brazil which showed that among 236 older people, 1.3% were malnourished and 25% were at risk of malnutrition [17]. This difference may be due to the fact that Saudi government provide support and health programs to the old people in the country.

Overall, the mean BMI and MUAC indicated that 43% of older people included in the study were obese and non was underweight. This was further supported by their body fat percent in which 88.6% of older people were classified as having “above average” fat percent (Table 2). This reflects the current situation in Saudi Arabia where most of the population are suffering from overweight and/or obesity. A

Brazilian study found that overweight distribution among elderly was 38.6% and obesity was 43% [17]. Besides, the current study found that the average MUAC for both women and men was high (60% more than 32 cm) which disagree with another community-based study carried out in India which found that the average MUAC among the older adult was 25.6 cm ± 3.7 cm [18]. The fat percentage in this study was above average for 88.6% of participants, which agreed with other studies which revealed that increased fat tissue was related to body composition changed with the ageing process [19,20].

Classification	Men n (%)	Women n (%)	Total n (%)	P-value#
Nutritional status*				0.503
Normal nutritional status	23 (72)	54 (65.9)	77 (67.5)	
At risk of malnutrition	8 (25)	25 (30.5)	33(28.9)	
Malnourished	1 (3)	3 (3.6)	4 (3.5)	
BMI (kgm⁻²)				
Mean ± sd	29.4 ± 5.7	30 ± 7.1	30 ± 6.7	0.504
Normal	7 (21.8)	14 (17.1)	21 (18.4)	
Overweight	11(34.5)	33 (40.2)	44 (38.6)	
Obese‡	14(43.7)	35 (42.7)	49 (43)	
MUAC (cm)				0.05
Mean ± sd	35 ± 5.2	32.7 ± 5.8	33.4 ± 5.7	
< 32 cm	9(28.2)	36 (43.9)	45 (39.4)	
> 32 cm	23(71.8)	46 (56.1)	69 (60.6)	
Fat percent (%)				0.355
Mean ± sd	45.7 ± 10.5	47.7 ± 10.1	47 ± 10.2	
Ideal	0	4 (4.9)	4 (3.5)	
Average	2 (6.25)	7 (8.5)	9 (7.9)	
Above average	30 (93.75)	71 (86.6)	101 (88.6)	

Table 2: The nutritional status and Anthropometric measurement of the older people included (n = 114).
 Number, percent and Mean ± sd are shown.

*Findings based on MNA-SF tool; #P-value obtained from Independent Student t-test; ‡Obese included all the three grades combined.

Dietary intake

Old people (80%) were consuming three meals and one snack. Snacks were mostly of coffee, dates, fruits, tea and chocolates. This pattern was more prevalent amongst women than men. Large number of participants (88%) were not taking any dietary supplement. In general, participants consumed more than 50% of their RDA from energy and most of the nutrients. Women consumed higher % energy from proteins whereas lower amount of vitamin B2, fiber and water compared to their counterparts (Table 3). Similar findings were reported previously in a study conducted in Poland [21]. Water intake was lower than the recommendations and this is consistent with a study conducted in United State which found that the total water intake decrease with increased age [22].

Physiological and selected health factors of the old people

It is important to note that almost 85% of the participants who did not consume any medications, reported that they stopped taking them due to some side effects such as GIT discomfort and constipation. Intermittent night sleeping was more common amongst women compared to men who slept more than five hours at night. The main physiological disorders were tooth problem and constipation (Table 4).

Nutrients	Men		RDA [§]	Women		RDA [§]	P-value [#]
	Mean ± sem	%RDA [§]		Mean ± sem	%RDA [§]		
Energy (kcal)	1613.5 ± 72.8	80.7 5	2000	1305 ± 42.8	81.5	1600	0.001
Carbohydrates (%)	59.3 ± 2	91.2-132	45 - 65%	55.2 ± 1.4	84.9 - 123	45 - 65%	0.11
Protein (%)	15 ± 0.6	42.9 - 150	10 - 35%	18 ± 0.8	51.4 - 180	10 - 35%	0.007
Fat (%)	25.8 ± 1.8	73.7 - 129	20 - 35%	26.8 ± 1.1	76.6 - 134	20 - 35%	0.64
Vitamin B ₁ (mg)	1.3 ± 0.1	108.3	1.2	3.47 ± 2.4	315	1.1	0.38
Vitamin B ₂ (mg)	2 ± 0.2	153.8	1.3	1.38 ± 0.1	125	1.1	0.01
Vitamin B ₆ (mg)	1.44 ± 0.1	84.7	1.7	3.28 ± 1.5	218.7	1.5	0.21
Vitamin B ₉ (µg)	315.3 ± 57.5	78.8	400	271.12 ± 29	67.78	400	0.50
Vitamin B ₁₂ (µg)	2.7 ± 0.25	112.5	2.4	5.23 ± 3	218	2.4	0.41
Phosphorus (mg)	1117.2 ± 72	16.7	700	971.19 ± 56	138.7	700	0.12
Calcium (mg)	920.18 ± 83.5	76.6	1200	727.4 ± 47	60.6	1200	0.049
Vitamin D (µg)	31.7 ± 30	52.8	10	68 ± 24	113.2	10	0.35
Fiber (g)	20.4 ± 1.35	72.8	28	16.7 ± 0.7	74.1	22.4	0.02
Water (ml)	1559 ± 96.6	42	3700	1327 ± 54.1	49	2700	0.04

Table 3: Dietary intake amongst older people (n = 114). Mean ± sem, % RDA and RDA based on gender are shown. [#]P-value obtained from Independent Student t-test; [§]RDA value based on the 2015-2020 American dietary guidelines.

Variable	Men n (%)	Women n (%)	Total n (%)	P-value [#]
Smoking habit				
Smoker	8 (25)	2 (2.4)	10 (8.8)	0.008
Non- smoker	24 (75)	80 (97.6)	104 (91.2)	
Presence of chronic disease				
No chronic disease	16 (50)	33 (40.2)	49 (43)	0.045
Diabetes	5 (15.6)	4 (4.9)	9 (7.9)	
Hypertension	3 (9.4)	10 (12.2)	13 (11.4)	
Others [§]	8 (25)	35 (42.7)	43 (37.7)	
Physiological disorder				
No problem	21 (65.6)	41 (50)	62 (54.4)	0.032
Vomiting	1 (3.1)	0	1 (0.9)	
Chewing problem	1 (3.1)	0	1 (0.9)	
Dizziness	1 (3.1)	1 (1.2)	2 (1.8)	
Tooth problem	5 (15.7)	3 (3.7)	4 (3.5)	
Smell and/or taste problem	1 (3.1)	17 (20.7)	22 (19.3)	
GIT problem				
No problem	27 (84.4)	57 (69.5)	84 (73.6)	0.077
Constipation	4 (12.5)	21 (25.6)	25 (21.9)	
Diarrhea	1 (3.1)	4 (4.9)	5 (4.3)	
Sleeping continuity and duration				
Sleeping continuously all night	19 (59.4)	40 (48.8)	59 (51.8)	0.049
Intermittent night sleeping	13 (40.6)	42 (51.2)	55 (48.2)	
< 5 hours during the night	4 (12.5)	23 (28)	27 (23.7)	
> 5 hours during the night	28 (87.5)	59 (72)	87 (76.3)	

Table 4: Physiological and health selected factors of older people (n = 114). [#]P value was obtained from Independent Student t-test; [§]Others included having more than one health problem and those with other diseases such as thyroid disorders, coronary heart disease etc.

Moreover, the older people's psychological status assessed by the WHO-5 well-being was classified as good for most of participants (85%); few of them had low mood (11%) and the rest had depression and required further assessment. Most of the participants (97%) were highly independent and had high quality of life according to their answers on the Quality of life questionnaire; women and men had different responses to the questions. For instance, more women (87%) than men (66%) agreed with the statements "I take life as it comes and make the best of things" and "I have enough money to pay for household bills".

Pearson's correlation showed that some risk factors included in this study affected the older people's nutritional status (as determined by MNA tool). There was a positive relationship between age and nutritional status ($r = 0.24$, $P = 0.01$). Educational level affected the older people's nutritional status negatively ($r = -0.2$, $P = 0.03$); educated older people had better nutritional status. Also, sleeping status had a positive relationship with the MNA score ($r = 0.26$, $P = 0.01$); longer sleeping hours (> 5 hours during the night) had a better effect on the nutritional status. Moreover, the ADL was positively associated with nutritional status ($r = 0.5$, $P = 0.001$) in that the highly dependent older persons had higher MNA score i.e. at risk of malnutrition or malnourished. This agreed with a study conducted in Japan [23].

Also, the current study showed direct relationship between the nutritional status and physiological disorders such as vomiting. This agreed with a study conducted in India [7]. Furthermore, the current results showed education affected nutritional status negatively; this was consistent with the study conducted in Lebanon [24]. Furthermore, there was an inverse relationship between the WHO-5 well-being and the older people's nutritional status ($r = -0.3$, $P = 0.003$). Finally, certain physiological factors associated with their nutritional status; the presence of disorders such as the loss of teeth and vomiting associated with lower nutritional status ($r = 0.2$, $P = 0.03$).

One of the limitations of the current study was the fact that no biochemical data was assessed. The researchers wanted to conduct biochemical analysis to determine serum level of selected parameters affected by nutritional status such as hemoglobin level, plasma protein, and micronutrients. However, due to the nature of the culture, it was not possible to conduct biochemical testing. The reasons were either related to older people refusal to have their blood samples drawn or to the religious schools who did not give permission for the researchers to take blood samples. Another limitation was the inclusion of small number of old men. However, due to cultural issues, it was not feasible to include more men in this pilot study. In the future, male researchers would be involved for data collection from older men. The results need to be interpreted with caution and would not be generalized to the older population in Al Madinah Al Munawarah. This is mainly because the same size was small.

However, since it is a pilot study, it gave a good opportunity to know all the possible obstacles that might face the researchers in the main study so as to overcome them. The main strong point of this study is the fact that it the first community-based well-designed study conducted among older people in Al Madinah Al Munawarah. The anthropometric measurements and dietary recall records were carried out twice to reduce any measurement bias. Findings from the current study will act as a base for the future main study that will be conducted soon.

Conclusion

Older population increasing dramatically over the past few years. Optimum nutritional status enhances the quality of life of elderly, healthy aging can result in good quality of life. The study revealed that most of elderly had normal nutritional status and were independent. Most of the elderly were either obese or overweight with very high body fat percentage and low lean body mass, the average MUAC among this population was high. Malnutrition among this age group can occur due to many factors such as educational level and sleeping status in the form of continue or discontinuous sleeping. The findings showed there were correlation between psychological and functional factors with nutritional status of elderly population living in Al-Madinah Al Munawrah. Their energy consumption was lower than the dietary guidelines of American 2015 - 2020; most of elderly were not consuming enough water.

This study recommends the development of education campaigns targeting older people and their family focusing on healthy dietary pattern and increasing physical activity. Also, the main study should include larger sample size and the use of biochemical markers to support the findings related to dietary intake.

Conflict of Interest

The authors declare that there no financial interest or any conflict of interest exists.

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