Original Article

Nutritional status of Saudi males living in the Riyadh nursing home

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This study evaluated the nutritional status of residents in the Riyadh nursing home, using anthropometric and haematological measurements. All male residents (*N*=84; age range 24-80 years) in the Riyadh nursing home were included in the study. Weight, height, body mass index, triceps skin fold thickness, and mid-arm muscle circumference were measured. Furthermore, serum concentrations of albumin, haemoglobin and haematocrit were measured. About 13% of adult residents and 11% of elderly residents were considered to be underweight (body mass index <18.5 kg/m^2). From estimations of fat mass in the periphery, using triceps skin fold thickness, it appears that the elderly residents had significantly lower fat mass compared to the adult residents (P <0.05). The results showed that more than 40% of residents had low mid-arm muscle circumference (<22.3 cm). Serum albumin concentration was significantly lower in the elderly group than in the adult group (P <0.01). No significant difference was found in haematocrit level between the adult and elderly residents. Within the adult group, about 38% of residents had low haemoglobin level (<12 mg/dl), and this proportion was even higher, about 55%, in elderly residents. Based on body mass index or albumin to determine the prevalence of malnutrition among residents, the results have shown that the prevalence of undernourished residents was not higher than the prevalence of undernourished nursing-home residents reported in other studies. The percentage of elderly residents with anaemia was appreciable. Thus, undernourished and anemic residents should have special dietary and medical attention. Early detection of malnutrition upon admission would lead to early intervention and thus to reduced complications and medical-treatment costs. Staff working in nursing homes should be aware of the nutritional guidelines for health and disease.

Key Words: Nutritional status, anthropometric measurements, haematological measurements, nursing home, elderly, Saudi males, Saudi Arabia, Gulf

Introduction

Malnutrition is common in nursing homes. It has been reported that the prevalence of malnutrition in nursing-home residents ranges from 23-85%.[1-3] The proportion of people who are 60 years of age and older in the Saudi population is 4%, which is similar to that for other Gulf countries: Bahrain 5.2%, Kuwait 3.9%, Oman 4.5%, Qatar 6%[4]. With the attention that the government of Saudi Arabia is paying to improve health services, the proportion of elderly people is expected to increase in the future. Poor nutritional status is one of the major factors associated with mortality in older persons.[5] It is well documented that poor nourishment impairs immunity, decreases resistance to infection and reduces the antioxidant-defence mechanisms of the body.[6] The elderly are at increased risk of being undernourished because of inadequate food intake (e.g anorexia, dysphagia, reduced physical ability to eat as in arthritis), reduced desire to eat (e.g. depression, chronic pain), decline in food digestion or absorption, compromised metabolic pathways, poor dental hygiene or because of chronic diseases that are commonly found in the elderly.[7,8]

Mentally retarded persons in nursing homes are also at risk of becoming malnourished. In mentally retarded subjects, food choices may be restricted as a result of physical abnormalities and poor control over feeding.[9] Therefore, during a stay in a long-term care facility home, nutrition should become a major component of the rehabilitative process in the elderly as well as in mentally-retarded subjects.

The male nursing home in Riyadh, Kingdom of Saudi Arabia, accommodates and provides health and rehabilitative care for elderly Saudi men aged 60 years and over, as well as Saudi men below 60 years of age, with stable conditions of neurospychiatric diseases (e.g. schizophrenia, dementia, hemiparalysis and Down syndrome). Almost all of the people living in the home are without family or financial support. The present study was conducted in the Riyadh nursing home to assess the nutritional status of residents using anthropometric and haematological measurements.

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Subjects and methods

All Saudi males living in the Riyadh nursing home were included in the study (*N*=84). The mean age of the residents was 55.6 ± 16.9 years (range 24-80 years). Because of the large variation in the age of residents, and because of the effect of aging on physiological, functional and health status[10,11], it was decided that the subjects should be divided into two age groups. The first group was the *adult* group (less than 60 years old, *N* = 39). The mean age of adult residents was 39.7 ± 1.63 years (range 24-58 years). The second group was the *elderly* group (≥ 60 years old, *N* =45). The mean age of elderly residents was 69.4 ± 0.77 years (range 60-80 years). The study was approved by the Nursing home ethics committee.

Anthropometric and haematological measurements

All anthropometric measurements were collected by a single well-trained physician. Measurements of weight (to the nearest 0.1 kg) and height (to the nearest 0.1 cm) were made using a portable scale and a portable stadiometer, respectively. Knee height was used to estimate the stature of a person who could not stand, or for a person with an obvious spinal curvature. The following equation was used to estimate the stature from knee height. Stature for men = [(2.02 × knee height) – (0.24 × age)].[12] Body mass index (BMI) was calculated by dividing the weight in kilograms by the square of the stature in meters (kg/m^2). Triceps skin fold thickness (TSFT) was taken on the back of the left upper arm by measuring the distance from the acromion to the olecranon process and marking the half point. TSFT was measured to the nearest 0.2 mm with a calibrated caliper, and it provides an estimate of body fat. To measure mid-arm muscle circumference (MAMC), which reflects muscle mass, mid-arm circumference (MAC) was taken on the front of the left-upper arm by measuring the halfway distance between the inferior aspect of the acromion and the olecranon. MAC was measured to the nearest 0.1 cm using a flexible non-elastic tape. MAMC was determined by measuring MAC and TSFT using the following equation: MAMC (cm) = MAC (cm) – [0.314 × TSFT (mm)].[13]

BMI (kg/m^2) was classified into underweight [< 18.5 kg/m^2], normal weight [18.5-24.9 kg/m^2], overweight [25-29.9 kg/m^2], and obese [> 30 kg/m^2] (14). The following desirable ranges, 4-25 (mm) and 22.3-30.6 (cm), were used for the TSFT and MAMC measurements, respectively.[15]

For haematological analysis, a fasting venous blood sample was taken. Analysis included serum albumin, haemoglobin (Hb) and hematocrit (Hct).

A serum albumin level < 35 g/l was considered to be low.[16] A serum Hb level between 12 and 13.9 mg/dl was considered to be bordering on low, while a serum Hb level of <12 mg/dl was considered to be low. A serum Hct level between 37% and 43% was considered to be bordering on low, while a serum Hct level < 37% was considered to be low.[17]

Statistical analysis

Results were expressed as mean values ± standard error of the mean (SEM). When comparing the mean values between adult and elderly residents, statistical analysis was performed using unpaired Student's *t* test, with a significance level of $P < 0.05$. The number and the percentage of adult or elderly residents with normal and abnormal anthropometric and haematological measurements were also estimated.

Results

The mean values of the BMI and MAMC showed no significant difference between the adult and the elderly residents. However, the results of the TSFT showed that the elderly residents had significantly lower mean values than the adult residents (Table 1).

Table 1. Comparison of the anthropometric measurements between adult and elderly residents

Measurement	Adult residents	Elderly residents	*P*-value
BMI (kg/m^2)	25.7 ± 0.93	24.2 ± 0.85	0.23
MAMC (cm)	27.6 ± 0.74	25.8 ± 0.67	0.083
TSFT (mm)	16.0 ± 1.46	11.5 ± 1.07	0.015

Anthropometric measurements. BMI: Body mass index. MAMC: Mid-arm muscle circumference. TSFT: Triceps skin fold thickness. Values are means ± SEM. *N* = 39 for the adult group, and *N* = 45 for the elderly group. Measurements with $P<0.05$ indicate a significant different between the groups.

Table 2. Comparison of the haematological measurements between adult and elderly residents.

Measurement	Adult residents	Elderly residents	*P* value
Albumin (g/l)	42.0 ± 0.68	38.5 ± 0.60	0.002
Hg (mg/dl)	14.1 ± 0.20	13.6 ± 0.22	0.053
Hct (%)	41.1 ± 0.60	40.6 ± 0.70	0.59

Values are means ± SEM. N=39 for the adult group, and n=45 for the elderly group. Measurements with P<0.05 indicate a significant different between the groups.

Based on BMI measurement, Table 3 shows that 12.8% and 11.1% of the residents in the adult group and elderly group, respectively, were considered underweight. The percentage of obese residents was 25.6% in the adult group, but only 13.3% in the elderly group. Measurement of the MAMC indicated that 41% of adult residents and 55.6% of the elderly residents were below the desirable range (Table 3). Despite the fact that the TSFT-mean values were lower in the elderly residents than in the adult residents, no elderly resident was found to have a TSFT below the desirable range (Table 3). Three (6.7%) elderly residents and 7 (17.9%) adult residents had TSFT above the desirable range.

Serum albumin concentration was significantly lower in the elderly group than in the adult group (Table 2). The results show that the percentage of adult residents with albumin concentration below 35 g/l was 2.6%, and the corresponding percentage was much higher (18%) in the elderly residents (Table 4). Table 2 shows that Hg concentration was slightly lower in the elderly group than in the adult group, but the lower value was not statistically significant ($P = 0{,}053$). No significant difference was found in Hct levels between the adult and elderly

Table 3. The number and percentage[1] of adult and elderly residents with normal and abnormal anthropometric measurements.

Measurements	Adult residents (*N*=39)	Elderly residents (*N*=45)
BMI (kg/m2)	5 (12.8%)	5 (11.1%)
Underweight	12 (30.8%)	24 (53.3%)
Normal weight	12 (30.8%)	10 (22.2%)
Overweight	10 (25.6%)	6 (13.3%)
Obese		
MAMC (cm)	16 (41.0%)	25 (55.6%)
Below desirable range	23 (59.0%)	19 (42.2%)
Desirable range	0 (0%)	1 (2.2%)
Above normal range		
TSFT (mm)		
Below desirable range	1 (2.6%)	0 (0%)
Desirable range	31 (79.5%)	42 (93.3%)
Above normal range	7 (17.9%)	3 (6.7%)

Anthropometric measurements. BMI: Body mass index; MAMC: Mid-arm muscle circumference; TSFT: Triceps skin fold thickness.[1]Sum percentage may not equal 100% due to rounding.

Table 4. The number and percentage[1] of adult and elderly residents with normal and abnormal haematological measurements.

Measurements	Adult residents (*N* = 39)	Elderly residents (*N* = 45)
Albumin (g/l)		
Normal (≥ 35)	38 (97.4%)	37 (82.2%)
Low (< 35)	1 (2.6%)	8 (17.8%)
Hb (mg/dl)		
Normal (≥ 14)	24 (61.5%)	20 (44.4%)
Borderline (12-13.9)	13 (33.3%)	19 (42.2%)
Low (< 12)	2 (5.1%)	6 (13.3%)
HCT (%)		
Normal (≥ 44)	7 (17.9%)	11 (24.4%)
Borderline (37-43)	27 (69.2%)	25 (55.6%)
Low (< 37)	5 (12.8%)	9 (20%)

Hb: haemoglobin; HCT: haematocrit. [1]Sum percentage may not equal 100% due to rounding.

residents (Table 2). Within the adult group, 38.4% of residents had Hg level below normal, and the corresponding percentage was higher for elderly residents (55.5%) (Table 4). A large proportion of adult (82%) and elderly (75.6%) residents had an Ht level below normal (Table 4).

Discussion

Hypoalbuminemia and being underweight has been reported to affect 30-50% of nursing-home residents.[18] In the present study, when BMI was used as an indicator of malnutrition (underweight and obese subjects), the percentage of malnourished residents was 38.4% and 24.4% for the adult and elderly respectively. When albumin was used as an indicator of malnutrition, the percentage of undernourished residents was 2.6% and 17.8% for the adult and elderly residents, respectively. Based on the results of the BMI and albumin, we can conclude that the prevalence of malnutrition in the Riyadh nursing home was not higher than the prevalence reported for other nursing homes.[1,2,3,18]

Using the World Health Organization (WHO) criteria of anaemia (< 13 g/l in men), the prevalence of anaemia in the elderly has been reported to be in the range of 8% to 44%.[19,20] In the present study, also when using the WHO criteria of anaemia, the percentage of anemic residents in the nursing home was 17.9% (n=7) in the adult residents and 40% (n=18) in the elderly residents. Thus, the pre-valence of anaemia in the elderly residents was appre-ciable. It has been reported that the most common causes of anaemia in the elderly are chronic diseases (30% to 45% of cases) and iron deficiency (15% to 30% of cases), while 15% to 25% of cases have no identifiable cause.[21] The dietary habits of old people and their previous dietary histories (what they ate and drank during childhood and adulthood), in addition to genetic factors, affect the degree of the response to aging, so that they age at different rates. Because of the large variability in health status, physiologic function, physical activity, and nutritional status among older adults, there is no set of reference data for a representative sample of the elderly. Hence, it is important to combine anthropometric measurements with other biochemical and/or dietary measurements to get a more reliable indication of their nutritional status.

When dietary inadequacy is defined as the dietary intake of four or more of the following nutrients (protein, thiamine, vitamin A, riboflavin, vitamin C, niacin, calcium and iron) falling below two-thirds of the recommended dietary allowance, Shahar and his colleges have shown that in elderly Malaysian subjects, consuming less than three meals per day is one of the determinants of dietary inadequacy.[22] In the present study, we have found that all elderly residents (*N*=45) ate at least two full meals per day, 86.6% (*N*=39) of whom ate three full meals per day.

When the dietary intake of dairy products, beans, eggs, fish, meat and poultry was recorded as markers for protein intake, we found that most of the residents, 97.3% of adult residents and 84.4% of elderly residents, consumed at least one serving of dairy products/day, two or more servings of beans or eggs per week, and ate fish, meat or poultry every day.

Several studies have shown a significant decrease in lean body mass and a significant increase in body fat in elderly subjects.[23-25] The present study has shown a decrease in lean body mass in elderly subjects, as measured by MAMC, when compared to adult residents, but this was not statistically significant (P <0.083). However, when using TSFT to estimate body fat, the results showed a significant reduction in the fat mass in the elderly subjects compared to the adult subjects. In old age, a redistribution of fat occurs, in which more fat is deposited in the trunk than in the extremities. Thus, adipose tissue thickness decreases in the limbs and increases in the abdominal area and around the internal organs.[26-28] Minten *et al*., (1991) have found a relatively

low correlation between body mass index and body fat (assessed by biceps and triceps skin-fold thickness) in old age.[29] Thus, using TSFT may not be a good indicator for the estimation of body fat in elderly subjects. Due to this alteration in fat distribution, measuring waist-to-hip ratio may be a better predictor of overall fatness in old age.[29,30] Despite the fact that there are some difficulties in interpretation of anthropometric measurements in old age, due to changes in body composition, these are essential for providing basic descriptive information.[26]

Early detection of malnourished residents upon admission to the nursing home would lead to early intervention and thus to a reduction in medical-treatment costs and also reduced complications. The staff working in the nursing home should be aware of the nutritional guidelines for health and disease. Improving the knowledge of nutrition amongst staff and residents would improve the nutritional status of all individuals in the nursing home. Kim *et al*., (1981) have observed a significant improvement in dietary intake during the period of a program related to nutrition and healthy food habits, but this improvement was not sustained after the program ended, indicating that individuals in nursing homes need great attention and a continuous nutritional education program.[31]

Good eating habits based on moderation and variety and following general guidelines for reducing the risk of chronic diseases, for example by maintaining healthy weight, reducing the intake of dietary fat, particularly saturated fat, increasing the intake of fruit and vegetables and whole-grain products, and using salt and sugar in moderation, is the best advice that we can give the residents of nursing homes.

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