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Research Article

Anthropometric Characteristics in the Nutritional Status of Older Adults

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Abstract

The purpose of the study was to assess the anthropometric characteristics in the nutritional status of the older adult (AM) not institutionalized in the state of Colima and its association with the classification resulting from the mini nutritional assessment (MNA).

It is a descriptive, cross-sectional and observational study that considered 74 AM, men and women belonging to day or part-time homes, with age equal to or greater than 60 years, with controlled comorbidity and that gave their consent to participate in the study. The MNA was applied to each participant, a validated instrument which classifies the nutritional status into three categories; nurtured (N) > at 23.6 points; risk of malnutrition (RD) 17 to 23.5 points; and malnutrition (D) < 17 points.

Descriptive statistics were used for demographic variables such as means, frequencies and percentages as well as standard deviation (SD). For the quantitative variables, the Kolmogorov Smirnoff (KS) test was used to identify the normality of the observations, ANOVA of a Pos Hoc Tukey factor for the differences of homogeneous means and subgroups, with a 95% confidence interval, 73 gl, with a significance level of P≤0.05.

They were evaluated (N = 74) AM, age of 73.61 ± 9.20; 52.70% are men, the difference is women; 54.1% are married; the nutritional status of AM through MNA classified as N 35.1%; RD 56.8% and D8.1%. The KS test identified that age (P = 0.454), weight (P = 0.996), height (P = 0.654), BMI (P = 0.561), waist circumference (P = 0.959), hip (P = 0.753), arm (P = 0.446), calf (P = 0.146), skin folds: biceps (P = 0.392), triceps (P = 0.607), subscapular (P = 0.166) observe normal behavior in the observations, not so, the subscapular and calf fold.

The analysis between the groups showed no differences in the mean age (P = 0.754), weight (P = 0.332), BMI (P = 0.296), waist circumference (P = 0.374), hip (P = 0.067), arm (P = 0.404), calf (P = 0.245), skin folds: bicipital (P = 0.521), tricipital (P = 0.662), suprailiac (P = 0.599), subscapular (P = 0.223) and calf (P = 0.965). In contrast, the average size shows difference between the nourished vs. the groups. Malnourished (P = 0.012) and risk of malnutrition vs. Malnutrition (P = 0.021).

In AM, size is a determining anthropometric measure for the assessment of nutritional status.

Keywords: *Elderly; Nutritional Status; Anthropometric Measures; Skin Folds; Nutrition; Health*

Abbreviations

MNA: Mini Nutritional Assessment; N: Nourished; RD: Risk of Malnutrition; D: Malnutrition; Kg: Kilogram; cm: Centimeter; m^2: Square meter

Introduction

The nutritional status of the elderly in the state of Colima México, is not only affected by the economic factor, but also cultural, psychological and physiological aspects that can modify it are involved, it is important to identify the nutritional conditions that allow planning and establishing strategies in the field of nutrition and food that contribute to improve health.

Nutritional status is a phenomenon that has been studied in people regardless of the life cycle in which they are, the weight/height tables for children and girls up to 20 years of age have been used in México [1,2], in the population aged 20 to 59, the nutritional status is determined by the body mass index (BMI) that according to the WHO is classified under weight < 18.5, normal 18.5 - 24.9, overweight 25 - 29.9, obesity ≥ 30, obesity 1 ≥ 30 - 34.9, obesity II 35 - 39.9, obesity III ≥ 40. It seems that in the Mexican context overweight and obesity is a risk factor [3-5], while that overweight in Asians is a protective factor [6].

Nutritional status in the elderly involves other elements to consider, such as poor oral hygiene, deficiency of vitamins C and D, sensory deficiencies such as taste and smell, decrease in the production of gastric acid, which determines poor absorption of Iron and vitamin B12, in psychosocial and environmental aspects such as loneliness isolation, depression, lack of income that impacts diet or food [7].

Therefore, to determine with the highest level of objectivity the nutritional status in the AM an assessment should be made that considers taking anthropometric measurements, biochemical analyzes and nutritional evaluations [7], such as the mini nutritional assessment (MVN or MNA) for its acronym in English, this instrument has been used as a validated tool that classifies the nutritional status in large (N) ≥ 24 sts; at risk of malnutrition (RD) 17 - 23.5 pts.; if the patient has a score lower than 17, he/she presents protein-calorie malnutrition (D) [8].

Other anthropometric measurements such as waist-hip index, middle arm circumference [9], calf circumference and body fat distribution through plyometric have also been studied and related to nutritional status or some chronic degenerative diseases. Such as metabolic syndrome, diabetes mellitus 2 among others [10].

Health, innocuous food and nutrition are universal rights recognized in the world [11], for their approach, new approaches to health care are considered, which is understood as the design of policies and programs aimed at improving the quality of AM life [12].

According to international estimates, the population of AM will double its number by the middle of this century, the expectations are revealing since there is little training of professionals in geriatric and gerontological issues, in every sense the conditions are created to have the opportunity to train human resources in schools of nursing, nutrition and medicine.

Purpose of the Study

The purpose of the study was to identify the anthropometric characteristics presented by older adults based on their nutritional status, measured under the conditions of the MNA that catalogs this condition into three main categories: nourished, risk of malnutrition and malnutrition.

Materials and Methods

A team of three students of the Nursing career at the University of Colima and professors were formed, integrated the Research Project: Anthropometric characteristics in the nutritional status of the elderly measured by Mini Nutritional Assessment, is a quantitative, descriptive, cross-sectional study and observational.

Selection of participants

The sample consisted of 74 older adults who maintained partial stay in homes in Colima. Participants of both sexes were included, with an age greater than or equal to 60 years, that suffering from any disease was in control at the time of the interview and that they gave their consent to participate in the study. The confidentiality of your data was guaranteed at all times.

Instruments

The Mini Nutritional Assessment (MNA) was applied, which is a tool to assess the nutritional status of older adults. It has a sensitivity of 98% and a specificity of 100% in its full version. The short version shows a sensitivity of 96% and a specificity of 98%. This is a questionnaire conducted by health personnel. It consists of two parts: a screening (7 questions), and an evaluation (12 questions) that is performed only if the screening is positive. A total score ≥ 24 indicates that the patient has a good nutritional status. A score between 17 - 23.5 identifies patients at nutritional risk, who may not have lost much weight, nor have their biochemical parameters altered, but who are having a protein-caloric intake lower than recommended. A score ≤ 17 identifies people in malnutrition.

Recently, the MNA Short Form (MNA_short_form english) has been validated as an independent screening tool. It is only the first part of the previous MNA (the screening one) that includes the possibility of using the calf perimeter when it is not possible to obtain the patient's BMI. It also classifies patients as Well Nourished, Risk and Malnourished. The realization of this screening takes about 4 - 5 minutes [8,13-15].

Anthropometric measurements

To each participant their weight expressed in kg was measured. In the process a digital scale was used for diagnosis WS 90 microlife® Capacity: 180 kg/397 lb/28 st 5lb; accuracy and repeatability: +/- 1% + 0.1 kg/0.2 lb/1/4st [16].

The size of the AM was measured in standing position using a Sies® measuring tape graduated in centimeters (150 cm). The procedure consisted of measuring a meter in the wall from the floor to locate the starting point at 0 cm the size was identified from the formation of a 90° angle by means of a ruler transverse to the wall that made contact with the head of the person, who was told to place their heels attached to the wall, arms in anatomical fall, Looking to the horizon. In that same position, the abdominal and hip circumference were measured as well as the circumference of the biceps and calf. For the measurement of the waist the measuring tape was placed passing through the iliac crests of the participant, until reaching the umbilical scar, in the anterior part, through the back it was ensured that the tape passed through the reference of L3 and L4 of the lumbar spine [16], to measure the brachial circumference the measuring tape was placed midway between the acromion and olecranon without exerting pressure on the arm [15,17].

To measure the bicipital, tricipital, suprailiac, subscapular, and calf skin folds, a LANGE SKINFOLD CALIPER® PAT NO 3,008,239 was used, the procedures were performed in standing position, three measurements of the same fold were made and the average of them was calculated as a final result [18]. To calculate the percentage of body fat, the Siri formula was used, which consists of the sum of the values of four skin folds, % GC = (4.95/DC-4.5) x100 [6].

Statistical analysis

A database was designed in the Excel v program. 2013, which included sociodemographic data of the participants, anthropometry and mini nutritional assessment.

The Kolmogorov Smirnoff test was used to identify normality in the quantitative variables data, descriptive statistics were used for the demographic variables of the participants, ANOVA analysis of a factor with Pos Hoc Tukey test was performed, to compare mean difference of the anthropometric variables between the groups of nourished, risk of malnutrition and malnutrition and the group that evidences differences was determined, with a 95% CI and significance level $P \leq 0.05$.

Results and Discussion

Of (N = 74) AM participants with an age of 73.61 ± 9.20 years, weight 69.10 ± 13.16; and size of 1.57 ± .145; Men (52.7%), married (54.1%), those who do not maintain employment (33.8%), those living on the coast, the capital and the mountain area (24.1%, 21.6%, 21.6% respectively) stand out) (Table 1).

Variables	Frequency (f)	Percentage (%)
Sex		
Women	35	47.3
Man	39	52.7
Civil Status		
Married	40	54.1
Single	15	20.3
Free union	16	21.6
Widowed	3	4.1
Occupation		
Work	19	25.7
Does not work	25	33.8
Senior Citizen	14	18.9
Housewife	16	21.6
Location		
Colima	16	21.6
Villa de Álvarez	8	10.8
Coquimatlán	8	10.8
Cuauhtémoc	16	21.6
Comala	8	10.8
Manzanillo	18	24.3
Body Mass Index (BMI)		
18.5 - 24.9	43	58.1
25 - 29.9	19	25.7
30 - 34.9	10	13.5
35 - 39.9	2	2.7

Table 1: *Sociodemographic variables of the elderly.*
Source: *Results obtained by descriptive statistics 2015.*

Nutritional status and MNA

The predominant nutritional status observed by the participants places them in the category of "risk of malnutrition" (56.8%) (Figure 1). However, BMI places AMs in good nutrition (58.1%). This condition may be related to the anatomical and functional changes experienced by AM, particularly in the gastrointestinal system [19], on the other hand, the most recent research suggests a genetic variation in the dietary response, the role of nutrients and bioactive compounds of food in the gene expression "Nutrigenetics and Nutrigenomics" [20]. In aging the nutrition detection process will be damaged and will not work properly, these drastic changes result in obesity, diabetes and other metabolic diseases [21-23].

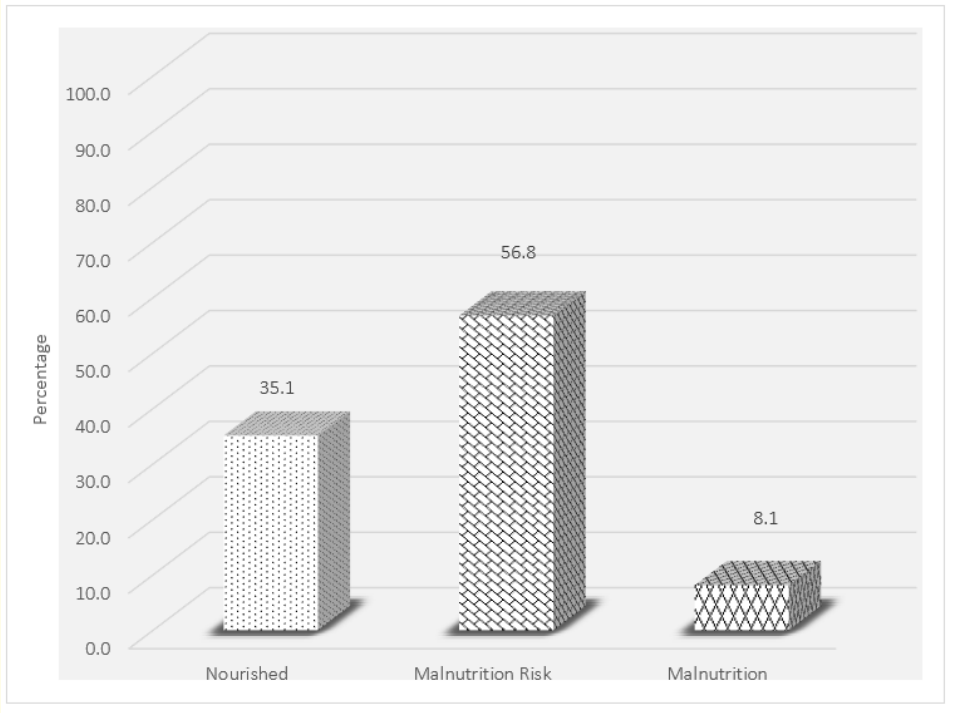

Figure 1: *Nutritional status of older adults measured by mini nutritional assessment. Source: Results obtained by descriptive statistics.*

Anthropometric characteristics

The participating AM have anthropometric characteristics of clinical importance in nutritional health, overweight and obesity in them, is consistent with the waist circumference, since according to the accepted clinical practice guide for the Mexican population a greater waist circumference to 90 cm in men and greater than 80 cm. In women it is a risk factor for developing some type of metabolic disease [3,10,24]. However, there is evidence that in AM this condition may be a protective factor [25]. The average waist and hip circumference is greater than what is accepted for this population group (Table 2).

Anthropometric characteristics	X̄-DE
BMI	27.55 ± 4.11
Waist circumference	99.16 ± 10.04
Hip perimeter	102.25 ± 9.67
Arm circumference	28.77 ± 4.75
Calf Circumference	32.85 ± 5.22
Triceps fold	19.45 ± 9.75
biceps fold	15.04 ± 8.68
Subscapular fold	21.16 ± 7.99
Suprailiac fold	21.25 ± 6.88
Calf fold	15.52 ± 6.59

Table 2: *Anthropometric characteristics in older adults of Colima.*
Source: Results obtained by descriptive statistics.

Girth measurements

Arm circumference is a marker of nutritional status in older adults, some studies consider that a circumference less than 37 cm. in men and 25 in women it is oriented towards malnutrition by default, that is, the nutritional contribution does not meet the requirements to give muscular structure to the AM [9,16]. The study reported that the average circumference is less than what is established as an indicator of good nutritional status, this measure puts the AM in malnutrition (Table 2).

Calf circumference, also an indicator of nutritional status, has been published that values less than 29 cm they are related to malnutrition using the MNA, with very high sensitivity (99.31%). Contrary to the circumference of the arm in the case of the calf, the AM, have higher average values 29 cm. This may be related to the mobility they perform for activities of daily living, despite the changes in the musculoskeletal system, at least in the male sex, the effects are less obvious compared to women [26].

Skinfold measurements

The measurement of skin folds and BMI are two simple methods widely used for their low cost to measure subcutaneous fat, better correlations with nutritional status have been demonstrated in population groups [18]. An important aspect related to skin folds is body density, it is necessary to perform this operation to determine the percentage of body fat that AM has and be more objective in their nutritional explanations.

The groups of nourishment, risk of malnutrition and malnutrition were created to compare the means of age, weight, height, BMI, waist circumference, hip, arm, calf; skin folds of biceps, triceps, suprailiac, subscapularis and calf, in this way determine differences between the groups.

The average of the groups are the same in the anthropometric measurements, except the average of the size, it is observed between the groups significant differences, the malnourished group is different with respect to risk of malnutrition ($P = 0.021$) and nutrition ($P = 0.012$) respectively (Table 3). This may be related to the aging process, to anatomical and functional changes, such as alteration in the intervertebral discs, early sarcopenia, overweight and obesity [19,27]. The malnourished group is smaller than the nourished groups and the risk of malnutrition, which is consistent with the MNA classification. It could also be due to sex and its genotypic and phenotypic differences, women have a smaller size (1.49 ± .123) than men (1.64 ± .1.27) ($P \leq 0.001$), an explanation for this event is the decrease in

body mass Fat-free (Sarcopenia) that in the AM has been reported to increase body fat due to hormonal alterations and reduced physical activity [25].

Variables	$\bar{X}$ -DE			P value
	Nourished N = 26	Malnutrition Risk N = 42	Malnutrition N = 6	
Age	72.38 ± 9.33	74.6 ± 9.54	72 ± 5.33	0.754
Size (mts.)	1.58 ± .168	1.586 ± .104	1.40 ± .206	0.021* 0.012**
Weight (kg.)	73.3 ± 12.93	66.92 ± 12.59	66.08 ± 15.64	0.332
BMI (kg./mts2)	28.89 ± 3.45	26.54 ± 4.15	28.86 ± 5.18	0.296
C. hip (cm.)	103.94 ± 8.87	100.28 ± 9.77	108.66 ± 9.78	0.067
C. waist (cm.)	101.17 ± 8.68	97.41 ± 10.85	102.66 ± 8.28	0.374
C. arm (cm.)	29.3 ± 3.95	28.17 ± 5.28	30.58 ± 3.92	0.404
C. calf (cm.)	34.29 ± 4.23	32.23± 5.78	31 ± 4.0	0.245
Bicipital P. (mm)	17.3 ± 9.77	13.61 ± 7.43	15.16 ± 11.26	0.521
Tricipital P. (mm)	20.46 ± 9.91	18.5 ± 9.14	21.83 ± 13.84	0.662
P. suprailiac (mm)	21.96 ± 7.63	21.09 ± 6.62	19.33 ± 5.71	0.599
P.subescapular (mm)	22.15 ± 7.57	19.97 ± 8.10	25.16 ± 8.42	0.223
P. pantorilla (mm)	15.42 ± 6.99	15.66 ± 6.39	15 ± 7.34	0.965

Table 3: *Comparison of homogeneous subsets anthropometric characteristics and MNA.*
*Source: Results obtained by ANOVA of a factor with Pos Hoc Tukey test, *: malnourished/R. of malnutrition, **: malnourished/nourished, significance level P = 0.05.*

The percentage of body fat was calculated following the Siri formula [28], from the groups of nourished, risk of malnutrition and malnutrition, it is identified that, there are no differences between the groups in global terms, however, there is greater congruence Between being classified in some group and the corresponding body fat percentage, women present higher percentages of body fat than men (24.63 ± 5.28; 20.44 ± 3.66) respectively (P≤ 0.0001). This finding is similar to that reported by Heliodoro Alemán and Esparza Romero, measuring folds with electrical bioimpedance and using the modified technique of Deuerenberg and collaborators [25] even so, they are in low percentages of fat compared to the scales published by Durning and Womersley, also used by these authors [28].

MNA	N	∑ Folds* $\bar{X}$ y DE	Body density	%CG
Nourished	26	97.30 ± 32.86	1.0465	23.05 ± 5.24
Malnutrition risk	42	88.85 ± 29.07	1.0469	21.96 ± 4.45
malnutrtition	6	96.5 ± 41.78	1.0489	22.9 ± 7.26
Total	74	92.44 ± 31.33	1.0479	22.42 ± 4.94

Table 4: *Percentage of body fat in the nutritional status of adults.*
*Source: Result obtained through the SIRI formula. *: Bicipital, tricipital, subscapular and suprailiac folds.*

Study Limitations

Among the limitations of the study, we can mention that it was to investigate in depth about the feeding process in terms of affordability and accessibility, so far and our knowledge the food will be provided by the institution, the measurement of biochemical parameters such as hemoglobin, albumin, profile of lipids to name a few, the safety aspects in the communities influenced the study to be carried out in part-time institutions.

Conclusion

Conclusion should reflect and elucidate how the results correspond to the study presented and provide a concise explanation of the allegation of the findings.

The anthropometric characteristics in the nutritional status of the elderly show equality between the groups formed by nourished, risk of malnutrition and malnutrition in age, weight, BMI, waist circumference, hip, arm, calf and skin folds such as bicipital, tricipital, suprailiac, subscapular and calf.

The size is the anthropometric measure that shows difference between the groups derived from the MNA, the average of the size in the malnourished are those that evidences differences with the other groups.

From these results we must reflect the context of the AM in the biological, social and psychological sphere of the biological sphere; its total body composition, the amount of water that ranges from 50 to 65%, bone, muscle, adipose tissue, the ability to metabolize macro and micronutrients, with aging there is a decrease in the ability to absorb minerals, synthesize hydrochloric acid, metabolize fats, the digestive system undergoes an adaptation process to not process some nutrients. Socially, the participants were studied in day centers - daycare - a form of social abandonment by the family, so there is a kind of adaptation, they usually isolate themselves while assimilating the new reality they live, this conditions that there is no desire to feed, but to solve the why is there? Why did your family make this decision? Why is he not at home? Questions to be resolved before socializing with others. On the other hand, those who take time, socialize, there are bonds of friendship, share the food and experiences of life.

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Conflict of Interest

The authors of this paper declare that they have no conflict of interest.

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