Aspects regarding the importance of maintaining the independence of elderly through the relationship between morbidity and anthropometric indicators

N. Ciuciuc, B. A. Năsui

Department of Hygiene of the University of Medicine and Pharmacy „Iuliu Haţieganu” –Cluj Napoca, Romania

Abstract — As we get older, our body undergoes changes that occur gradually and inevitably progresses over time, but the rate of progression is very different from one person to another. One of the most important factors influencing quality of life in the elderly is to maintain aerobic capacity and independence in daily self-care. This study has followed the relationship between anthropometric indicators and morbidity of two lots of elderly - institutionalized and non-institutionalized. The used anthropometric indicators were skin folds at several levels, height and weight. Also, the study has determined the percentage of fat mass by bio-electrical impedance method. Morbidity data were collected from medical records of elderly. While evaluating the anthropometric data in relation with the elderly's pathology, it was observed that non-institutionalized elderly - by maintaining their social life - had better values for muscle mass and the pathology is less severe. Also the number of illnesses associated to one person is lower. These differences can be explained if we consider that the institutionalized elderly physical activity is extremely low, either due to lack of equipment (there are few institutions equipped with a gym), either because of associated chronic diseases which further limits exercise capacity.

Keywords—anthropometric indicators in elderly, elderly, elderly morbidity, elderly independence

Introduction The elderly's pathological characteristics is generally represented by long-term chronic diseases that have a significant social and economic impact.

Aging is associated with increased risk of chronic diseases and morbidity and, in particular, the physical inability of the elderly. All of these are related to the particularities of elderly:

1. older people tend to be sick more often;

2. there are diseases that are found predominantly in the elderly: cardiovascular diseases, physical disabilities, mental disorders, cancers;

3. elderly have an increased risk for chronic diseases;

4. polymorbidity - the elderly have a higher risk to suffer from several diseases. [1, 2]

Keeping older people in an active state has, besides social implications, a number of physiological benefits, as well as psychological and medical, too. Thus, this population can be stimulated to walk, light jogging within the tolerance limit or to cycle. [3]

As they get older, there is a declining in functional capacity, but some people retain a considerable ability to adapt. The decreasing in physical abilities observed in the elderly is due to a progressive and inevitable tendency for physical inactivity, sometimes caused by pluripathology that accompanies this period of life or can be defined as a typical characteristic in elderly within our cultural system. An organized and systematic physical activity in the elderly has beneficial effects on the organism, those persons having a better tone, being more optimistic, more organized, feeling healthier and in a better physical shape.[4, 5, 6]

Objectives

In Romania there are profound socioeconomic transformations due to major demographic changes. It is estimated that the percentage of the population over 65 years old will have been doubled from 15% to 30% by 2060.[6, 7, 8]

This study proposes to identify the importance of maintaining the physical independence of elderly in relation with their health.

Material and Method

Collection of data on elderly's pathology study groups was taken from their medical records, statistically processed in relation with their nutritional status previously evaluated.

In the investigation of the nutritional status in elderly, two compartments are very important: body fat and muscle skeletal. Finding the proportion of fat is useful for assessing the risk of obesity and overweight and, indirectly, the cardiovascular risk. From these measurements, skin folds get the attention of nutritionists due to the ease of determination, accessibility and results comparable with other investigations that are more complex and expensive (CT).

To quantitatively assess the body fat and the muscular mass, there were used two anthropometric methods:

1. skin folds measurements on several levels (tricipital, bicipital, subscapularis, suprailiac folds), brachial, abdominal and shank circumferences and also the height and weight measurements;

2. use of bio-electrical impedance.

Skin folds, indicators of the subcutaneous fat tissue, were determined using the caliper**.** There were three successive determinations and the medium value was considered to avoid errors produced by different pressure executed to the tissue folds. Results were calculated in mm.[9]

The height was determined using the Martin anthropometre; the investigated subjects were in orthostatism, with its heels closed, the buttocks spaced, scapula and buttocks touching the rod of the anthropometre and with the head in straight position – so that the line that unites the superior edge of the ear canal to the eye's external angle to be horizontal. The height was calculated in cm and mm.

The body weight view as the quantitative aspect of the tissues and the organs' weight, is a useful indicator for assessing the nutritional status. The body weight was determined using the scale which was verified before the measurements for accuracy and sensitivity, results being expressed in kg and hundreds of grams. [10]

Total muscle mass (TMM) was calculated using the values of skin folds and circumferences.

Formulas used:
TMM (kg) = H (cm) x (0.0264 + 0.0029) x AMA, where:
H- subjects' height
AMA= {(BMC - □x TSF)^2/ 4□} - 6.5

AMA = arm muscle area; BMC = brachial medium circumference (cm) and TSF = tricipital skin fold (cm). [11]

Bio-electrical impedance is based on the electrical resistance of various tissues while crossed by an undetectable electric shock, with the following characteristics: less than 1 milliampere, frequency of 50 kilohertz and a voltage of maximum 500 millivolts.

There was used OMRON BF 300 device to determine the body composition, which measures the total quantity of fat contained by the human body, expressed in kg and % of total weight.

Percents recommended by specialists are:

1. for men: 10 – 19%;
2. for women: 20 – 29%.

For obtaining as accurate values as possible, there had to be followed some rules:

1. electrodes (handles) kept tight with the thumb and pointer around the first part of the electrode and the ring finger and pinkie around the second part;
2. orthostatic position straight with inferior members slightly distant;
3. arms stretched ahead, so there was a 90 degrees angle formed between body and arms;
4. immobilization during the determination.

Performed measurements show:

1. content of fat tissue (expressed in kg and % of the investigated elder's total weight);
2. non-fat tissue (total quantity expressed in kg).

For avoiding the possible errors, the subjects were asked not to consume:

1. alcohol within the 24 hours before examination;
2. caffeine within 4 hours before examination;
3. no physical effort in the 4 hours before examination;
4. drinking of 2 – 4 glasses of water within 2 hours before examination for a normal hydration. [12, 13]

Regardless of methodology, the values obtained are used to calculate: body density, total muscle mass indicators or directly to calculate the percentage of fat in body weight. [14, 15, 16]

In interpreting the results the investigated subjects were divided into two groups: the institutionalized elderly (Ei) and the non-institutionalized elderly (Eni), which they are themselves divided into two other groups.

Investigated lots

The lots of elderly in the study were:

- 116 institutionalized elderly, aged between 65 - 84 years,

- 122 non-institutionalized elderly, aged between 65 - 78 years.

The groups were divided according to age and sex:

1. Institutionalized elderly (Ei):

- 64 women aged between 65 - 79 years;

- 52 men aged between 70 - 84 years.

2. Non-institutionalized elderly (Eni):

      - 68 women aged between 65 - 76 years;

      - 54 men aged between 65 - 78 years.

The anthropometrical assessment finds (accordingly to the BMI values) the two investigated lots of women in the second overweight category (with medium values of 32.65 for the institutionalized women and 31.05 for the non-institutionalized women); medium BMI values for men in both investigated lots fits them into normal weight category in relation to their height (table no. 1).

Table no. 1   Anthropometric characteristics of lots

LOT	Lot Ei		Lot Eni	
	Women	Men	Women	Men
Weight (kg)	81	57	78,5	60
Height (cm)	157,5	164	159	165
BMI (kg/m^2)	32,92	21,26	31	22

Data process showed bigger values in body fat, both percentually as well as in kg for the insitutionalized elders. Total muscular mass was calculated using skin folds' values and circumferences, emphasizing higher values for the non-institutionalized elders lot.

Ei lot – women: TMM = 17.07 kg;

  – men: TMM = 23.26 kg.

Eni lot – women: TMM = 18.30 kg;

  – men: TMM = 25.11 kg.

A bigger total muscular mass in the non-institutionalized elders explains in part also why their weight is bigger than the one in the institutionalized elders.

Also, the lack of activity in the Ei lot and a series of chronic pathologies associated to the institutionalized elderly make the decrease of muscular mass to be more emphasized.

Analysis of the results of the applied anthropometric methods (muscle mass, fat mass percentage, average weight) highlights that the difference in weight is given both by the muscle mass and the fat percentage.

For the fat mass, obtained values through bio-electrical impedance method emphasizes:

Ei lot: – women: 42.36 kg;

     – men: 23.52 kg;

Eni lot: – women: 35.24 kg;

     - men: 24.6 kg.

The comparative data show that non-institutionalized elders' non-fat mass is better represented in women (where the difference is 1.9 kg) than in men (where the difference is 4.63 kg) (table no. 2, table no. 3).

Table no. 2   Body composition parameters institutionalized elderly

Parameter	Sex	
	Women	Men
Age (year)	72	77
Fat mass (%)	52.30%	42.00%
Fat mass (kg)	42.36	23.52
Total muscle mass (kg)	17.07	23.26
Non-fat mass (kg)	33.48	38.63

Table no. 3 Body composition parameters non-institutionalized elderly

Parameter	Sex	
	Women	Men
Age (year)	70.5	71.5
Fat mass (%)	44.90%	41.00%
Fat mass (kg)	35.24	24.6
Total muscle mass (kg)	18.3	25.11
Non-fat mass (kg)	35.4	43.26

Chronic diseases for the two studied lots are represented in the table no. 4 and in table no. 5.

Table no. 4   Chronic diseases institutionalized elderly

Chronic diseases	Women	% no. total women	Men	% no. total men
Cardiovascular diseases	60	93,75	50	96,15
Neurological diseases	17	26,56	8	15,38
Mental illness	6	9,37	4	7,69
Respiratory diseases	14	21,87	33	63,46
Digestive diseases	5	7,81	12	23,07
Diabetes and nutrition diseases	7	10,93	3	5,76

disease				
Heart failure	12	20	15	30

Table no. 7 Cardiovascular diseases non-institutionalized elderly

Chronic diseases	Women	% no. total women	Men	% no. total men
High blood pressure	39	66.1	17	34
Atherosclerosis	2	3.38	8	16
Ischemic hearth disease	29	49.15	22	44
Heart failure	6	10.16	3	6

In institutionalized elderly the predominant cardiovascular pathology, in both sexes, are high blood pressure and ischemic hearth diseases (60% in women and 44% in men).

For the non-institutionalized elders lot the same dominant pathology is observed, high blood pressure and ischemic hearth diseases, but while in women, the first place is occupied by high blood pressure, in men the ischemic hearth disease come in the first place.

Although in both groups of elderly the first two places in cardiovascular diseases are the same, the clinical forms (according to data from medical records, evolution, stability and treatment) are less severe and less debilitating in non-institutionalized elderly lot.

The results are consistent with cardiovascular morbidity in Europe and in Romania, where the main cardiovascular diseases are high blood pressure, ischemic cardiovascular disease, and heart failure.

In Romania, 40% of the population suffers from a high blood pressure and cardiovascular disease mortality rate is 61% of all deaths [5].

In 2009, Romania was ranked third in Europe in regards of the cardiovascular disease, surpassed only by Russia and Bulgaria, and in 2010, Romania passed fourth place [5].

Conclusion

According to this study the following conclusions may be drawn:

Predominant chronic pathologies in both groups of elderly are cardiovascular diseases (high blood pressure and ischemic hearth disease), which emphasizes the importance of healthy diet, reducing the amount of fat and increasing the intake of vegetables and fruits, and constant physical activity within the tolerance limit of each person.

Table no. 5 Chronic diseases non-institutionalized elderly

Chronic diseases	Women	% no. total women	Men	% no. total men
Cardiovascular diseases	59	86.76	50	92.59
Neurological diseases	5	7.35	4	7.4
Mental illness	2	2.94	0	0
Respiratory diseases	18	26.47	49	90.74
Digestive diseases	11	16.17	23	42.59
Diabetes and nutrition diseases	19	27.94	7	12.96

According to the obtained data, the cardiovascular diseases are the most frequent chronic diseases for the two lots, both men and women.

    5.   93.75% of women, 96.15% of men, Ei lot;

    6.   86.76% of women, 92.59% of men, lot Eni.

In institutionalized women lot the neurological diseases are on the second place (26.56%), which decreases the mobility and self-care ability; the presence of these diseases was one of the motive for their institutionalization.

Respiratory diseases comes in the second place in both men lots (63.46% and 90.74%, respectively) possible because of smoking or several professions which expose men to risk factors further than women; part of these diseases decrease more the capacity to effort in elders.

The great number of cases with diabetes and nutritional diseases for the non-institutionalized women should also be noticed, explaining the high quantity of fat mass determined, through impedance method.

To be mentioned that in both elders groups, we observe the existence of more chronic diseases for the same person: at least two chronic diseases for each non-institutionalized elder and a polipathology for each institutionalized elder.

While analyzing the cardiovascular pathology the following results were obtained (table no. 6 and table no 7).

Table no. 6 Cardiovascular diseases institutionalized elderly

Chronic diseases	Women	% no. total women	Men	% no. total men
High blood pressure	36	60	22	44
Atherosclerosis	7	11.66	6	12
Ischemic hearth	38	63.33	19	38

The presence of a large number of institutionalized men with respiratory diseases and a large number of women with debilitating neurological diseases explains the significant reduction in muscle mass.

Impedance measurements shows the importance of assessing the body compartments, especially the fat proportion, with risks on cardiovascular disease.

Therefore, the study emphasizes the importance of maintaining the physical activity in elderly, as much as possible or they can be engaged in different domestic activities or volunteering. Improving physical fitness means a better health and a lower cost in social care.

Our results shows the need of implementation of programs involving the elderly in social activities in order to improve their nutritional and health status.

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