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El Bcheraoui C, Chapuis-Lucciani N. Obesity in the Lebanese elderly : Prevalence, relative risks and anthropometrical measurements. *J Med Liban* 2008 ; 56 (3) : 174-180.

ABSTRACT • OBJECTIVE : To measure the prevalence of obesity in the Lebanese elderly population and to compare it to another sample studied 10 years ago ; to investigate the best anthropometrical measurement related to obesity relative risks in this age group.

DESIGN : Cross-sectional study about aging and obesity in the Lebanese society.

SUBJECTS : 237 Lebanese elderly (60-85 y.o.) selected randomly from an urban and a rural community.

MEASUREMENTS : Height, weight, waist and hips circumferences.

RESULTS : 47% of the studied sample is obese and obesity is related to gender, educational level and age. Body mass index (BMI) is a good indicator for diabetes 2. Central obesity did not correlate with obesity relative risks.

CONCLUSION : Obesity is more prevalent in 2005 than it was in 1995. Prevention programs should be installed in schools and work places in Lebanon to fight against the epidemic of obesity.

INTRODUCTION

The prevalence of obesity and overweight is increasing worldwide. It has doubled in the last decade [1]. The frequency of overweight in the 70-79 y.o. varies from 0% in some Asian and African populations (Nigerian, Cameroonian, Chinese Australian and from Hong Kong) to 35% in Greece as shown by a study comparing 19 geographically and ethnically varied samples of community-dwelling elderly people [2].

In the USA, the prevalence of obesity has increased by 110% between 1976-1980 and 1999-2000 [3]. In 2005, only four of the American states had a prevalence of obesity less than 20% ; for 14 states it was equal or greater than 25% and for three others, the prevalence of obesity was equal or greater than 30% [4].

For the elderly, the prevalence of obesity in this country

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El Bcheraoui C, Chapuis-Lucciani N. Obésité chez les personnes âgées libanaises : Prévalence, risques relatifs et mesures anthropométriques. *J Med Liban* 2008 ; 56 (3) : 174-180.

RÉSUMÉ • OBJECTIFS : Mesurer la prévalence de l'obésité chez une population âgée libanaise et la comparer à celle d'un autre échantillon étudié il y a 10 ans ; trouver la meilleure mesure anthropométrique liée aux risques relatifs à l'obésité dans ce groupe d'âge.

MODÈLE : Étude transversale du vieillissement et de l'obésité dans la société libanaise.

SUJETS : 237 personnes âgées libanaises (60-85 ans) sélectionnées au hasard d'une communauté urbaine et d'une autre rurale.

MESURES : Taille, poids, tours de taille et de hanches.

RÉSULTATS : 47% de l'échantillon étudié est obèse et l'obésité est liée au sexe, au niveau d'éducation et à l'âge. L'indice de masse corporelle (IMC) est un bon indicateur pour le diabète de type 2. L'obésité centrale n'a pas été corrélée aux risques relatifs à l'obésité.

CONCLUSION : La prévalence de l'obésité est plus grande en 2005 qu'elle ne l'était en 1995. Des programmes de prévention doivent être mis en place dans les écoles et les lieux de travail au Liban pour lutter contre l'épidémie de l'obésité.

has increased by 45% in the age group of 60-69 y.o. and 29% in the age group of 70 y.o. and above between 1991 and 1998 [5] though less attention has been given to obesity problems in the elderly [6], an age group escalating rapidly worldwide [7] and rarely included in epidemiological studies concerning age-related patterns of change [8].

Several studies have proven the increase of many diseases related to obesity such as diabetes 2, hypercholesterolemia and cardiovascular diseases [9-13]. Extremes of body mass index (BMI, very high 30 kg/m² and very low 18 kg/m²) are associated with poorer health states in the elderly populations [5].

The prevalence of overweight and obesity is most often different between men and women and there is a remarkable variation of both overweight and obesity between the sexes worldwide. Obesity is clearly more prevalent in women whereas overweight is more prevalent in men [1]. Even in the elderly, women are more likely to be obese than men [14]. Also, obesity seems to be correlated to the educational level [15] which is regularly used as a measurement of socioeconomic status in epidemiological studies [16-17].

However, the anthropometrical measurements of obesity that best predict obesity relative risks (ORR) are not

the same in men and women, in all age groups and in all populations. BMI and waist circumference (WC) are so far the most common anthropometrical indices used for the classification of general and central obesity and for the prediction of cardiovascular risks [18]. In China, for example, while general obesity measured by BMI seems to better predict cardiovascular risks and metabolic syndromes in men, central obesity measured by WC and waist to hips ratio (WHR) predicts better cardiovascular risks and metabolic syndromes respectively in women [19].

According to Heng-Chia et al., 2000 [20], little is known about the value of anthropometrical data for predicting the health status of older people. In fact, though BMI is the accepted measure of obesity in populations and in clinical practice [1], it does not distinguish between fat mass and lean mass and therefore is not providing an accurate indication of body fat in extremely muscular individuals or people who have lost significant muscle mass [11, 21]. BMI is also age-, sex- and population-dependent when used as indicator of body fatness [22], so it seems to underestimate elderly with low mass of muscles like in all persons with extreme of age [1] and WC seems to better predict ORR in young than in elderly subjects [21]. It is highly correlated with the amount of abdominal fat which is a predictor of metabolic syndrome independent of total body fat [18, 21] and many studies now show that WC is a useful measure of increased intra-abdominal fat [1]. In many populations it is considered as a better indicator of metabolic syndrome risk than BMI. Meanwhile, WHR seems to be useless as a method to estimate central obesity in elderly populations [15, 23].

Only one epidemiological study about obesity has been conducted till now in Lebanon, an eastern Mediterranean country [14]. This study involved all age groups from 3 to 70 y.o. This data's analysis showed a 53% prevalence of overweight and a 17% prevalence of obesity among adult Lebanese (20 y.o.) in 1995. For the 60 y.o., the prevalence of overweight and obesity were 39.6% and 27.9% respectively.

Only one bioanthropological study about aging, an essay about nutritional status of institutionalized and community dwelling elderly, has been carried out in Lebanon [24].

However, the Lebanese population is aging just like the majority of western countries. According to Courbage, 2005 [25], the elderly Lebanese population (65 y.o.) passed from 6.8% in 1995 to 7.4% in 2000 and 8.3% in 2005.

It is well known that many chronic diseases occur with age such as cardiovascular diseases and metabolic syndromes. This is why it would be of an interest to measure the prevalence of obesity and check for its relative risks, especially chronic diseases, in this growing age range of the population in order to prevent the problems that might occur with time due to these two factors : aging and obesity.

In the region, a study on an urban Palestinian population showed that the prevalence of overweight or obesity

in persons 55 to 65 y.o. was 74% in men and 88% in women [26]. Another and more recent study on the Jordanian population, showed a prevalence of obesity of 14.4% in men and 23.4% in women. More specifically, the prevalence of obesity in the age group of 65 y.o. and older was 28% in 2004 [27].

The aim of our work was to measure the prevalence of overweight and obesity in a Lebanese elderly sample controlling for sociodemographic factors (age, gender, living place, educational level), to compare it to another sample studied 10 years ago and to investigate the best anthropometrical measurements in predicting ORR. We hypothesized that 1) the prevalence of overweight and obesity was higher in our sample than in the one studied 10 years ago showing a possible increase in obesity after the end of the Lebanese war and the stabilization of the economic system ; 2) this prevalence was correlated to sociodemographic factors such as place of residency (Urban vs. Rural) ; and 3) the anthropometrical measurements of obesity that correlate best with ORR were not the same among men and women, like in many other countries.

METHODS

Design

Between January and September 2005, 237 Lebanese men and women community-dwelling aged between 60 and 85 y.o. (Mean age 69.5 ; SD 6.3 years) were interviewed. The subjects were randomly chosen from the community of Beirut, the Lebanese capital (Beirut City and its suburbs), and Ras-Baalbeck, a Lebanese village in the northeast of the valley of Bekaa. The purpose of our communities' choice was to compare an urban and a rural population and the effect of the different life styles on the body. Due to the lack of socioeconomic status studies in Lebanon, we thought that it should be higher in the city of Beirut than in a small village like Ras-Baalbeck. Subjects were recruited in different ways in Beirut ; some of them via social associations, others via personal contacts. In Ras-Baalbeck, we were introduced to the subjects via the municipality vice-president. Two conditions were necessary for a person to be included in our sample besides age. One should have been living at home [1] and in each of the mentioned areas for the last 15 years at least [2].

Each person was interviewed for at least one hour using a questionnaire of life style and public health and then anthropometrical measurements were taken. Subjects were divided by age (Age Group 1 : 60-69 y.o. [AG1] and Age Group 2 : 70 y.o. [AG2]) and place of residency (Urban : Beyrouth and Rural : Ras-Baalbeck).

During the meetings, data about age, socioeconomic status, marital status, educational level, tobacco use and chronic disease were collected.

Marital status

For each subject we asked if, at the time of the interview, he/she was married, widowed, divorced or single. For the statistics, we gathered widowed, divorced and

TABLE I
DISTRIBUTION OF SUBJECTS ACCORDING TO AGE, GENDER AND RESIDENCY PLACE

	AG1 URBAN	AG1 RURAL	AG2 URBAN	AG2 RURAL	TOTAL (%)
Men	28	35	28	33	124 (53.45)
Women	25	31	27	25	128 (46.55)
Total (%)	53 (22.84)	66 (28.44)	55 (23.70)	58 (25.0)	232 (100)

AG : Age group

single people into one group since the enrollments of the last two categories were very low.

Educational level

Subjects were asked about their educational level and were divided into 3 groups : illiterate, primary school and above primary school for statistic analysis.

Tobacco use

Subjects were asked if they were smokers or not.

Medical report

Subjects were asked if they were suffering from chronic diseases such as cardiovascular diseases, hypertension, hypercholesterolemia and diabetes 2.

Anthropometrical measurements

Height was measured without shoes, with a construction height gauge, subjects standing against a wall. Weight was measured in indoor clothing with bare feet using a mechanical balance. BMI was calculated by dividing weight (kilograms) to height (meter) squared.

The cut-off points of the WHO were used to define overweight (BMI between 25 and 29.9 kg/m²) and obesity (BMI ≥ 30 kg/m²).

Waist and hips circumferences were measured using a flexible tape ; WHR was then calculated. Central obesity was defined as WC ≥ 88 cm for women and ≥ 102 cm for men and as WHR ≥ 1 for both men and women.

At the end of the inquiry, 5 subjects were excluded from the analysis due to their refusal to be measured which left 232 subjects for the study.

We certify that all applicable institutional and governmental regulations concerning the ethical use of human volunteers were followed during this research.

Statistics

Chi square test was used to compare the differences between groups.

Logistic regressions were used to test the relation between two variables controlled by confusion factors (e.g. BMI and diabetes 2 controlled by sociodemographic factors).

A p value of 0.05 and less was considered significant. SPSS Version 11.0 was used for these analyses.

RESULTS

The distribution of subjects according to age, gender and residency place is shown in table I.

The distribution of subjects according to sociodemographic factors are presented in table II.

Comparison of the prevalence of overweight and obesity with a 10 years' data

We compared our data to the one of Sibai et al., 2003, according to gender and age groups for BMI and WC. Sibai et al. analyzed the data base of the Population and Housing Survey (PHS) conducted by the Ministry of Social Affairs in Lebanon in collaboration with the United Nations Fund for Population Activities between 1995 and 1996). Our results, compared to the findings of the mentioned authors, are presented in Table III. It should be noted that WHR was not mentioned in Sibai et al.'s study.

In total, the prevalence of general obesity was 46.6% in our sample. In the elderly sample of Sibai et al. it was 27.9%. Meanwhile, the prevalence of overweight is at a lower level in our 2005 data (36.6%) than in 1995 (39.6%).

TABLE II
DISTRIBUTION OF SUBJECTS ACCORDING TO SOCIODEMOGRAPHIC FACTORS

VARIABLES	Categories	Number	%
GENDER	Male	124	53.45
	Female	108	46.55
AGE	AG1	119	51.29
	AG2	113	48.71
RESIDENCY	Urban	108	46.55
	Rural	124	53.44
MARITAL STATUS	Married	168	72.41
	Single	7	3.01
	Divorced	1	0.004
	Widowed	56	24.13
EDUCATIONAL LEVEL	< 4 years	58	25.00
	Primary School	133	57.32
	> Primary School	41	17.67
TOBACCO USE	Smokers	53	22.85
	Nonsmokers	179	77.15

Relationships between general obesity and sociodemographic factors

Table IV shows the distribution of obesity and overweight according to sociodemographic factors.

The prevalence of obesity was significantly higher in women than in men [Chi^2 (1 ddl) = 8.00, $p = 0.005$], in AG1 than in AG2 [Chi^2 (1 ddl) = 5.13, $p = 0.02$] and the least educated in comparison to the most educated [Chi^2 (1 ddl) = 5.39, $p = 0.067$]. No statistic differences were found for the other factors such as the place of residency (Urban vs. Rural) as we hypothesized.

The educational level was statistically different between the city and the village residents as shown by Chi^2 test. There are more people with an educational level superior than primary school in the city and more people with an educational level of less than 4 years of education in the village.

The logistic regression test confirmed these results. Women tended to be two times more likely to be obese than men. Subjects of AG2 were significantly protected against obesity in comparison to subjects of AG1. Subjects of AG2 had 50% less chance to be obese than subjects of AG1. Also, education seemed to be a protective factor against obesity. Subjects with educational level over primary school had 60% less chance to be obese than subjects with less than 4 years of education. These results are presented in table V.

Chronic diseases

Cardiovascular diseases had the highest prevalence of chronic diseases that affected our subjects of whom 61.6% had at least one cardiovascular disease such as stroke, hypertension, coronary heart disease or cardiac

TABLE IV
DISTRIBUTION OF OVERWEIGHT (BMI 25-29.9 kg/m²) AND OBESITY (BMI kg/m²) ACCORDING TO SOCIODEMOGRAPHIC FACTORS

SOCIODEMOGRAPHIC FACTORS	Categories	Overweight %	Obesity %
GENDER	Male	41.93	37.90
	Female	30.55	56.48
AGE GROUP	AG1	32.77	53.78
	AG2	40.70	38.93
MARITAL STATUS	Married	39.28	44.64
	Single/Divorced/ Widowed	29.68	51.56
RESIDENCY	Beirut	37.03	43.51
	Ras-Baalbeck	36.29	49.19
EDUCATIONAL LEVEL	< 4 years	31.03	55.17
	Primary School	38.34	47.36
	> Primary School	39.02	31.70

TABLE III
PREVALENCE OF OVERWEIGHT AND OBESITY DISTRIBUTED BY GENDER AND AGE IN 2005 COMPARED TO THE FINDINGS OF SIBAI *et al.* IN 1995

ANTHROPOMETRICAL MEASUREMENTS	Categories	% 1995 N = 222	% 2005 N = 232
BMI	Male AG1 Overweight	47.1	33.3
	Male AG1 Obese	13.8	49.2
	Male AG2 Overweight	41.1	50.8
	Male AG2 Obese	16.1	26.2
	Female AG1 Overweight	35.1	32.1
	Female AG1 Obese	41.2	58.9
	Female AG2 Overweight	38.5	28.8
	Female AG2 Obese	33.4	53.8
WC	Male AG1 Obese	40.2	60.3
	Male AG2 Obese	35.7	60.7
	Female AG1 Obese	78.9	94.6
	Female AG2 Obese	66.7	94.2
WHR	Male Obese	–	47.6
	Female Obese	–	19.4

BMI : Body mass index **AG1** : 60-69 y.o. **AG2** : 70 y.o.
WC : Waist circumference **WHR** :Waist to hips ratio

arrhythmia. Hypertension considered alone had the next highest prevalence of a chronic disease affecting our subjects (50.4%), then came hypercholesterolemia (25.4%) and diabetes 2 (16.8%).

Table VI resumes the medical report of the subjects.

Relationships between anthropometrical measurements and diseases according to gender

BMI

We tested whether cardiovascular diseases, hypercholesterolemia, hypertension or diabetes 2 were related to obesity in men, using the cut-off point of 30 kg/m² as the limit of obesity. Chi^2 test did not show any difference between obese and nonobese subjects for cardiovascular diseases [Chi^2 (1 ddl) = 0.23, $p = 0.62$ NS]; hypercholesterolemia [Chi^2 (1 ddl) = 0.02, $p = 0.87$ NS]; hypertension [Chi^2

TABLE V
ODDS RATIOS ADJUSTED FOR GENERAL OBESITY

VARIABLES	Categories	OR	p
GENDER [MALE]	Female	1.73	0.08
AGE [AG1]	AG2	0.44	0.007
RESIDENCY [CITY]	Village	1.08	0.78
MARITAL STATUS [MARRIED]	Widowed/Single/ Divorced	1.13	0.72
EDUCATIONAL LEVEL [< 4 YEARS]	Primary School	0.73	0.36
	> Primary School	0.36	0.04

OR : Odds ratios

TABLE VI
CARDIOVASCULAR DISEASES
& METABOLIC SYNDROMES

DISEASE	Enrollment	%
CARDIOVASCULAR DISEASES	143	61.6
HYPERCHOLESTEROLEMIA	59	25.4
HYPERTENSION	117	50.4
DIABETES 2	39	16.8

(1ddl) = 0.47, $p = 0.49$ NS] and diabetes 2 [Chi^2 (1 ddl) = 1.89, $p = 0.16$ NS]. We performed logistic regressions to check for any relation of BMI to the mentioned risk diseases and risk factors controlling for age, residency, marital status, educational level and tobacco use. None of the odds ratios was significant.

The same tests were repeated for women alone. Chi^2 test did not show any difference between obese and nonobese subjects for cardiovascular diseases [Chi^2 (1 ddl) = 0.11, $p = 0.73$ NS]; hypercholesterolemia [Chi^2 (1 ddl) = 1.08, $p = 0.29$ NS]; hypertension [Chi^2 (1 ddl) = 0.6, $p = 0.43$ NS] but was significant for diabetes 2 [Chi^2 (1 ddl) = 4.85, $p = 0.02$].

When performing logistic regressions, odds ratios were insignificant for all the diseases in relation to obesity measured by BMI and controlling for the same factors described above except for diabetes 2. There were trends in obese women to be three times more likely to be affected with diabetes 2 in comparison to nonobese women.

WHR

In men, Chi^2 test showed no difference between groups of cardiovascular diseases [Chi^2 (1 ddl) = 0.4, $p = 0.52$], hypercholesterolemia [Chi^2 (1 ddl) = 0.28, $p = 0.59$], hypertension [Chi^2 (1 ddl) = 1.92, $p = 0.16$] or diabetes 2 [Chi^2 (1 ddl) = 0.002, $p = 0.96$] when obese were compared to nonobese.

Odds ratios were also insignificant when we performed the logistic regressions.

TABLE VII

ODDS RATIOS ADJUSTED FOR DIABETES2 IN WOMEN

VARIABLES	Categories	OR	p
AGE [AG1]	AG2	0.57	0.32
RESIDENCY [CITY]	Village	0.63	0.42
MARITAL STATUS [MARRIED]	Widowed/ Single/ Divorced	1.11	0.84
EDUCATIONAL LEVEL [< 4 YEARS]	Primary School > Primary School	0.42 0.68	0.12 0.71
TOBACCO USE [NONSMOKERS]	Smokers	0.23	0.19
BMI [< 30 kg/m ²]	30 kg/m ²	3.02	0.073

OR : Odds ratios

No significant relationship between WHR and ORR was observed in women for cardiovascular diseases [Chi^2 (1 ddl) = 0.1, $p = 0.74$], hypercholesterolemia [Chi^2 (1 ddl) = 0.8, $p = 0.36$], hypertension [Chi^2 (1 ddl) = 0.001, $p = 0.97$] nor diabetes 2 [Chi^2 (1 ddl) = 1.08, $p = 0.29$].

The results of logistic regressions were similar in associating WHR to ORR in women.

WC

The same test were performed for obesity measured with WC. None of the diseases was related to WC in men : cardiovascular disease [Chi^2 (1 ddl) = 0.02, $p = 0.86$], hypercholesterolemia [Chi^2 (1 ddl) = 0.25, $p = 0.62$], hypertension [Chi^2 (1 ddl) = 0.07, $p = 0.78$] or diabetes 2 [Chi^2 (1 ddl) = 0.14, $p = 0.7$].

Even in the logistic regressions, WC was not associated to any of these ORR.

For women, Chi^2 test showed no differences between groups : cardiovascular disease [Chi^2 (1 ddl) = 0.01, $p = 0.92$], hypercholesterolemia [Chi^2 (1 ddl) = 0.13, $p = 0.71$], hypertension [Chi^2 (1 ddl) = 0.14, $p = 0.7$] and diabetes 2 [Chi^2 (1 ddl) = 0.62, $p = 0.2$].

Also in logistic regressions, this anthropometrical measurement wasn't associated to any of the mentioned ORR.

DISCUSSION

The importance of our study is that it shows a high prevalence of ORR and a real increase of the obesity prevalence in the Lebanese elderly over 10 years.

In comparison with Sibai et al. 1995 data [14], the prevalence of obesity in our sample (47%) is much higher in men and women of both age groups which might show an increase of obesity in the Lebanese elderly population. Meanwhile, the prevalence of overweight is globally smaller in the 2005' sample (36.6%). Together, the overweight and obesity prevalence is 23% higher in Lebanon than it was 10 years ago in this age range.

Even if the two samples are too small to conclude a drastic increase of obesity (67% in 10 years), these data are in agreement with the findings of several authors about the increase in the prevalence of obesity worldwide [1, 9, 28]. Nevertheless, the rate of obesity is high in 2005 for the population studied, and, for both age groups, the prevalence of obesity was higher in women than in men as shown in several studies [1].

In addition to gender differences, in our sample, obesity was also related to age. Prevalence of obesity in subjects 70 y.o. was smaller than in 60-69 y.o. subjects. A decline in the prevalence of obesity after 70 y.o. has been shown in several populations [29].

Also, the prevalence of obesity was significantly smaller in subjects of the highest educational level than in subjects with low education. This was also proved in other studies [15].

In the region, a prevalence of overweight or obesity of

74% and 88% respectively in men and women aged from 55 to 65 y.o. was showed in an urban Palestinian population [26]. In a more peaceful country, Jordan, the prevalence of obesity increased by 52.3% just between 2002 and 2004 [27]. The increase in the prevalence of obesity seems to affect the whole region even in countries that did not go through war which might substantiate the theory of changes in culinary habits.

Our second hypothesis concerning differences in anthropometrical measurements significance between genders has been proved for BMI.

General obesity measured by BMI correlated best with diabetes 2 for women but not for men. These findings do not match with the ones of Ho et al., 2001 [19] for a Chinese population where BMI predicts metabolic syndromes like diabetes 2 for men and does not predict any ORR for women. General obesity measured with BMI is correlated to diabetes 2 in the USA [30].

We did not assess any anthropometrical measurement in our population to cardiovascular diseases, hypercholesterolemia and hypertension. These findings did not match with many other authors' findings like Woo et al. for whom WC was associated to hypertension [23] or Park et al. for whom BMI is associated to cardiovascular diseases [10].

The most surprising of our results is that WC does not correlate with any of the ORR. In the British elderly, WC was a good indicator of ORR such as diabetes [31]. This outcome does not match that of Ho et al. [19] where WC was strongly associated with hypertension in women and diabetes in men. It should be noted that their study did not separate elderly from other age groups.

Central obesity measured by WHR was not related to any disease which makes this indicator useless in our population whereas Abdul-Rahim et al. found WHR highly correlated to metabolic syndromes [26]. Meanwhile, more recent studies correlate our findings [15, 23].

This high prevalence of obesity which seems to have increased over the last ten years might be attributable to the end of the Lebanese war in the early 1990s, the wilder accessibility and variety of food and its cost on the market and the stabilization of the Lebanese economic system. Another reason might be the change in culinary habits, besides the introduction of western and junk food into the country [32].

At the same time, we should mention the lack of knowledge in the Lebanese society concerning the importance of physical activity. Older adults in Lebanon don't practice any sports activity. On the other hand, they spend most of their time watching TV which is becoming their only entertainment. It is likely that single, widowed or divorced and less educated people spend more time watching TV than others.

The high prevalence of obesity in this sample is not different from the regional one [26-27, 33]. Changing their diet into a healthier one and adopting a life style which includes more training and physical activity is

becoming a necessity. It is very important to fight the epidemic of obesity starting by public health research about food intake and physical activity to find out more about the reasons of the increase of obesity among elderly especially because of the high prevalence of ORR in this age group ; in fact, more than 60% of our subjects are affected with cardiovascular diseases.

Our study has some limitations. It is a cross sectional one so we cannot assess causation. Our sample size is small and not representative of the country. However, to our knowledge this is the first study of this nature in Lebanon that examines obesity in elderly alone. Also, ill subjects might have undergone diets and physical exercise which might have led to weight loss after diagnosing their health state. In this case, association between anthropometrical measurements and ORR might have been masked because of these bias. This would be the most probable explanation for the lack of association of anthropometrical measurements with ORR in our sample.

At the same time, it is possible that the choice of our cut-off points in BMI, WC and WHR might not be the right ones for the Lebanese population. A future study with a larger sample across the whole country would provide more information about this issue.

CONCLUSION

The high prevalence of obesity shown in our data and the increase of this prevalence over 10 years should be a warning signal for the public health policy makers in the country.

Fighting the epidemic of obesity should be a matter of great concern in order to lessen the health risks it entails. Prevention should be a priority in Lebanon and public health programs for prevention should be conducted in schools and especially at work where people of older age can be reached.

Healthy life style should be promoted by teaching people very simple and possible solutions consisting mainly in an increase in physical activity and diets with less fat food.

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REFERENCES

1. James P. Obesity : the worldwide epidemic. *Clin Dermatol* 2004 ; 22 : 276-80.
2. Launer L, Harris T. Weight, height and body mass index distributions in geographically and ethnically diverse samples of older persons. *Age Ageing* 1996 ; 25 : 300-6.
3. Flegal KM, Carroll M, Ogden C, Johnson C. Prevalence and trends in obesity among US adults, 1999-2000. *JAMA* 2002 ; 288 : 1723-7.

4. Densmore D, Blanck HM, Dietz WH et al. State-specific prevalence of obesity among adults – United States, 2005. *MMWR* 2006 ; 55 (36) : 985-8.
5. Mokdad A, Serdula M, Dietz W, Bowman B, Marks J, Koplan J. The spread of the obesity epidemic in the United States, 1991-1998. *JAMA* 1999 ; 282 (16) : 1519-22.
6. Rolland Y, Lauwers-Cances V, Pahor M, Fillaux J, Grandjean H, Vellas B. Muscle strength in obese elderly women : effect of recreational physical activity in a cross-sectional study. *Am J Clin Nutr* 2004 ; 79 : 552-7.
7. Tucker K, Buranapin S. Nutrition and aging in developing countries. *J Nutr* 2001 ; 131 : 2417S-2423S.
8. Hughes V, Frontera W, Roubenoff R, Evans W, Fiatarone Singh M. Longitudinal changes in body composition in older men and women : role of body weight change and physical activity. *Am J Clin Nutr* 2002 ; 76 : 473-81.
9. Kaplan M, Huguot N, Newsom J, McFarland B, Lindsay J. Prevalence and correlates of overweight and obesity among older adults : findings from the Canadian national population health survey. *J Gerontol A Biol Sci Med Sci* 2003 ; 58A/11 : 1018-30.
10. Park HS, Song YM, Cho SI. Obesity has a greater impact on cardiovascular mortality in younger men than in older men among nonsmoking Koreans. *Int J Epidemiol* 2006 ; 35 (1) : 181-7.
11. Stein C, Colditz G. The epidemic of obesity. *J Clin Endocrinol Metab* 2004 ; 89 (6) : 2522-5.
12. Mokdad A, Bowman B, Ford E, Vinicor F, Marks J, Koplan J. The continuing epidemics of obesity and diabetes in the United States. *JAMA* 2001 ; 286 (10) : 1195-200.
13. Waldstein SR, Katzel LI. Interactive relations of central versus total obesity and blood pressure to cognitive function. *Int J Obes* 2006 ; 30 : 201-7.
14. Mehio-Sibai A, Hwalla N, Adra N, Rahal B. Prevalence and covariates of obesity in Lebanon : Findings from the first epidemiological study. *Obes Res* 2003 ; 11 : 1353-61.
15. Guitiérrez-Fisac J, Lopez E, Banegas J, Graciani A, Rodriguez-Artalejo F. Prevalence of overweight and obesity in elderly people in Spain. *Obes Res* 2004 ; 4 : 710-15.
16. Gurka M, Wolf A, Conway M, Crowther J, Nadler J, Bovbjerg V. Lifestyle intervention in obese patients with type 2 diabetes : Impact of the patient's educational background. *Obesity* 2006 ; 14 (6) : 1085-92.
17. Liberatos P, Link BG, Kelsey JL. The measurement of social class in epidemiology. *Epidemiol Rev* 1988 ; 10 : 87-121.
18. Shen W, Punyanitya M, Chen J et al. Waist circumference correlates with metabolic syndrome indicators better than percentage fat. *Obesity* 2006 ; 14 (4) : 727-36.
19. Ho SC, Chen YM, Woo JLF, Leung SSF, Lam TH, Janus ED. Association between simple anthropometrical indices and cardiovascular risk factors. *Int J Obes* 2001 ; 25 : 1689-97.
20. Herg-Chia C, Hsin-Yi C, Lih-Wen M, Ti-Kai L, Hong-Wen L. Height, weight and body mass index of elderly persons in Taiwan. *J Gerontol* 2000 ; 55A/11 : M684-M690.
21. Yeh WT, Chang HY, Yeh CJ, Tsai KS, Chen HJ, Pan WH. Do centrally obese Chinese with normal BMI have increased risk of metabolic disorders ? *Int J Obes* 2005 ; 29 : 818-25.
22. Gallagher D, Visser M, Sepulveda D, Pierson, R, Harris T, Heymsfield S. How useful is body mass index for comparison of body fatness across age, sex, and ethnic groups ? *Am J Epidemiol* 1996 ; 143 (3) : 228-39.
23. Woo J, Ho SC, Yu ALM, Sham A. Is waist circumference a useful measure in predicting health outcomes in the elderly ? *Int J Obes* 2002 ; 26 : 1349-55.
24. Mehio-Sibai A, Zard C, Adra N, Baydoun M, Hwalla Baba N. Variations in nutritional status of elderly men and women according to place of residence. *Gerontology* 2003 ; 49 (4) : 215-24.
25. Courbage Y : *New Demographic Scenarios in the Mediterranean Region*. Paris : National Institute of Demographic Studies, 2005.
26. Abdul-Rahim HF, Abu-Rmeileh NME, Hussein A, Holmboe-Ottesen G, Jervell J, Bjertness E. Obesity and selected co-morbidities in a rural and urban Palestinian population. *Int J Obes Relat Metab Disord* 2001 ; 25 : 1736-40.
27. Belbeisi A, Zindah M, Halke H, Jarrar B, Mokdad AH. Assessing risk factors for chronic disease, Jordan, 2004. *MMWR* 2006 ; 55 (23) : 653-5.
28. Evans A, Tolonen H, Hense HW, Ferrario M, Sans S, Kuulasmaa K. Trends in coronary risk factors in the WHO MONICA project. *Int J Epidemiol* 2003 ; 30 : S35-S40.
29. Zamboni M, Turcato E, Armellini F et al. Sagittal abdominal diameter as a practical predictor of visceral fat. *Int J Obes* 1998 ; 22 : 655-60.
30. Mokdad AH, Ford E, Bowman B et al. Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. *JAMA* 2003 ; 289 : 76-9.
31. Ramsay S, Whincup P, Shaper A, Wannamethee S. The relations of body composition and adiposity measures to ill health and physical disability in elderly men. *Am J Epidemiol* 2006 ; 5 : 459-69.
32. Chapuis-Lucciani N, El Cherbaoui C. Quand l'économie domestique devient goût de la tradition et facteur de santé : les conserves d'été – la mouné – dans un village de montagne du Liban. In : *Alimentation et montagne*. Gap : Editions des Hautes-Alpes, 2007.
33. Kaluski DN, Berry EM. National prevalence of obesity. Prevalence of obesity in Israel. *Obes Rev* 2005 ; 6 : 115-16.

البدانة عند المتقدمين في العمر : الانتشار الاخطار المتعلقة والقياسات الجسدية

موجز : الهدف - قياس نسبة البدانة عند المسنين اللبنانيين. ومقابلتها مع غيرها من العينات التي درست منذ ١٠ سنوات وايجاد افضل طريقة للقياس الجسدي المرتبطة بالأخطار المتعلقة بالبدانة في هذه المجموعة.

الطريقة - دراسة ميدانية حول الشيخوخة والبدانة في المجتمع اللبناني.

الاشخاص - ٢٣٧ شخصا، العمر ٦٠ - ٨٥ سنة أختبروا عشوائيا من فئة مدنية وفئة قروية.

القياسات : الطول، الوزن، الخصر ومحيط الوركين.

النتائج : ٤٧٪ من المجموعة هي بدينة لهذه البدانة علاقة بالجنس، المستوى التعليمي والعمر. مؤشر الكتلة الجسدية دليل جيد للاصابة بالسكري نمط (٢). البدانة المركزية ليست مرتبطة بالأخطار المنتسبة للبدانة.

الخلاصة : انتشار البدانة هي أعلى في العام ٢٠٠٥ مما كانت عليه في العام ١٩٩٥. يجب ان تنشر مناهج الوقاية في المدارس وفي امكنة العمل في لبنان لمكافحة وبائية السمنة.