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Metabolic syndrome and its relationship with obesity in procreative women in Morocco

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Abstract

Introduction

The objective of this study was to define the prevalence of metabolic syndrome (MS)is procreative women and its relationship with obesity in the eastern region of Morocco. The purpose of our work and to determine the prevalence of MS and its relation to obesity in the eastern region of Morocco

Materials and methods

Our study was conducted in the oriental region of Morocco (Oujda-Angad). The study included 624 women aged 20-49 years healthy and non-pregnant. Anthropometric measurements were determined according to World Hearth Organization (WHO) standards.The medical tests were conducted in a private testing laboratory in Oujda. Data of demographic and socioeconomic level were collected using a questionnaire.The data were processed on SPSS.

Results

The average age of the women surveyed was 33.42 ± 8.02 years. The BMI values indicated that the prevalence of obesity among women surveyed was 30,61% and the prevalence of overweight was 38,78%. The abdominal obesity affects 79,10% of women. The MS affects 21% (according to the definition of NCEP-ATP III) of women surveyed, while according to the definition of the International Diabetes Federation (IDF) prevalence increases to 35%. The MS increases with age, was affects 25% of women aged between 20 and 29 years, and 37,5% of women aged between 40 and 49 years. All women with MS were overweight (obesity included) (p = 0.004). With the exception of level of education all socio-demographic factors were not associated with the MS.

Conclusion

The prevalence of metabolic syndrome in our study was higher. The MS was more pronounced among obese and illiterate women. The results of this study will help in the planning of control of these problems in the future.

Keywords

Obesity, Metabolic syndrome, Women of child procreated, Morocco.

Introduction

In recent years, it has been clearly demonstrated that the metabolic syndrome is common and has an increasing prevalence worldwide, which is largely correlated with increasing obesity and sedentary lifestyles.

Visceral obesity and insulin resistance are an integral part of the mechanism implicated in the genesis and progression of the metabolic syndrome towards cardiovascular complications and type 2 diabetes. So far, the most universally accepted hypothesis for which is the pathogenesis of the metabolic syndrome is the development of insulin resistance [1].

due to the overabundance of visceral adipose tissue, (obesity android), several authors suggest from their studies that obesity android precede the appearance of other MS components [2]. The Coronary Artery Risk Development in Young Adults (CARDIA) study, conducted from 1985 to 2001 on a population of men and women aged 18 to 30 years, demonstrated that weight gain and a body mass index high risk factors for the development of a metabolic syndrome [3]. Weight gain of 4.5 kg increases risk of developing metabolic syndrome by 23%.

Studies conducted in recent years in North African countries show that MS is developing rapidly, as a result of globalization, urbanization and the socio-economic development of these countries.

Materials and Methods

Our study was conducted in the prefecture of Oujda-Angad, the capital of the region of Eastern Morocco, it is located at the northern limit-East of Morocco, This city is located 12 km from the Algerian border and 60 km from the Mediterranean coast. The area covers 1,714 km2or 2.06% of the surface area of the East. The province consists of 11 municipalities.

Urban area of the prefecture of Oujda is considered a commercial and industrial administrative center. The data from this study are from a cross-sectional survey, which took place in the prefecture of Oujda-Angad. The study included 624 women aged 20 to 49 years and healthy non-pregnant, randomly selected. Data on socioeconomic and demographic level were collected using a questionnaire. Several variables were collected to characterize the women surveyed, including age, household size, number of children, occupation, and education level, occupation of head of household and dwelling type.

Anthropometric data

Anthropometric measurements were measured according to WHO standards [5]. Weight in kg was determined by weighing a person Seca type and size by a graduated height board 1 mm Seca kind. Measuring the weight and size has allowed calculating BMI (weight in kg compared to height squared). Obesity was defined on the basis of body mass index (BMI) > 30 kg/m2 and overweight

for a BMI between 25 and 29.9 kg/m2. Waist and hip circumference were measured using a tape graduated in millimeters, respectively horizontal level of the umbilicus and the horizontal level of the maximum protrusion of the gluteal muscles, and then a waist report hip measurement was calculated. Abdominal obesity was defined a threshold TT > 88 cm or TT/TH > 0.85 [5].

Biological Data

The blood pressure (BP) was measured using a digital sphygmomanometer in women sitting position, after a rest 20 minutes. Average two spaced steps 20 minutes retained. Hypertension is defined using the World Health Organization thresholds/International Society of Hypertension (WHO/ISH): systolic BP ≥ 140 MmHg and/or diastolic BP ≥ 90 mmHg.

Diabetes and fasting hyperglycemia were determined from glycaemia Fasting using the Organization's thresholds World Health (WHO) (WHO, 2003): ≥ 1.26 g/L for diabetes, and > 1.1 to 1.25 g/L.

For hyperglycemia fasting (glucose dosage per method oxidase).

Total cholesterol was defined as any value of cholesterol Total (TB), determined by the method the enzyme cholesterol oxidase, exceeding 2 g/L (5.16 mmol/L). There HDL-C fraction was determined by precipitation with phosphotungstic acid and MgCl2. The concentration of LDL-C was calculated using the formula Friedewald. Hypertriglyceridemia was defined any value as triglycerides (assay byan enzymatic method) > 1.5 g/L. Dyslipidemia refers to a total cholesterol > 2.0 g/L and/or triglyceride levels > 1.5 g/L. The hypoHDLemie is retained as defined IDF: HDL-C < 0.50 g/L for women.

The metabolic syndrome is determined following the definition of the IDF (rate high triglycerides, low HDL-C, hypertension, fasting hyperglycemia, abdominal obesity).

The study data were entered and analyzed using SPSS Version20 for Windows. The results are expressed as mean standard deviation or percentage. The correlations between BMI, and various sociodemographic variables were assessed by the Spearman test. The chi-square test is used to compare the two percentages. The significance level was set at 0.05.

Ethics

The study was approved and conducted under the responsibility of the ethics committee of the University of Ibn Tofail (Kenitra) and had permission from the regional legal representing of the Moroccan health ministry (Oujda). Finally, an information text, prepared in Arabic and French, was distributed to eligible women and free and informed consent has been obtained on a form also prepared in Arabic and French.

The study data were entered and analyzed on SPSS software version 20 for Windows. The results are expressed as mean standard deviation, or as a percentage. Correlations are determined by the Spearman test. The Chi-square test is used to compare two percentages, while the comparison averages was made by the test Student t. The level of significance was set at 0.05.

Results Anthropometric data

The average age of women was 31.74 ± 7.15 years (Table1). According to table 2 the age of 20 years to 29 years the most represented (38.7%), more than 30% of women are illiterate, most are housewives (96.8%) and majority of women are married (96%).

		N	%
Housing size	1 à 4	268	42,95
	5 et plus	356	57,05
The household head has a profession	Oui	557	89,26
	Non	67	10,74
Socio-professional status	Active	66	10,58
	inactive	558	89,42
Marital status of women	single	23	3,69
	married	591	94,71
	widower		0,16
	divorce	9	1,44
Level of education	analphabet	173	27,72
	primary	234	37,50
	secondarily	207	33,17
	sup	10	1,60
Number of children	0	25	4,01
	1-2	378	60,58
	> 3	221	35,42
Housing type	Traditional	276	43,59
	Villa	14	2,24
	Apartment	14	2,24
	home modern	320	51,28

Table 1: Parameters anthropometric indicators of nutritional status of women aged 20 to 49 in the prefecture of Oujda-Angad.

	N	Age	Height	Weight	BMI	Waist size	Waist/hip circumference
20-29	249	24,33(3,24)	1,63(0,07)	69,55(16,13)	26,09(6,06)	95,22(11,15)	0,89(0,07)
30-39	269	33,86(2,99)	1,60(0,05)	74,18(13,60)	28,75(5,73)	102,08(10,15)	0,91(0,05)
40-49	106	44,19(5,65)	1,61(0,06)	78,24(15,97)	29,24(5,01)	106,75(11,02)	0,92(0,04)
	624	31,47(7,87)	1,62(0,06)	72,87(15,32)	27,72(5,91)	100,04(11,47)	0,9(0,06)

Table 2: Socio-demographic characteristics of women.

For married women about 51.6% are mothers of children under 2.71% of women living in households with more than 5 persons (Table 2).

The body mass index (BMI) was 27.75 kg/m2 ± 5.90 kg/m2, with a minimum of 16.71 kg/m2 and a maximum of 45.82 kg/m2. The average size is 1.61± 0.06 m with an average weight of 72.87 ± 15.32 kg (Table 1). The BMI values indicate that the prevalence of obesity and overweight among women surveyed are respectively 30.61 and 38%. The results also show that the BMI increases with the number of pregnancy ($p < 0.001$) and the number of children ($p < 0.001$).

The level of education is not involved in obesity but we note that the prevalence of obesity decreases with the level of education, 37% of women illiterate obese. We also note that 88% of working women are obese.

Biological data

Mean values for systolic BP and diastolic are 120.67 ± 17.1 mmHg and 74.2 ± 10.56 mmHg, respectively (Table 1). Prevalence Total of hypertension is 35%. Hypertension was not associated at studies (Table 3),

	doyenne	écart type	minimum	maximum
Pression systolique (mm Hg)	120,67	17,1	76	181
Pression diastolique (mm Hg)	74,2	10,56	48	98
fréquence cardiaque	82,71	11,7	55	125
Cholestérol totale (g/l)	1,66	0,33	1,22	2,41
Cholestérol HDL (g/l)	0,48	0,11	0,3	0,85
Rapport cholestérol total / HDL	3,52	0,98	1,91	6,3
Cholestérol LDL (g/l)	0,98	0,26	0,47	1,46
Triglycérides (g/l)	0,93	0,56	0,32	2,5
Glycémie à jeun (g/l)	0,96	0,29	0,71	2,57

Table 3: Biological characteristics of women aged 20 to 49 in the prefecture of Oujda-Angad.

Because the majority of women surveyed are illiterate or with an educational level primary. Furthermore, we observed that the prevalence of hypertension increases with age (Table 4), and 47% obese women with hypertension ($p = 0.01$) (Table 3). The risk of arterial hypertension in obese is multiplied by 2 (OR = 2.7 [0.95-7.61]). Hypertension is associated to the abdominal obesity ($p = 0.02$) (Table 4).

Except for study level, all sociodemographic factors are not associated with MS (Table 4).

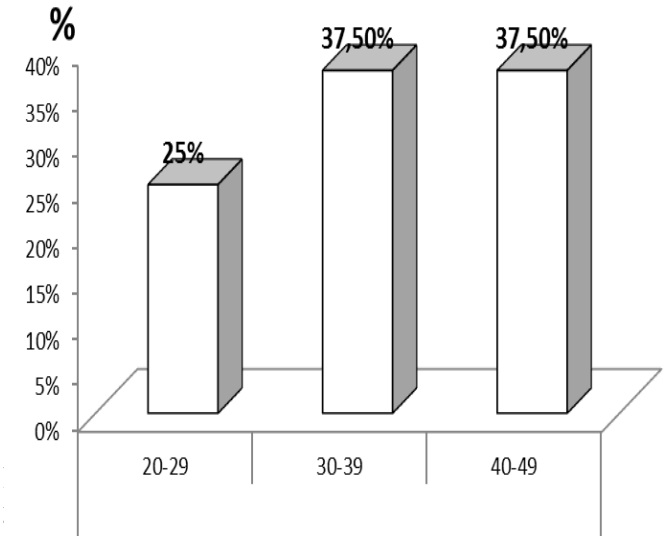
	HTA	Triglyceride	Cholesterol	Glycemia	MS
socio-professional	0,3	0,39	0,39	0,64	0.4
Marital status	0,3	0,39	0	0,64	0.4
Level of study	0,1	0,15	0,064	0,15	0.01
Occupation of the head of the household	0,9	0,03	0,64	0,27	0.42
Household size	0,9	0,65	0,65	0,1	0.5
Number of children	0,4	0,49	0.01	0,3	0.67
age	0,01	0,005	0,006	0,55	0.25
BMI	0,01	0,03	0,003	0,001	0.004
Waist size	0,03	0,07	0,07	0,23	0.03

On the other hand there is the strong association between hypertension and cholesterol total triglycerides, HDL-C and LDL-C.

The values of fasting glucose range from 0.96 ± 0.29 g/L, with a prevalence of hyperglycemia 7.2%. Hyperglycemia is associated with age ($p = 0.03$). Hyperglycemia increases with BMI (OR = 1.5 [1.05-1.57]; $p = 0.001$) it affects 25% of the obese. However, no association was found between hyperglycemia and sociodemographic factors ($p > 0.05$). (Table 3).

Hypercholesterolemia increases significantly with age ($p = 0.01$), it affects 37% of women aged 40-49, 18.8% of 30-39 and 8.33% of 20-29 ans. Distribution by BMI shows that high cholesterol increases significantly with obesity, 32% of obese women with hypercholesterolemia (OR = 3.1 [1.092-9.18] ($p = 0.02$)). Correlations associated with the marital status of women ($p = 0.04$) (Table 3). The increase in triglycerides is associated with age ($p = 0.005$) (Table 3), the age group of 40-49 years is the most affected by hypertriglyceridemia (38%), against 19% of 30-39 years ($p = 0.003$), hypertriglyceridemia is associated with BMI (OR = 2; $p = 0.001$). No association was found between hypertriglyceridemia and sociodemographic factors (Table 3). The average values of HDL and LDL were respectively 0.48 g/L, 0.11 g/L and 0.98 g/L , 0.26 g/L, the rate of LDL in the sample is normal in all women. However, low HDL levels are associated with obesity, as 15% have lowered levels of HDL ($p < 0.05$). The relationship between anthropometric indices in women and risk factors is presented in table3.

The metabolic syndrome (MS) affects 35% of women surveyed as defined in the IDF (Figure 1). The MS increases with age, it affects 25% of women between 20 and 29, and 37.5% of women aged between 40 and 49 (Figure 1).



The high prevalence of MS is due to the incidence of obesity abdominal and hypertriglyceridemia. Obesity/metabolic syndrome risk is multiplied by 3.6 (OR= 3.6 [1.34-9.6] (Figure2).

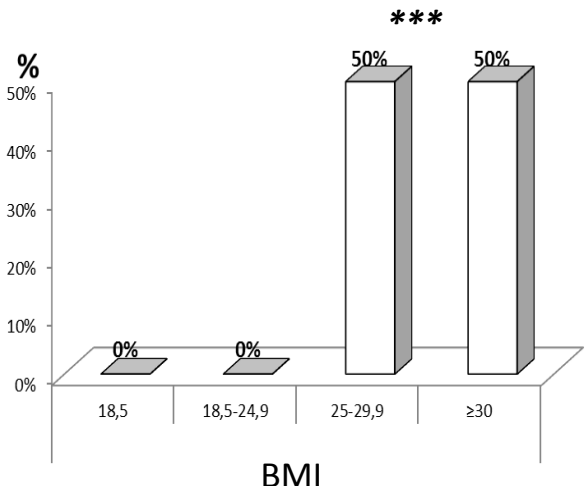


Figure 2: Distribution of the prevalence of metabolic syndrome / BMI as defined by the IDF. P <0.01.

Discussion

In recent years, Morocco has undergone a nutritional transition following economic development and urbanization, which is characterized by energy densification and the decline in physical activity. These changes have led to an increase obesity in Morocco and the associated metabolic disorder such as the metabolic syndrome. The purpose of our work and to determine the prevalence of MS and its relation to obesity in the eastern region of Morocco.

This study showed that the prevalence of obesity and metabolic syndrome are alarmingly high among women in our sample. The data from this study confirms that the nutritional transition underway in Morocco has exacerbated the heavy burden of metabolic diseases before the decline of undernutrition; We are therefore talking about the double burden of malnutrition, which is observed in Morocco and in our region (6, 7).

We have shown in a previous study that among the factors related to the development of obesity an age, marital status and urbanization (8).

According to the literature, the urban environment is characterized on the one hand by an energetic densification of the diet, and on the other hand by the sedentary lifestyle and the decrease in physical activity. This energy imbalance between the calories consumed and spent is a key element for the development of obesity and its attendant diseases.

The prevalence of MS generally increases in both poor and developed countries. Studies have shown a wide variability in the prevalence of metabolic syndrome ranging from about 4% in a rural area of Japan (9) to 63.7% in urban areas in Pakistan (10). This variability is observed in studies carried out in Morocco ranging from 16.3% to 40% (11, 12). Among the reasons for this difference is the heterogeneity of the definition used, the inclusion criteria of the sample and the difference in the prevalence of each component of the MS. For example, the prevalence of hypo HDLemia is 15% in our study but it is 75.8% in Marrakech (12). Genetic factors play an important role in the incidence of HDL deficiency. Existence of specific genes, in addition to nutrition and physical activity, and Smoking may have an effect on the prevalence of low HDL (13-14).

The results of our study showed that the prevalence of metabolic syndrome is very high in our sample and significantly increases with BMI, waist circumference, and level of study. The prevalence of MS is not associated with age. Most studies conducted before have shown that age is an important factor in increasing the prevalence of MS (15.16.17). With age, physical activity and metabolism diminish. The level of education is a risk indicator of MS in our sample. The prevalence of MS is higher among women who are illiterate or at secondary level who are in line with other studies (11).

The major reason for the increased prevalence of MS may be the rise in the prevalence of abdominal obesity observed in our study population. The prevalence of MS increases significantly with BMI, 50% of obese women in our study have MS, and this is consistent with other studies (18).

According to the literature, diet and physical activity are major factors in the genesis of obesity in Morocco and other countries of the world. In a salted flap study almost half of women (47%) have a sedentary or extremely inactive lifestyle (19). According to the HCP, the food mode of Moroccans is moving towards a Western mode (20). Average dietary energy supplies have increased from 2202 Kcal / person / day in 1970 to 3052 in 2007 (21), carbohydrate calories account for 64% of energy inputs while desirable limits are in the range of 45 to 55%, this consumption comes down to the use of sugar in tea, a national drink consumed during the whole day, moreover, the increase in the consumption of lipids, especially lipids of vegetable origin (15% in 1970 to 30% in 2007) (20). The role of dietary factors in the genesis of obesity is important and is supported by the literature (21, 22, 23). Lipids and carbohydrates, as well as foods that contain a lot of them, are particularly indexed. It is admitted that a diet high in fat and simple carbohydrates or free sugars, is associated with a high energy density, which would be associated with the development of obesity and its comorbidity process, (24; 25).

The most universally accepted hypothesis for the pathogenesis of the metabolic syndrome is the development of insulin resistance (24). Due to the overabundance of visceral adipose tissue, there is an excess of circulating free fatty acids that create insulin resistance in sensitive tissues such as liver and muscle. This relationship between visceral adiposity and insulin sensitivity has been demonstrated in humans.

Abdominal obesity is considered an essential element in Metabolic Syndrome, and is defined as the only essential component of metabolic syndrome based on the International Diabetes Federation (IDF) diagnostic criteria, (26, 27), obesity, especially abdominal obesity, is probably the leading cause of metabolic syndrome (MS), which includes insulin resistance, type 2 diabetes, hypertension, obstructive sleep apnea syndrome, non-alcoholic fatty liver disease (NAFLD) and dyslipidemia, all risk factors for cardiovascular disease (28).

Many studies (2, 30, and 32) have shown that subjects with Metabolic Syndrome have an increased risk of developing CV atherosclerosis disease. The degree of risk varies, depending on the population studied and the definition used. Using the NCEP ATP III criteria, the increased risk of CV morbidity and mortality ranges from 1.5 to 4.6. For example, in the NHANES III analysis, it was found that metabolic syndrome is associated with a two-fold increased risk of myocardial infarction (MI) and stroke.

Other factors may be nutritional status, including eating behavior and total energy consumption. However, we did not evaluate this factor.

Conclusion

The prevalence of metabolic syndrome and obesity in our population are higher. MS is more pronounced in obese and illiterate women. The results of this study will help planning to control these problems in the future to reduce obesity either through lifestyle modification (physical activity, diet) that may have an impact on MS reduction.

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