Moroccan Obese Patients with or without Metabolic Syndrome: Dietary Pattern and Risk of Cardiovascular Disease

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Objective

Metabolic syndrome (MetS) is a cluster of risk factors for cardiovascular diseases (CVD) that includes central obesity, hypertension, glucose intolerance, high triglyceride, and low high-density lipoprotein cholesterol. Its prevalence is rapidly increasing worldwide. This study aimed to identify dietary patterns in Moroccan obese patients with or without MetS and its association to CVD.

Patients & Methods

Ob without MS
n= 121
29 Men & 92 Women

241 obeses
53.97± 10.50 years

Ob with MS
n= 120
29 Men & 91 Women

Results

Table 1: Baseline characteristics of the study population

Parameters	Obese without MetS (n=121)	Obese with MetS (n=120)
Sex-ratio	0.29	0.35
Age (years-old)	52.10±9.99	54.45±9.33
BMI (Kg/m²)	33.49±3.46	34.68±4.41*
WC	108.18±7.90	111.10±9.45*
sBP(mmHg)	122.07±18.91	133.13±17.55+
dBP(mmHg)	73.48±9.81	79.43±11.78+
CRP category stratification		
CRP < 3 mg /dL (%)	36.11	34.69
CRP : 3-10 mg /dL (%)	41.67	38.78
CRP>10 mg /dL (%)	22.22	26.53
Lipidparameters		
TC (mmol/L)	4.98±0.83	5.24 ±1.10*
HDL-C (mmol/L)	1.43±0.27	1.23±0.31+
LDL-C(mmol/L)	3.01±0.78	3.12±0.95*
TG(mmol/L)	1.21±0.53	2.01±0.94+
VLDL-C(mmol/L)	0.55±0.24	0.92±0.43+
Apo AI (mg /dL)	158.61±36.70	168.42±44.10
Apo B(mg /dL)	106.45±24.47	127.01±27.28+
TC / HDL	3.60±0.87	4.47±1.23+
TG/HDL	0.91±0.53	1.80±1.16+
LDL/Apo B	1.14±0.19	1.80±1.16+
HDL/Apo A1	0.33±0.06	0.28±0.06+
Apo B / AI	0.70±0.21	0.85±0.44
Non HDL-C (mg /dL)	137.34±32.21	154.98±41.76+
AIP	-0.10±0.21	0.19±0.25+

AIP, atherogenic index of plasma; Apo, apolipoproteine; BMI, body mass index; CRP, C-reactive protein; dBP, diastolic blood pressure; HDL-C, high density lipoprotein cholesterol; LDL-C, low density lipoprotein cholesterol; MetS, metabolic syndrome; sBP, systolic blood pressure; TC total cholesterol; TG, triglycerides; VLDL-C very low density lipoproteine cholesterol; WC waist circumference.*: p<0.05; +: p<0.0001

Table 2: 24 H recall results in obese in obese patients with or without MS.

Parameters	Ob without MS (n=121)	Ob with MS (n=120)
Energy (Kcal)	2880.94±1471.33	3433.39±1910.44*
Proteins (%)	27.70±34.28	21.82±11.25
Carbohydrates (%)	49.53±28.92	47.08±13.18
Lipids (%)	39.78±65.98	31.06±12.01
Wich SFA (%)	43.53±12.56	45.65±15.48
MUFA (%)	41.96±8.66	41.77±12.19
PUFA (%)	14.52±10.03	12.57±10.15*
Cholesterol (mg)	319.88±483.59	235.17±249.66
Fibers (g)	20.58±11.45	16.64±3.57
Vitamin B9 (µg)	252.32±206.50	237.10±249.66*
Vitamin E (mg)	13.34±36.06	4.90±7.50*
Retinol (µg)	140.45±177.50	194.62±212.27**
Beta-Caroten (µg)	136.51±75.02	179.93±253.95*
Vitamin C (mg)	59.63±64.62	127.60 ± 134.02*
Magnesium (mg)	193.71±95.01	231.89±58.63*
Selenium (µg)	45.07±36.26	59.84±40.37**
Zinc (mg)	6.93±4.92	8.59±3.49*
Cooper (mg)	0.88±0.47	1.55±0.24*

SFA: Saturated fatty acids, MUFA : Monounsaturated fatty acids, PUFA: Polyunsaturated fatty acids. *: p<0.05; **: p<0.01
Obese patients with MetS presented high level in Energy, Retinol, Beta-caroten, Vitamin C, and Magnesium, selenium, zinc and cooper intakes. Nevertheless, a decreasing level of PUFA, vitamin B9 and vitamin E, in comparison with obese patients without MetS. Furthermore, the obese with MetS diet was more caloric but poorer in polyunsatured fatty acids (PUFA), in vitamin B9 and E

Table 3: Consumption frequencies of several food groups according to their nutritional benefits

Mean of intake of food rich in	Ob without MetS (n=121)	Ob with MetS (n=120)
Energy	More than 5 times /day	More than 4 times /day
Antioxidants	Many times/ day	Many times/ day
cholesterol	At least one /week	At last one / week
SFA	At least one /day	At least one /day
UFA	More than twice/day	More than twice/day
MUFA	More than twice/day	More than twice/day
PUFA	At least one /week	At least one /week
Vitamins	More than 5 times /day	More than 4 times /day
Vitamin E	More than twice/day	More than twice/day
Vitamin C	More than twice/day	More than twice/day
Trace elements	Many times/ day	Many times/ day
Magnesium	More than 5 times /day	More than 5 times /day
Zinc	More than 5 times /day	More than 6 times /day
Cooper	At least one /week	At least one /week
Selenium	More than one/day	More than twice /day
Bêta-caroten	More than 4 times /day	More than 4 times /day

SFA: Saturated fatty acids, UFA: unsaturated fatty acids, MUFA: Monounsaturated fatty acids, PUFA: polyunsatured fatty acids

Table 4: Consumption frequencies of several food groups

Mean of food intake classified in several categories	Ob without MS (n=121)	Ob withMS (n=120)
Milk and dairy products	More than twice /day	More than twice /day
Meats, fish and eggs	More than once /day	More than once /day
Fruit and vegetables	More than 4 times /day	More than 4 times /day
Fats	More than twice /day	More than twice /day
Cereals and derivates	More than 3 times /day	More than 3 times /day
Sugar and sweet products	More than 4 times /day	More than 3 times /day
Beverages	More than twice /day	More than twice /day
Spices and condiments	More than 6 times /day	More than 7 times /day
Dried fruits and seeds	At least once / week	At least once / week
Fast food	At least once / week	At least once / week

Table 5: Binomial logistic regression of lipid ratios and risks of cardiovascular outcomes.

OR(95% CI)	Presence vs. absence of MetS	Men vs. women	Number of MS components (vs. 1 MetS component)			
			2 MetS Components	3 MetS Components	4 MetS Components	5 MetS Components
TC/ HDL	2.21 (1. 65-2.95)+	1.49(1.15-1.94)**	1.47 (0.91-2.38)+	2.04(1.35-3.09)**	5.14(2.33-11.31)+	6.91(2.10-22.78)**
LDL/ HDL	1.92 (1.38-2.67)***	1.44(1.03-2.00)*	1.48 (0.86-2.56)	1.94(1.20-3.14)**	2.94 (1.41-6.16)**	5.04 (1.81-14.05)**
Non HDL-C	3.57 (1.72-7.41)+	1.51(0.70-3.29)	1.02(1.00-1.04)	3.36(1.15-9.83) *	1.03 (1.00-1.06)	1.08 (1.00-1.18)
AIP	2.09 (1.69-2.57)+	1.27(0.93-1.74)+	1.37(1.09-1.72)*	1.96(1.56-2.47)+	2.83 (1.30-6.16)**	2.89 (0.97-8.57)**
Apo B/ A1	1.42 (1.31-1.56)	0.97(0.63-1.49)	1.39(1.09-1.72)	1.51(1.20-1.90)	2.24 (0.91-5.57) *	2.40 (0.80-7.23)
Apo B/HDL	2.67(1.42-5.04)*	1.45(0.88-2.37)	1.90(0.70-5.18)	2.96(1.15-7.63) *	2.83(2.63-3.04) **	3.00(1.28-6.99)
Predicted risk of CHD	1.23 (1.15-1.31)+	1.13(1.08-1.19)+	1.27(1.10-1.46)**	1.41(1.21-1.63)+	1.59(1.30-1.96)+	1.49(1.15-1.92) **
MI	1.41 (1.25-1.59)+	1.24(1.14-1.35)+	1.53 (1.12-2.08)**	1.97(1.42-2.74)+	2.51(1.66-3.78)+	2.24(1.31-3.84) **
Stroke	1.41 (1.21-1.64)+	1.13(1.02-1.26)+	3.49(1.74-7.01)***	3.79(1.91-7.52) ***	4.02(2.64-6.19)+	4.48(1.53-13.11) **
CVD	1.12 (1.08-1.17)+	1.07(1.04-1.10)+	1.22(1.10-1.35)***	1.28 (1.15-1.43)+	1.39(1.20-1.62)+	1.33(1.10-1.61) **
CVD Death	1.27 (1.13-1.42)+	1.19(1.09-1.29)+	1.71(1.06-2.77)	2.22(1.31-3.76)	2.54(1.37-4.74) *	1.90 (1.23-2.93)

C total cholesterol; LDL, low density lipoprotein; HDL, high density lipoprotein ;AIP, atherogenic index of plasma; Apo, apolipoproteine; CHD, coronary heart disease; MI, myocardial infarction. *: p<0.05; **: p<0, 01; ***: p<0.001; +: p<0.0001
The ratio of TC/ HDL and AIP were the best predictors of MetS and their Ors were significantly higher in men than in women. All cardiovascular outcomes predicted risks were elevated with increased number of MetS components in men and participants with MetS. Lipid ratios were better predictors of cardiovascular risk.

Conclusion :

Our study shows that Moroccan obese patients with a hypercaloric diet and unbalanced fatty acids intakes, present disturbance in lipoprotein profile, with 3 to 5 components of MetS. All these parameters and disturbance may contribute to the development of CVD. The burden of CVD poses a serious public health problem in the region. It is strongly associated with dietary pattern.