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Research Article

Prevalence of Metabolic Syndrome Among Patients with Type 2 Diabetes at the Bon Samaritain University Hospital Complex in N'Djamena, Chad

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ABSTRACT

Introduction: The Metabolic Syndrome (MS) is characterized by the presence of at least three of the following five factors: abdominal obesity, hypertriglyceridemia, low HDL-cholesterol, glucose intolerance or type 2 diabetes, hypertension. It is relatively common with a prevalence that increases with age and predisposes to the occurrence of cardiovascular complications, hence the motivation of this study, the aim of which was to determine its prevalence in a Chadian population.
Method: We conducted a prospective study involving 115 subjects aged 20 to 80 received at the Biochemistry laboratory as part of a monthly visit. The anthropometric and clinical data were recorded, and the biochemical parameters were analyzed on the PENTRA C400 automaton. The MS was defined according to the criteria of the NCEP-ATP III (2001). All of these data were analyzed using Excel 2013 and IBM SPSS software.
Results: in our study the prevalence of MS is 72.2% of cases with a female predominance of 86.15% and it increases with age. The most frequent components of the metabolic syndrome were abdominal obesity (71%), arterial hypertension (45%), hypo HDL-cholesterol.
Conclusion: our results show a high prevalence of MS and its main components which are abdominal obesity, arterial hypertension, hypo HDL-cholesterol, explaining in parallel a high level of cardiovascular risk. Management should be multidisciplinary to optimize the risk of chronic complications.

Keywords: Metabolic Syndrome; Abdominal Obesity; Hypertension; Chad

INTRODUCTION

Metabolic Syndrome (MS) is characterized by the presence of several metabolic abnormalities including at least three of the five associated factors in the same individual (abdominal obesity, hypertriglyceridemia, low HDL-cholesterol, glucose intolerance or type 2 diabetes, hypertension). It is a major risk factor for cardiovascular disease and type 2 diabetes (T2DM). Added to this is the risk of chronic pro-inflammatory, pro-thrombotic conditions and non-alcoholic fatty liver disease.[1] First called syndrome X, then insulin resistance syndrome, MS has had several definitions during its evolution.[1] In the world, its prevalence varies according to the country but also according to the definitions used. In Europe, the prevalence is around 20%, whereas in the United States the figures are higher.[2] In Africa, there are few data on MS apart from a few countries such as Tunisia, Ivory Coast and Burkina where prevalence of about 7% have been reported.[3] several studies carried out both in the general diabetic population and among target groups have demonstrated the increasing frequency of metabolic syndrome and its consistent association with diabetes[4] and cardiovascular disease[5]. Worldwide, its prevalence varies not only from country to country, but also according to the definitions used.

Diagnostic criteria for MS have been proposed by many groups, including the World Health Organization (WHO, 1998), the European Group for the Study of Insulin Resistance (EGIR, 1999),[6] the American Association of Clinical Endocrinologists (AACE, 2003),[7] the National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III, 2001)[8], the National Cholesterol Education Program Revised Adult Treatment Panel III (NCEP-ATP III Revised, 2005)[9], the International Diabetes Federation (IDF, 2005),[10] and a consensus between the AHA/NHLBI and IDF (Joint Interim Statement, 2009).[11] There is agreement about the various components of MS, but there are differences in the details of the criteria used to describe them and their cut-off values.[12] Several studies conducted both in the general diabetic population and among target groups have demonstrated the increasing prevalence of metabolic syndrome and its consistent association with diabetes[13,14] and cardiovascular diseases. Globally, its prevalence varies not only between countries but also according to the definitions used.[15]

None of these definitions have been established on a sample of African, but mainly West- ern, individuals, making it difficult to choose one of the definitions for studies done in Africa.[16] This sometimes justifies the use of several definitions. Previously thought to be uncommon in Africa, numerous studies have revealed higher prevalence in various Sub-Saharan African countries, most notably in Nigeria (23%)[17] and Ghana (41.8%);[18] and in North African countries with prevalence of 39.6% and 48.5% observed in Tunisia and Morocco respectively.[19,20] Because of the rapid rise in MS, non-communicable diseases (NCDs) such.

Due to the dramatic increase in urbanization, smoking, severe stress-related problems of poverty, nutrition transition, reduced physical activity, and over nutrition increasing on top of the already high prevalence of undernutrition, sub-Saharan Africa is facing a rapid escalation of MS and noncommunicable chronic diseases and associated mortality[21] and particularly Chad, we have set ourselves the objective to determine the prevalence of the metabolic syndrome and its components in type 2 diabetics in a Chadian population.

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METHOD

Type, and study population

This was a descriptive and analytical cross-sectional study involving 115 subjects received for monthly diabetic follow-up in the laboratory of the "Le Bon Samaritain" University Hospital Complex (CHU-BS) in N'Djamena, Chad. Included in the study were all subjects who had undergone a blood test (glycaemia) provided for by this monthly medical check-up and who had consented to participate in the study. A questionnaire prepared in advance was made available to them in order to have information on their socio-demographic data. Then a clinical examination including anthropometric measurements was carried out and at the end a biochemical examination was carried out. Clinical and anthropometric data were collected on survey forms designed for this purpose. The parameters evaluated were age, sex, blood pressure and waist circumference.

For the biochemical analysis, blood samples were taken by venipuncture at the bend of the elbow in subjects who had fasted for at least 12 hours. For each patient, blood was collected in a tube containing citrate. After centrifugation, the serum was used immediately for the determination of biochemical parameters including glycaemia, triglycerides and HDL cholesterol. These assays were carried out using suitable enzymatic methods on the PENTRA C400 automaton.

All procedures were conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from each participant prior to inclusion. The study protocol was submitted to and approved by the management of the Bon Samaritain University Hospital (CHU-BS) before the start of the activities.

The metabolic syndrome has been defined according to the **(National Cholesterol Education Program); Adult Treatment Panel III** (NCEP-ATP III) criteria [10]: abdominal obesity (waist circumference > 102 cm (men); > 88 cm (women), arterial hypertension (AP ≥ 130/85 mm Hg), hypertriglycideremia (≥ 1.50 g/l), decreased HDL cholesterol (< 0.40 g/l (men); < 0.50 g/l (women) and hyperglycemia (≥ 1.10 g/l /l); subjects with at least three of these criteria were considered to have a metabolic syndrome.

Statistical analyzes

All data was entered and coded in Windows Excel 2013 and then analyzed using IBM SPSS Statistics 21.0. The comparison of the quantitative variables was made using the Student's T test, the comparison of the percentages required the chi-square test. The 95% confidence interval (95% CI) and A p value <0.05 was considered significant.

RESULTS

Our study included 115 subjects including 50 men and 65 women. It follows from Table 1 (Appendix) presenting the distribution of participants according to age groups and level of education that most of the participants were between 50-60 years (33.9%) and 60-70 years (33.9%).

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Table 1. Distribution of participants by age group and level of education

Settings		N	Percentage (%)
Age range	30-40	9	7.8
	40-50	21	18.3
	50-60	39	33.9
	60-70	39	33.9
	70-80	7	6.1
Level of education	Superior	46	40.0
	Secondary	27	23.5
	Primary	7	6.1
	No schooling	35	30.4
Total		115	100

Furthermore, 40% of the participants have a higher level of education, 23.5% have a secondary level, 6.1% have a primary level of education, and finally 30.4% are unschooled. A female predominance was observed (Figure 1).

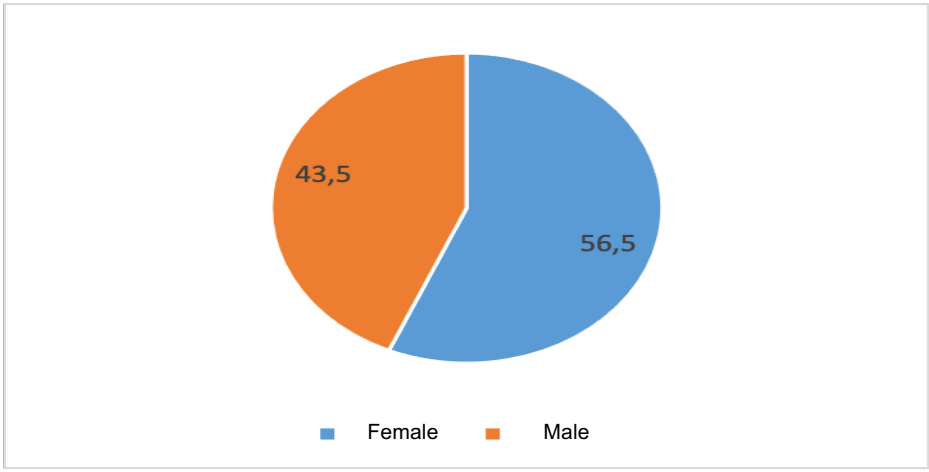

Figure 1. Breakdown of Study Participants by Gender

The breakdown of participants by sex shows a predominance of women, with 65 women (56.5%) and 50 men (43.5%). This predominance is still feminine in terms of the presence or absence of SM in this population (Table 2).

Table 2. Distribution of participants by gender and by presence or absence of SM.

Sex	N Attendees	Presence of SM	% Presence of SM	Absence of SM	% Absence of SM
Female	65 (56.5%)	59	51.3	6	5.2
Male	50 (43.5%)	24	20.9	26	22.6
Total	115 (100%)	83	72.2	32	27.8

The prevalence of MS in our study population is 72.2%, among the elements that compose it, hyperglycemia and hypo HDL-cholesterol were the two criteria mainly present with 88% for

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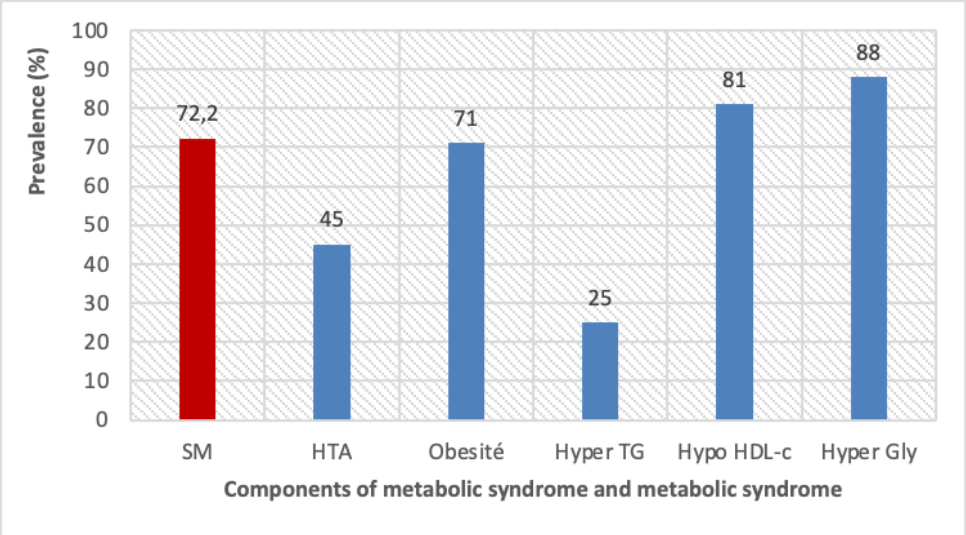
hyperglycemia, 81% for hypo HDL-cholesterol followed by abdominal obesity (71%), and arterial hypertension (45%), in the end hypertriglyceridemia was noted in (25) % (Figure 2).



Metabolic Syndrome, HTA= arterial hypertension, TG= triglycerides, Gly = blood sugar, HDL-c= high density lipoprotein cholesterol

Figure 2. Prevalence of Metabolic Syndrome and its components in the study population

Of the 83 patients identified with metabolic syndrome (MS), 39 (34%) met 3 diagnostic criteria, while 27 (23%) fulfilled 4 criteria and 17 (15%) met all 5 criteria. In addition, 17% of the study population presented 2 criteria, indicating a group at high risk of progression towards full MS (Table 3).

Table 3. Clinico-biochemical profile of participants according to the number of metabolic syndrome criteria

Settings	N attendees	Percentage
1 criteria	13	11%
2 criteria	19	17%
3 criteria	39	34%
4 criteria	27	23%
5 criteria	17	15%
Total	115	100%

41.7% of the study population practices at least one physical activity against 58.3% of those who do not practice any physical activity (Table 4).

DISCUSSION

The prevalence of MS varies greatly depending on the diagnostic criteria used. The prevalence rates with WHO were 44.8%, 39.7% with revised NCEP-ATP, 33.1% with JIS, and 31.6% with JIS. NCEP-ATP scored 29.3%, while IDF scored 29.3%. Although no statistically-

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Table 4. Representation of study participants according to alcohol or tobacco consumption and physical activity

Settings		Workforce	Percentage (%)
Physical activity	No	67	58.30%
	Yes	48	41.70%
Total		115	100.0%

- significant difference was found, the higher prevalence obtained with IDF definition in study could be attributed to the fact that, unlike the other definitions, this definition includes BMI as a diagnostic criterion for MS, which is the most important risk factor in the African population.[10]

In Chad, despite the seriousness of MS, we have little data on its prevalence. We found in this study which aimed to determine the prevalence of MS a rate of 72.2% (Figure 2) this result agrees with the data of the literature. In Burkina, in a study by.[11] The association diabetes mellitus and metabolic syndrome was reported in 48.9% among type 2 diabetic subjects. According to,[12] the prevalence of metabolic syndrome varies from 34% to 80% among diabetics, thus reflecting the importance of the problem.

Our results are much higher than those reported in Côte d'Ivoire (4.94%).[13] On the other hand, prevalence approaching ours were found in France (20%)[14] as well as in Kuwait (39.19%).[15] The gender distribution of MS prevalence showed that women had a higher prevalence (71.08%) than men (28.91%) (Table 2). Previous studies conducted on the African continent have shown similar results.[16,17] This could be explained by the obesity epidemic, which is a major risk factor for MS and predominantly affects women.[22] Menopause, polycystic ovarian syndrome, and low physical activity are additional risk factors that could explain this high prevalence in this population group, indeed in Chad women are faced with multiple challenges, particularly in terms of access to education, physical activities and health services (Unesco 2016). This result agrees with the work of Ba. (2012) in Senegal who found a frequency of 58% in the type 2 diabetic population. This trend has been reported in Tunisia.[23] However, a higher prevalence among men has been reported in Dakar.[24] On the other hand, no significant difference was observed between the two sexes in Greece.[25] Thus, the distribution of the prevalence of MS according to sex differs from one study to another.

The average age of the participants was 60 years old with extremes ranging from 30 to 80 years old. The predominant age group was 50-70 years old with a frequency of 67.8% (with 33.9% from 50-60 years old and 33.9% from 60-70 years old) this could be explained by aging of the population studied. This increase in the prevalence of MS with age is therefore in agreement with the data in the literature. It could be linked to the higher frequency of metabolic disturbances in the elderly,[26] However, the emergence of MS in adolescents should be noted, as evidenced by studies carried out in the United States,[12] and in Canada.[23,27] According to these authors, obesity would play an essential role.

According to the number of associated criteria, we found in most subjects presenting MS, the association of 3 criteria (34%) (Table 3). These results control the data from the literature which shows that the association of three components is always the most frequent.[28] However, it is important to note that 19 subjects (17%) of the total population already presented 2 criteria (Table 3). These should be carefully monitored to avoid progression to metabolic syndrome.

Nevertheless, our study had some limitations, namely: its short duration which did not allow us to investigate other possible factors that could be associated with the metabolic syndrome; the difficulty of collecting anthropometric data in some patients (ethical and religious problem) and the lack of additional examinations (lipidogram) often necessary for diagnosis. Moreover, our sample does not reflect all strata of Chadian society.

A multicenter study should therefore be considered to have exact figures on the prevalence of MS in Chad.

CONCLUSION

At the end of this study, the objective of which was to assess the prevalence of the metabolic syndrome, the results show a high prevalence of MS in the population studied, particularly among women. The metabolic syndrome, in view of the entities that compose it, makes it a real cardiovascular risk factor and therefore a major public health issue. The management of this metabolic syndrome requires emphasizing the proper monitoring of diet and physical activity in addition to drug treatment for a significant improvement in the various parameters.

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Declarations

Authors' contribution

ZAN, BBO and VC designed this survey. SNY, KD, and AA, collected the original data. SNY, ADD and KD analyzed the data. NYS, AA, and KD, contributed to the interpretation of the data. ALDW, BBO, DDA, GC, NYS, and VC contributed to the writing of the article. SA, contributed equally to this study. All the authors have read, edited and contributed to the content of this manuscript.

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Conflict of interest

There is no conflict of interest in this research.

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