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# Obesity, Central Obesity, Overweight and Diabetes: Women are the Most Affected in Burkina Faso

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## Abstract

**Objective:** To determine the importance of obesity and analyze the relationship between general obesity and central obesity in persons with diabetes monitored in Bobo-Dioulasso teaching hospital.

**Methods:** We used a sample of 380 persons with diabetes recruited through a study on compliance with follow-up examinations. Overweight and obesity were researched using the Quételet index, or Body Mass Index [BMI], which is defined as the individual's mass divided by the square of their height, as well as waist size. Univariate analysis and multivariate regression were used [p<0.05].

**Results:** We found that 22.6% were obese [n=86], 29.2% were overweight [n=111] and 65.3% had central obesity [n=240]. The majority of obese [98.8%] and overweight cases [87.4%] and also 40.0% of those with normal BMI [n=160] and 8.6% of underweight cases [n=23] had central obesity. Being a woman was associated with general and central obesity. In a univariate analysis, obese were more likely to be woman, educated, have low incomes, reside in urban areas and have central obesity and a metabolic syndrome; central obesity is associated with being a woman, having a low income, residing in an urban area and having hypertension, obesity and a metabolic syndrome. In a multivariate analysis, being a woman, educated and having central obesity was found to be associated with obesity. On the other hand, being a woman, residing in an urban area and having hypertension, obesity and a metabolic syndrome remained associated with central obesity.

**Conclusion:** Obesity, and above all, central obesityis a big problem in persons with diabetes, particularly in women in Bobo-Dioulasso, and waist size seems to be a better measurement compared to BMI. These results call for more organized diabetes care and prevention in Burkina Faso.

**Keywords:** Obesity; Central obesity; Diabetes; Women; Burkina faso

## Introduction

Obesity is one of the main determinants of the occurrence of cardiovascular diseases, arterial hypertension, diabetes and metabolic syndrome [1-4]. In persons with diabetes, obesity further increases the risk of the occurrence of cardiovascular diseases [5]. Thus, nowadays, it is recommended that obesity be prevented through nutrition education and regular exercise in order to reduce the risk of diabetes and cardiovascular diseases.

Obesity can be studied using several indicators, including Body Mass Index [BMI], abdominal circumference, waist size, abdomen-to-waist ratio and abdomen-to-height ratio. Studies have shown that the measures of central obesity such as abdominal circumference, waist size, abdomen-to-waist ratio and abdomen-to-height ratio are better risk indicators for cardiovascular diseases than BMI [6-15] et are better able to predict diabetes [16-18].

In Africa, several studies have shown that the prevalence of obesity, overweight and excess weight as determined by BMI varies, but that women are predominately affected by obesity [19-24]. In Burkina, the presence of obesity and overweight are a reality, and numerous studies support this finding. In fact, in the city of Ouagadougou, the prevalence of adult overweight [BMI > 25 kg/m$^2$] is estimated to be between 34 and 36% in women, between 14 and 16% in men [25,26] and at 8.7% in students between 13 and 25 years old [27]. In adults, the prevalence of obesity [BMI 30 kg/m$^2$] is 5.5% in men and 21.9% in women [28]. In persons with diabetes monitored at the Yalgado Ouédraogo University Hospital in the same city there is 17$^{th}$ years ago, the prevalence of overweight and obesity in men and women was estimated to be 34% and 28%, respectively [29]. In Bobo-Dioulasso, Burkina's second city, few publications exist on the impact of obesity in both the general population as well as in persons with diabetes.

In order to fill this gap in studies that exist on obesity in Bobo-Dioulasso, the objective of this study is to analyze the relationship between general obesity and central obesity in persons with diabetes. The results provide guidance to launch a campaign to prevent the occurrence of cardiovascular diseases in the city as well as the whole western region of Burkina Faso.

## Methods

We conducted a descriptive cross-sectional study with a sample of 380 consenting persons with diabetes, monitored in Bobo-Dioulasso teaching hospital and recruited on an ongoing basis through a study on

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compliance with para-clinical monitoring. Assuming that at least 50% of people with diabetes accede to the para-clinical monitoring, with an accuracy of 5% and an alpha error of 5% [IC to 95%], we selected a sample of 388 persons with diabetes; 8 of them were not weighed because of their bedridden state. They have not been taken into account in the assessment of obesity.

We collected information in individual records about each person with diabetes' socio-demographic characteristics, knowledge of cardiovascular risk factors, exercise habits, follow-up examinations, weight, height and waist size.

Obesity was determined using the Quételet index, or Body Mass Index [BMI], which is defined as the individual's mass divided by the square of their height, as well as waist size. A person was considered overweight if their BMI was greater than or equal to 25 kg/m² and less than 30 kg/m². Central obesity was defined as a waist size of greater than or equal to 94 cm in men and 80 cm in women.

A descriptive analysis of the data was performed, followed by a study of the relationship between overweight, general obesity, central obesity and characteristics of persons with diabetes, using Pearson's Chi-squared test with a statistical significance of 5%.

## Results

### Socio-demographic characteristics

The average age of the 380 persons with diabetes was 53.2 years [95% CI: 51.9 - 54.5]. Persons with diabetes at or over the age of 40 years represented 85.8% of the cases. The average age at the discovery of diabetes was 48.2 years [95% CI:46.8 - 49.5]. There were 224 female participants, representing 58.9% of the sample population and giving a sex ratio of 0.7. In terms of occupation, 152 were housewives [40.0%], 68 salaried employees [17.9%], 47 traders [12.4%], 46 farmers/shepherds [12.1%], 43 retirees [11.3%], 7 high school or university students [1.8%] and 17 unemployed [4.5%]. Persons with diabetes who were educated represented 43.2% of the sample population [n=164], and urban residents represented 85.3% [n=324]. In terms of support for care, only 6 persons with diabetes [1.6%] benefited from health insurance.

### Importance of overweight and obesity based on BMI

BMI varied from 13.4 to 55.4 kg/m² with an average of 25.9 kg/m² [95% CI: 25.4 - 26.5 kg/m²]. The distribution of persons with diabetes based on their BMI indicates that more than half of them [51.8%] had excess weight [BMI over 25/kg/m²]. Among those who had excess weight, we found that 86 [22.6%] were obese and 111 [29.2%] overweight (Table 1). We found that 5.8% of obese had a BMI over 40 kg/m².

### Importance of central obesity

Waist size was measured and varied from 53 cm to 181 cm, with an average of 91.3 cm [95% CI: 89.9 - 92.7 cm]. Two-hundred forty eight [248] persons with diabetes [65.3%] were considered to have central obesity.

### Obesity based on BMI and waist size

Table 2 gives the distribution of persons with diabetes based on BMI and central obesity. There is a statistically significant relationship between BMI and central obesity [p<0.001]. We found that 98.8% of those considered obese, 87.4% of those considered overweight, 40.0% with normal BMI and 8.6% of those who are underweight have central obesity.

### Obesity, central obesity and persons with diabetes' characteristics

Table 3 shows the distribution of persons with diabetes based on obesity, central obesity and other characteristics included in our study in a univariate and multivariate analysis.

Persons with diabetes who are obese are more likely to be woman, educated, have low incomes, reside in urban areas and have central obesity and a metabolic syndrome.

We found that central obesity is associated with being a woman, having a low income, residing in an urban area and having hypertension, obesity and a metabolic syndrome.

In a multivariate analysis, being a woman, educated and having central obesity was found to be associated with obesity. On the other hand, being a woman, residing in an urban area and having hypertension, obesity and a metabolic syndrome remained associated with central obesity. We found relation between general and central obesity but only central obesity was associated to the metabolic syndrome and hypertension.

## Discussion

In total, we found that 22.6% of persons with diabetes have general obesity, 29.2% are overweight and 65.3% have central obesity. The majority of persons with diabetes with general obesity [98.8%] and who are overweight [87.4%] and even the 40.9% who have a normal BMI and the 8% that are underweight have central obesity.

In a multivariate analysis, being a woman, educated and having central obesity was found to be associated with obesity. On the other hand, being a woman, residing in an urban area and having hypertension, obesity and a metabolic syndrome remained associated with central obesity.

In our study, we found that obesity was a major problem in persons with diabetes. In fact, 1 in 5 persons with diabetes had general obesity and nearly 1 in 3 had central obesity. This calls for the prioritization of a campaign for persons with diabetes in our practice in order to prevent the occurrence of cardiovascular diseases. In comparing our results to those of other African studies, the global prevalence of obesity in our study was higher than the 16% reported in Ivory Coast [30] and lower than the 34.72% reported in Burundi [31] and the 28%

| BMI | Frequency | Percentage |
|---|---|---|
| <18 | 23 | 6.1 |
| 18-24.9 | 160 | 42.1 |
| 25-29.9 | 111 | 29.2 |
| 30 and over | 86 | 22.6 |
| Total | 380 | 100.00 |

**Table 1:** Distribution of persons with diabetes monitored at CHU-SS in Bobo-Dioulasso based on BMI, 2011.

| | BMI | | | | |
|---|---|---|---|---|---|
| **Central Obesity** | <18 | 18-24.9 | 25-29.9 | 30 and over | Total |
| No | 21 | 96 | 14 | 1 | 132 |
| Yes | 2 | 64 | 97 | 85 | 248 |
| **Total** | 23 | 160 | 111 | 86 | 380 |

Pearson chi² =144.235 Pr=0.000

**Table 2:** Relationship between Body Mass Index (BMI) and Central Obesity in persons with diabetes at CHU-SS in Bobo-Dioulasso, 2011.

| | Number of cases (N=380) | Obesity | | | | Central Obesity | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Characteristics** | | % | Crude OR [95% CI] | OR adjusted [95% CI] | p | % | Crude OR [95% CI] | OR adjusted [95% CI] | p |
| **Sexe** | | | | | | | | | |
| Male | 156 | 4.5 | 1 | | | 32.2 | 1 | | |
| Female | 224 | 35.3 | 11.6 [5.2 - 25.9][a] | 5.6 [2.2- 14.4] | **0** | 88.4 | 16.1 [9.5 - 27.4][g] | 19.9 [8.3 – 47.9] | **0** |
| **Age** | | | | | | | | | |
| < 40 years | 54 | 22.2 | 1 | | | 53.7 | 1 | | |
| 40 and over | 326 | 22.7 | 1.0 [0.5 - 2.0] | | | 67.2 | 1.8 [0.9 – 3.2] | | |
| **Income** | | | | | | | | | |
| Yes | 204 | 18.1 | 0.6 [0.4 - 0.9][b] | | 0.3 | 53.9 | 0.3 [0.2 – 0.5][h] | | 0.2 |
| No | 176 | 27.8 | 1 | | | 78.3 | 1 | | |
| **Residence** | | | | | | | | | |
| Urban | 324 | 25 | 1 | | | 71.3 | 1 | | |
| Rural | 56 | 8.9 | 0.3 [0.1 - 0.7][c] | | 1 | 30.4 | 0.2 [0.1 – 0.3][i] | 0.2 [0.09 - 0.6] | **0.002** |
| **Educated** | | | | | | | | | |
| Yes | 164 | 29.9 | 2.1 [1.3 - 3.3][d] | 1.9 [1.1 - 3.5] | **0.02** | 70.7 | 1.5 [0.9 – 2.4] | | |
| No | 216 | 17.1 | 1 | | | 61.1 | 1 | | |
| | **Number of cases (N=380)** | **Obesity** | | | | **Central Obesity** | | | |
| **Characteristics** | | % | Crude OR [95% CI] | OR adjusted [95% CI] | p | % | Crude OR [95% CI] | OR adjusted [95% CI] | p |
| **Exercise** | | | | | | | | | |
| Yes | 26 | 19.2 | 1 | | | 69.2 | 1 | | |
| No | 354 | 22.9 | 1.3 [0.5 – 3.4] | | | 65 | 0.8 [0.3 – 1.9] | | |
| **Hypertension** | | | | | | | | | |
| Yes | 214 | 24.3 | 1.3 [0.8 – 2.0] | | | 74.8 | 2.6 [1.7 – 4.1][j] | 3.1 [1.6 – 5.8] | **0** |
| No | 166 | 20.5 | 1 | | | 53 | 1 | | |
| **Metabolic syndrome** | | | | | | | | | |
| Yes | 184 | 31 | 2.6 [1.6 – 4.3][e] | | 0.1 | 94 | 1 | | |
| No | 196 | 14.8 | 1 | | | 38.3 | 0.3 [0.2 – 0.4][k] | 0.3 [0.2 – 0.6] | **0** |
| **Central Obesity** | | | | | | | | | |
| Yes | 248 | 34.3 | 68.3 [9.4 – 497.2][f] | 31.6 [4.1-241.6] | **0.001** | | | | |
| No | 132 | 0.8 | 1 | | | | | | |
| **Obesity** | | | | | | | | | |
| Yes | | | | | | 98.8 | 68.3 [9.4 – 497.2][l] | 41.5 [5.1 –340.7] | **0.001** |
| No | | | | | | 55.4 | 1 | | |

a: p=0.000 b: p=0.02 c: p=0.008 d: p=0.003 e: p=0.000 f: p=0.000
g: p=0.000 h: p=0.000 i: p=0.000 j: p=0.000 k: p=0.000 l: p=0.000

**Table 3:** Obesity, overweight based on BMI, central obesity and characteristics of persons with diabetes in Bobo-Dioulasso, Burkina Faso, 2011.

reported in Ouagadougou [29]. The difference between the results could be explained by different nutritional contests and lifestyle in the various cities. Regardless of the study, the significance of obesity and overweight in persons with diabetes is a reality in Africa.

The prevalence of central obesity was 65.3% while the prevalence of general obesity was 22.6%. In population based studies in African region and elsewhere, central obesity was found more frequent than general obesity [32,33]. In addition, our study population is people with diabetes. Diabetes is known to be strongly associated with central obesity rather than general obesity, which would explain our observation [34].

Generally, the majority of those who were considered obese as well as those who were overweight had central obesity. On the other hand, 40.0% of those with a normal BMI and 8.6% of those who were underweight also had central obesity. In multivariate analysis we found relation between general and central obesity but only central obesity was associated to the metabolic syndrome and hypertension. These results confirm that central obesity is the best measure of obesity as a risk factor for cardiovascular complications [6-15]. It must be recommended as a measure instead of BMI, which leaves many persons with diabetes at risk for undiagnosed cardiovascular diseases.

General obesity and central obesity were more significant in women than in men in our study. The same observation was made in several studies in persons with diabetes in Cameroon, Kenya, South Africa, Tanzania and Zimbabwe [19-24]. The difference between men and woman could be explained in our case by the more frequent exposure of women to sugary and greasy foods at ceremonies like marriages and baptisms. In addition, with the advent of mopeds, few women who live in cities exercise regularly. Finally, the perception that excess weight is related to good living conditions means that women have the tendency

to gain weight after getting married, a sign of a better quality of life in their household. In Kenya, a population study found that more than half of people who are overweight underestimate their weight, and that in all weight categories based on BMI, more than a third preferred to be in the overweight or obese categories [35]. It emphasizes the necessity of educating and raising awareness about excess weight and its relationship to the occurrence of cardiovascular diseases, particularly of people implicated in meal preparation in Africa.

The distribution of obesity based on BMI in persons with diabetes based on their residential zone which we found in this study in univariate analysis has also been reported in several studies in Africa. But in our study, only central obesity is associated to patient residence. In Cameroon, Kenya and Tanzania [19,20,22], persons with diabetes who live in urban areas were more obese than those living in rural areas. The difference between urban and rural areas could be explained by the difference in lifestyles. In Burkina Faso, a study found that for pregnant women living in rural areas [36] and those considered obese living in cities, high-calorie diets were related to modern foods that are more commonly found in cities than in rural areas [25]. In addition, the difference in access to modern means of transportation which are found in cities, expose more urban residents to sedentary lifestyles.

We found in our study that central obesity was related to low incomes, which can be taken as a proxy indicator for socio-economic status. Our finding seems contrary to what has been found in Ouagadougou and elsewhere in Africa where in the general population, obesity is linked to better living conditions [28,37]. The difference in the sex ratio in our study could explain the difference.

## Conclusion

The results of our study show that obesity, overweight and central obesity affect more than half of the persons with diabetes in Bobo-Dioulasso, especially women; and confirm that central obesity is the best measure of obesity as a risk factor for cardiovascular complications. That calls for the urgent creation of a nutrition and cardiovascular diseases prevention program in our setting.

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