

Sleep Apnea Syndrome in Type 2 Diabetic African in Benin: Prevalence and Associated Factors

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Abstract

Background: Sleep Apnea Syndrome (SAS) is a public health issue because of its increasing incidence especially in type 2 diabetes, its impact on daily life quality and its complications.

Objective: To determine the prevalence and clinical presentation of the SAS in type 2 diabetes in Benin.

Patients and Methods: This was a cross multicenter, descriptive and analytical study which has as framework, the insulin Bank of Cotonou, the Polyclinic of Atinkanmey and the Departmental Hospital of Oueme-Plateau (CHUD-OP). The study covered six-month (March to August 2014), and included all type 2 diabetics who have given their consent for the ventilatory polygraphy. The diagnosis of Sleep Apnea Syndrome (SAS) was selected when the apnea hypopnea index (AHI) is greater than 5 per hour of sleep.

Results: During the study period, 79 patients were included. Among them, 74.7% were female; the sex ratio was 0.33. The average age was 54.6 ± 9.8 years. The SAS was present in 53.2% of diabetics included. Among the diabetics who experienced an SAS, 73.8% had mild SAS, 14.3% had moderate and 11.9% had severe SAS. The SAS was predominantly obstructive (95.2%). The risk factor significantly associated with SAS was the age over 60 years (OR = 3.5 [1.3 to 9.9]; $p = 0.013$).

Conclusion: The SAS is revealed in our black African setting to be a public health issue due to its high frequency especially in type 2 diabetic and should be considered in the evaluation of type 2 black African diabetics.

Keywords: Sleep Apnea Syndrome; Type 2 diabetes; Prevalence

Framework and Methodology

Study Framework

This is a multi-centre study which had the framework:

- “Banque d’insuline” in Cotonou : the screening, treatment and monitoring center of diabetic;
- Polyclinic Atinkanmey (PA) is a multipurpose clinical Cotonou
- The internal medicine department of Ouémé plateau departmental teaching hospital (CHUD-OP).

Study Method

This was a descriptive and analytical cross sectional study. The study was conducted over a period of six (6) months, from March to August, 2014.

We included patients with type 2 diabetes followed in the centres during the study period. The diagnosis of type 2 diabetes was confirmed by a diabetologist and the patients who monitored and treated as such were included in the study, type 2 diabetic monitored regularly in the centres and who have given their consent for recording ventilatory polygraphy. Patients with other types of diabetes were excluded.

The study was proposed to the patient by two endocrinologists during their consultation. Informed consent of the patient is collected. The questionnaire for this purpose is filled on the basis of the examination of the physical examination and the clinical record of the patient. An appointment is then given to the patient to achieve the polygraphic recording over a period of at least 6 hours of sleep. The analysis of the recording was done by qualified pulmonologist internist in the treatment of sleep apnea syndrome.

The ventilatory polygraph was conducted using three devices sleep tester LS 300; it records nocturnal Type III with at least four recorded signals such as naso-oral air flow, breathing movements, oximetry and heart rate.

Thus, 79 type 2 diabetic patients were included. Among them, 57 were included at the insulin bank, 10 at the polyclinic and 12 at Atinkanmey CHUD-OP.

The variables studied were:

- Demographic (age, gender, ethnicity, occupation, marital status, level of study)
- Related field (seniority diabetes, family history of diabetes, high blood pressure (hypertension), current treatments for diabetes)
- Clinical parameters (BMI classified according to WHO,

Introduction

Diabetes mellitus is a major public health problem, particularly type 2 diabetes that fits most often in the context of metabolic syndrome. Like diabetes and obesity, sleep apnea syndrome is associated with an excess risk of major cardiovascular events in the general population.

The link between SAS and type 2 diabetes has been demonstrated in several studies [1-3]. This link is not only associated with obesity, common risk factor for both diseases, but also can be related to hypoxemia caused by the SAS [4].

In Africa, especially in sub Saharan Africa, sleep apnea syndrome is not well known by actors of the health system and there is no published study on the subject as there is no organized structure screening and assumption.

Taking advantage of a first SAS management experience in Benin, we studied the prevalence of sleep apnea syndrome in type 2 diabetic African.

waist circumference (WC) classified according to the IDF, sedentary lifestyle, neck circumference, sleepiness)

- Apnea Hypopnea Index (AHI).

BMI was classified according to WHO criteria (normal: 18 to 24.99 kg / m²; Overweight: 25 to 29.99 kg / m²; Obesity grade 1: 30 to 34.99 kg / m²; obesity grade 2: 35- 39.99 kg / m²; Obesity grade 3: ≥ 40 kg / m²).

Abdominal obesity was defined according to IDF 2005 (WC > 94 cm in men and WC > 80 cm in women).

Epworth Sleepiness Scale (ESS) was used to assess Sleepiness (< 8: no sleep debt; 9-14: sleep deprivation; > 15: excessive daytime sleepiness)

The definition of sleep apnea syndrome is based on apnea hypopnea index; AHI is the number of respiratory events per hour of sleep. When AHI is less than 5, there is no SAS; 5 to 15, the SAS is mild; 15 to 30, the SAS is moderate and when the AHI greater than or equal to 30 SAS is severe.

Data was entered and analyzed using SPSS 18.0 software. Categorical variables were expressed as a percentage and quantitative variables averaged together with a standard deviation. Differences in proportions were compared with a χ^2 test or Fisher's exact test where values are five or less; the means were compared using ANOVA. The association between SAS and investigated factors was also studied by calculating the odd ratio (OR) with 95% confidence interval. Probability values of $p < 0.05$ were considered significant.

Results

Main Features

Demographics: Of the 79 type 2 diabetes patients who were included in the study, 20 (25.3%) were male and 59 (74.7%) females with a sex ratio of 0.33.

The average age was 54.6 ± 9.8 with extremes of 33 and 87 years (table 1), 59 (74.7%) lived with a partner and 8.9% were divorced.

On a professional level, 34.2% were housewives, 30.4% were employed, 24.0% were traders or resellers and 11.3% were craftsmen.

Clinical features: Among the 79 diabetics included, 35 (44.3%) were obese (BMI greater than or equal to 30 kg / m²) and 38% were overweight. Abdominal obesity was present in 89.9% of patients.

Diabetes was old and followed for over 10 years in 38 people (48.1%); 25% had a good balance of diabetes. 57 patients (72.2%)

were on oral antidiabetic treatment (ADO), 11 (13.9%) were on insulin and the remainder (13.9%) in the combination of ADO and insulins.

Hypertension was present in 55 patients (69.6%); 28 patients (35.4%) were sedentary.

The sleep apnea syndrome

Epworth Sleepiness Scale (ESS): Of the 79 patients included in the study, 62 responded to all the items of the questionnaire. According to ESS, 24 diabetics (38.7%) had a sleep deficit and 7 (11.3%) had excessive daytime sleepiness.

Prevalence, type, severity and associated factors

Prevalence: Among the 79 patients with type 2 who underwent a polygraph recording, 42 had an AHI higher than 5; SAS prevalence among diabetics was included and 53.2%.

SAS Type: Of the 42 type 2 diabetes patients who developed SAS, the majority (95.2%) had a SAS predominantly obstructive (OSA), and 2 (4.8%) had a center-weighted SAS (SACS). None of the patients had a mixed SAS (SAMS).

SAS Severity: Of the 42 diabetic patients with SAS, 31 (73.8%) had mild SAS, 6 (14.3%) and 5 (11.9%) had severe SAS. The mean AHI was 13.9 ± 12.2 / hour with extremes of 5.40 and 63.3 (table1).

Relationship between SAS and settings

Table 2 summarizes the factors associated with SAS. Sleep apnea syndrome is significantly associated with age; there was no significant association of SAS with sex, obesity, abdominal obesity and physical inactivity. In other hand, the table 1 shows that the mean of age, of waist circumference, of neck circumference and of AHI were greater in SAS people than those without SAS.

Discussion

Socio-demographic characteristics of the study population

We observed a female predominance with a sex ratio at 0.33. This female predominance is more pronounced than those reported by Foster GD et al. [5] in 2009 to 60% in women. The female preponderance could be explained by the constraint of the polygraphic recording and thereby illustrates the prevalence of household women and merchants included; these two occupational categories are autonomous and run by women.

The average age was 54.6 ± 9.8 with extremes of 33 and 87 years. In Germany, Sanner BM, et al. [6] in 2003 had found a similar

	Total n = 79	SAS *		p*
		Present n = 42	Absent n = 37	
Age (year) $\pm ds$	54.6 ± 9.8	58.2 ± 8.6	50.4 ± 9.5	0.000
BMI (Kg/m ²) $\pm ds$	29.4 ± 5.4	30.4 ± 5.6	28.2 ± 5.1	0.088
WC (cm) $\pm ds$	101.1 ± 15.3	105.3 ± 17.1	96.4 ± 11.7	0.009
Neck circumference (cm)	35.3 ± 3.4	36.0 ± 2.8 (42)	34.4 ± 2.8 (37)	0.045
ESS	8.1 ± 5.2	8.3 ± 5.4 (40)	7.9 ± 5.0 (37)	0.715
HbA1C (%) N = 60	8.4 ± 2.1	8.6 ± 2.2 (37)	8.2 ± 1.9 (23)	0.549
SBP (mmhg) N = 79	133.8 ± 20.6	138.0 ± 19.7 (42)	129.0 ± 20.8 (37)	0.052
DBP (mmhg) N = 79	80.2 ± 20.2	80.7 ± 12.3 (42)	79.6 ± 12.2 (37)	0.685
AHI N = 79	8.6 ± 10.6	13.9 ± 12.2 (42)	2.4 ± 1.3 (37)	0.000

Table 1: Differences between patients with and without SAS by comparing some average

SAS: Sleep Apnea Syndrome; BMI: Body Mass Index; * to estimate mean difference (p) the Student t test was used, while for difference of proportions χ^2 or Fisher exact test was used for estimating and OR, whit IC 95%

Associated Factors		SAS		OR	IC (95%)	p *
		Present	Absent			
Gender	Male	14	6	2,6	0.9-7.6	0.082
	Female	28	31			
Age (years)	≥ 60	19	7	3,5	1.3-9.8	0.013
	< 60	23	30			
Obesity	IMC ≥ 30	20	15	1,3	0.5-3.3	0.527
	IMC < 30	22	22			
BMI* (kg/m ²)	< 25	5	9	1		
	25-30	17	13	2.4	0.6-8.7	0.331
	30-40	18	15	2.2	0.6-7.8	0.341
	> 40	2	0	-	-	0.175
Abdominal obesity	Yes	37	34	0.6	0.1-3.7	0.716
	No	5	3			
Sedentarity	Yes	17	9	2.3	0.8-6.1	0.094
	No	23	28			
Hypertension	Yes	37	18	7,8	2.5-24.3	0.000
	No	5	19			

Table 2: Breakdown of factors associated with SAS

SAS: Sleep Apnea Syndrome; BMI: Body Mass Index; * to estimate mean difference (p) the Student t test was used, while for difference of proportions X2 or Fisher exact test was used for estimating and OR

average age of 57.5 ± 11 years with extremes of 30 and 90 years. Type 2 diabetes is a disease often in asymptomatic adult, often late onset after several years of evolution, sometimes in conjunction with complications; this explains the advanced age of type 2 diabetic patients included [7].

SAS prevalence in the study population

Among the 79 type 2 diabetic patients included, 53.2% were SAS. Foster GD et al. [5] in 2009 had observed a higher prevalence of 86% among 306 obese diabetics. This difference is mainly due to the study population. Indeed, these authors included obese or overweight type 2 diabetics and the PSG recording had been realized in those in whom the clinical suspicion was strong. Obesity is truly a causative factor of SAS as demonstrated by several authors [8,9]. West SD et al. [10] reported a prevalence of 23% for type 2 diabetics; a lower prevalence than that we observed. Thus, the prevalence of SAS of the type 2 diabetics is a concern in our context and should lead to public health interventions in order to reduce the risk linked to this association.

Type of SAS

Among the 42 patients with the type 2 diabetes in whom SAS was diagnosed, the majority (95.2%) had an obstructive SAS and two had a central predominance (4.8%). Tamisier R. et al. [11] had also noted the scarcity of central apnea of sleep; they conclude that they represent less than 10% incidence of obstructive sleep apnea. Our study was conducted in outpatient site; it may not include few subjects at risk of central apneas that are the brain strokes, brain tumours, encephalitis, degenerative diseases, and neuromuscular diseases. Also, the high frequency of OSA is explained by the high prevalence of obese and overweight people who represent respectively 44.3% and 38%.

SAS severity

The mean of AHI is relatively low in our study compared with other authors and is especially light weight SAS. Certainly, West S et al. [6] reported an average of AHI respectively 32.2 / H 26.2 / H for diabetics high risk of SAS and diabetics with low risk. Sanner BM et al. [5] in Germany have objectified a higher average AHI 28 ± 19.5 / h with a range of 5.3 to 89.6. The proportion of SAS requiring CPAP equipment (AHI ≥ 30) is low in our study (11.9%). And Foster et al

had reported 22.6% of severe SAS in obese diabetics. The difference may be related to the type of recruitment done.

Gender and SAS

The analysis of the influence of gender on the development of SAS shows no significant difference between men and women. However, analysis of proportions revealed that the frequency of SAS is higher in men than in women (70% in men versus 47.46% for women). Young T et al. [12] in Wisconsin had also found a male predominance with 24% of SAS in man versus 9% in women with a sex ratio of 2.67. According to the work of J. Leech et al. [13] the sex ratio for the SAS was 2.7. The male can be partly explained by the difference in size of the upper airway (VAS) and a different distribution of fats deposits in men and women [14]. Abnormalities of VAS take a more prominent place in men than in women with the presence of a longer soft palate in men [14]. This promotes obstructive apnea due to a collapse of the pharynx higher airway obstruction. The woman has a shorter soft palate and lower airway collapsibility [15].

Age and SAS

The age higher than 60 years and mean of age is the risk factor for SAS occurrence ($p < 0.05$). Others have made the same observations. Thus, Susan K. and Sonia AI [16] in the US have found that in adults, the prevalence of SAS increases with age, especially after 65 years. For Young T et al. [17], the frequency of an AHI ≥ 15 is twice higher in the age group 60-69 years than in the age 40-60 years. This frequency of SAS after 60 years could be explained by the increase in respiratory disorders with age, with the affected anatomical abnormalities, instability of ventilatory control and the association with cardiovascular or neurological disease which leads to use sedatives or hypnotics sometimes [17].

Obesity, hypertension and SAS

The analysis of the influence of obesity on sleep apnea syndrome shows no significant difference between obese and non-obese subjects in our study. However, one third (40.5%) patients with SAS and all obese patients with morbid obesity were carriers of SAS; so the majority (88.1%) patients with SAS had abdominal obesity. In most studies, the role of obesity in the genesis of SAS is indisputable [18,19]. Considine RV et al. [9] have shown that obesity is closely associated with mortality and morbidity increased in

the SAS. According to work by Vgontzas et al. [20] the US visceral fats rather than generalized obesity is one that predisposes to the development of sleep apnea. Their sleep apnea was significantly higher levels than of visceral compared to their obese status.

The lack of significant association with obesity SAS in our study could be explained by the relatively low rate of obesity in our sample (44.3%) but also to the small size of our sample. But in other hand, the mean of waist or neck circumference were greater on people with SAS as shown by Jorge Vale et al. [19] in their study.

The influence of SAS on hypertension and its control is well known [21]. Zhang P et al. [18] also found a significant relationship between hypertension and SAS.

Drowsiness according to ESE

The frequency of excessive daytime sleepiness is 11.3% according to ESA. This low rate of excessive daytime sleepiness according to ESE is explained by the fact that several items of this score is to say issues reading, driving a car is not always adapted to our study population.

Definitely, many of our patients did not have the habit of reading (books, newspapers) and others almost never watched television. The economic activity that led patients and / or operating conditions does not allow them to take a nap. Similarly only a few of them had a car and / or driving. This shows the limitations of this scale in screening for SAS in our African context. Thus, according to Carole S. ESE is a subjective measure of sleepiness; the postponement by the patient himself may reflect inaccurate information if the patient has difficulty understanding what is written or if it cannot physically see or write answers [22]. In other hand, diabetes mellitus is known to affect sleep quality [23]. This could explain the lack of significant difference between diabetics with sleep apnea syndrome and those who don't have.

Conclusion

In African context, SAS is a public health issue due to its high frequency particularly in type 2 diabetic. The screening of sleep apnea syndrome should be considered in the assessment of cardiovascular risk during several pathologies such as diabetes, as well as resistant hypertension in obese patients.

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