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A comparison of public and private obstructive sleep apnea clinics

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Abstract

The aim of the present study was to compare the clinical findings and polysomnography results obtained at public and private clinics in Brazil, the follow-up after diagnosis, and the therapeutic aspects related to continuous positive airway pressure. Patients who snore and who have obstructive sleep apnea were retrospectively divided into two groups, i.e., public clinic (N = 307) and private clinic (N = 317). Data concerning age, sex, body mass index (BMI), neck circumference, medical history, sleepiness scale, follow-up after diagnosis, and acceptance of continuous positive airway pressure therapy were collected. Mean age was 50 ± 12 (range: 15-80) for public patients and 48 ± 12 years (range: 19-91) for private patients. Mean BMI was 30 ± 6 (range: 19-67) for public patients and 31 ± 6 kg/m^2 (range: 21-59) for private patients. The public clinic had a significantly higher frequency of women than the private clinic (M:F ratio of 2.0:1 and 6.9:1, respectively). The condition of private patients (apnea-hypopnea index = 31 ± 25) was more severe than that of public patients (apnea-hypopnea index = 25 ± 24 events/h; P = 0.0004). In the public and private clinics, 19 and 15% of patients were snorers, respectively, and 81 and 85% of them had sleep apnea. After diagnosis, follow-up was longer in the private group. The continuous positive airway pressure acceptance was similar for both groups (32 *vs* 35%), but patients from the public clinic abandoned treatment more than private ones (65 *vs* 13%). Social status was significant in terms of the severity of obstructive sleep apnea age and gender distribution. Private patients look for a diagnosis earlier in the course of the disease than public patients, adhere more to follow-up, and abandon continuous positive airway pressure treatment less than public patients do.

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Key words
- Obstructive sleep apnea
- Social class aspects
- Anthropometric aspects
- Continuous positive airway pressure

Introduction

Obstructive sleep apnea (OSA) is considered to be a medical and public health problem in terms of its consequences for the cardiovascular system (high blood pressure and ischemic heart disease) and excessive daytime sleepiness (causing automobile accidents), affecting mainly obese middle-aged individuals (1-4). Since OSA was first described by Guilleminault et al. (5), some therapeutic modalities have been adopted such as tracheostomy, weight loss, upper airway surgeries, oral appliances, and con-

tinuous positive airway pressure (CPAP) (6). The use of CPAP is one of the most common treatments for patients with OSA since its efficacy for the improvement of quality of life has been well demonstrated (7,8). The clinical and polysomnography (PSG) features of OSA patients are well-known in the literature, as also are the indication of and compliance with nasal CPAP (9-11). Some individual aspects such as obesity, gender, age, ethnicity, smoking, and alcohol use are closely related to OSA (12-18). Demographic data, clinical findings, PSG features, and CPAP acceptance have not been previously compared between public and private clinics. Patients from these clinics mainly differ in economic status, a fact that can be highly relevant in terms of the principal treatment of sleep apnea considering the high cost of nasal CPAP.

We hypothesize that patients from public and private clinics differ not only in severity of apnea-hypopnea index (AHI) but also in social aspects that might influence treatment with nasal CPAP. The objectives of the present study were: 1) to compare clinical findings and PSG results between public and private clinics, and 2) to compare the follow-up after diagnosis of OSA and the therapeutic aspects related to nasal CPAP between these groups of patients in Brazil.

Material and Methods

Study subjects

All data were retrospectively collected from patient charts at the Sleep Clinic of Universidade Federal de São Paulo, that attends patients referred from the public university hospital and from a private clinic. A total of 624 adult snorers or OSA patients seen from 1997 to 2000 were divided into two groups, namely public clinic (N = 307) and private clinic (N = 317). The inclusion criterion was adult patients with OSA (including snorers without apnea) evaluated by PSG.

Clinical evaluation

Our Sleep Laboratory is a national reference center staffed by a multidisciplinary group, and the physicians responsible for the respiratory sleep disorders use the same standardized questionnaire to evaluate both public and private patients. The data collected from the charts were age, sex, body mass index (BMI), neck circumference, past and present medical history, Epworth Sleepiness Scale (ESS), follow-up after diagnosis, and acceptance of CPAP therapy. Medical history included presence of hypertension, cardiovascular diseases (myocardial infarction, coronary heart disease, arrhythmia, heart failure, and cerebrovascular accident), asthma, diabetes mellitus, hypothyroidism, nasal obstruction, and nasal allergic symptoms (sneezing, nasal itching, rhinorrhea).

Polysomnography monitoring

PSG was performed for one full night using a 13-channel SAC Oxford® system (version 10, Oxford Instruments, Inc., Tampa, FL, USA) for the determination of electrocardiogram, oculogram, submental and anterior tibialis electromyogram, nasal and oral airflow (measured with a thermistor), thoracic and abdominal movements, body position, and oxygen saturation measured by pulse oximetry. The sleep stages were scored according to the Rechstaffen and Kales Manual (19), arousal according to ASDA recommendations (20), and respiratory events according to AASM (21) recommendations.

Statistical analysis

Statistically significant differences between public and private patients were determined by the Mann-Whitney U-test or the chi-square test for two independent samples, depending on the type of the variable. For all tests, the level of significance was set at $P \leq 0.05$. Data were analyzed using Statistics for

Windows software, release 5.1 (Statsoft Inc., 1997).

Results

The data comparing public to private patients revealed a mean age of 50 ± 12 and 48 ± 12 years (P = 0.014), BMI of 30 ± 6 and 31 ± 6 kg/m^2, neck circumference of 41 ± 5 and 43 ± 4 cm, respectively, with a predominance of men in both groups, and with the private clinic having a higher percent of men than the public (87 and 67%, respectively, P < 0.0001) (Table 1). The public clinic had a significantly higher frequency of women than the private clinic, with male:female ratios of 2.0:1 for public clinic and 6.9:1 for private clinic. When the groups were divided according to age decade, the majority of patients in both clinics were found to be concentrated between the 4th and 5th decade (Figure 1). The groups differed significantly in the distribution of age decade, with more private than public patients in the 3rd decade and more public than private patients in the 6th decade. Considering the degrees of obesity, the public and private clinics were closely similar, and most patients were concentrated in the mild and moderate categories of obesity in both groups. Among all patients (snorers and OSA patients), the basal PSG study showed a mean AHI of 25 ± 24 and 31 ± 25 events/h for the public and private clinics (P = 0.0004), respectively, and a lowest oxygen saturation of 78 ± 12 and 74 ± 13% (P = 0.0003). According to the sleep questionnaire, private patients were similar, with a mean ESS score of 12 ± 8 and 13 ± 6.

In the past medical history of the public and private groups, hypertension was the major health problem without a significant difference between groups, affecting 36% of public patients and 34% of private patients. Hypothyroidism, diabetes mellitus, asthma, and cardiovascular diseases were present at low frequency in both groups, and diabetes mellitus was more frequent among public clinic patients. The anthropometric and PSG data, ESS and medical history of both groups are summarized in Table 1.

On the basis of AHI score, the patients were classified as snorers without apnea (AHI <5), with mild sleep apnea (AHI = 5-15), moderate sleep apnea (AHI = 15-30) or severe disease (AHI >30) (21). According to this classification, the groups were significantly different in terms of the severe apnea category, with the private clinic having more

Table 1. Anthropometric and polysomnography data, Epworth Sleepiness Scale, and past medical history of private and public clinic patients.

	Public clinic (N = 307)	Private clinic (N = 317)
Age (years)	50 ± 12	48 ± 12*
BMI (kg/m^2)	30 ± 6	31 ± 6
Neck circumference (cm)	41 ± 5	43 ± 4
Gender (% males:% females)	67:33	87:13*
ESS	12 ± 8	13 ± 6
Basal AHI (events/h)	25 ± 24	31 ± 25*
Lowest O_2 saturation (%)	78 ± 12	74 ± 13*
Hypertension	36%	34%
Hypothyroidism	3%	2%
Diabetes mellitus	9%	3%*
Asthma	5%	6%
Cardiovascular diseases	6%	7%

AHI = apnea-hypopnea index; BMI = body mass index; ESS = Epworth Sleepiness Scale; N = number of patients.
*P < 0.05 compared to public clinic patients (Mann-Whitney U-test and chi-square test).

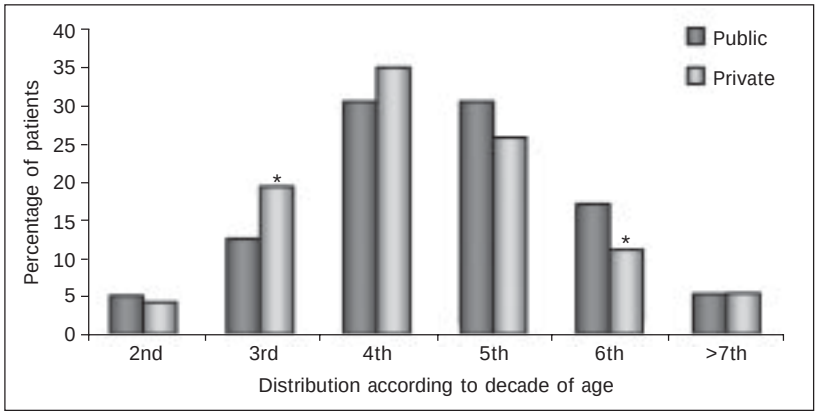

Figure 1. Patient distribution between public and private clinics according to age (2nd: up to 29 years; 3rd: between 30 and 39 years; 4th: between 40 and 49 years; 5th: between 50 and 59 years; 6th: between 60 and 69 years; >7th: 70 years and over). *P = 0.019 for 3rd decade and P = 0.033 for 6th decade of age (chi-square test).

severe patients than the public clinic (P = 0.002; Figure 2). In the public and private clinics, 19 and 15% of patients, respectively, were considered to be snorers (AHI <5), and 81 and 85% of them had some degree of sleep apnea (AHI >5), representing the great majority in both groups, without a significant difference between them.

According to the charts, part of the patients in each group had been questioned about nasal symptoms (obstruction or allergy), i.e., 67.1% of public patients (N = 209/307) and 74.4% of private patients (N = 236/317). Considering just patients who were questioned about nasal symptoms, 75.6% of those in the public group (N = 158/209) and 58.1% of those in the private group (N = 137/236; P = 0.001) reported a past history of nasal symptoms. Nasal obstruction was the most common symptom, followed by sneezing and nasal itching.

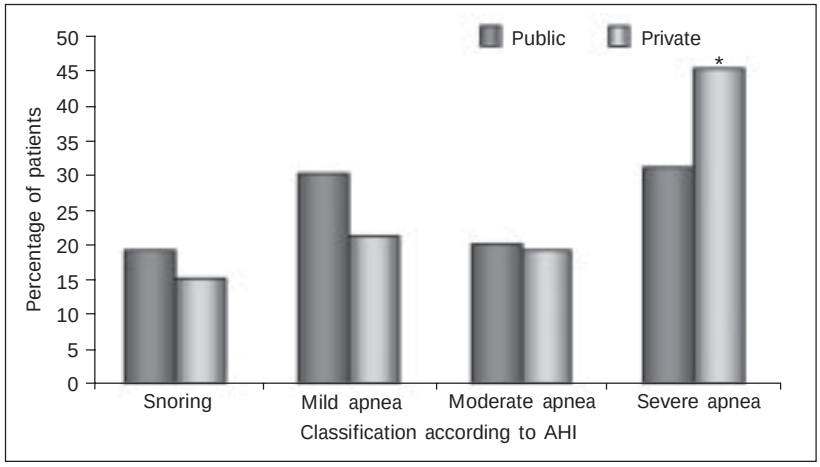

Figure 2. Patient distribution according to AHI classification between public and private clinics (without apnea: AHI <5; mild: AHI = 5-15; moderate: AHI = 15-30; severe: AHI >30 events/h). AHI = apnea-hypopnea index. *P = 0.002 compared to severe apnea public clinic patients (chi-square test).

Table 2. Comparison of follow-up after diagnosis and of CPAP impact between the public and private clinic patients.

	Public clinic (N = 307)	Private clinic (N = 317)	Odds ratio 95% CI (range)
Return after OSA diagnosis	68% (209/307)	79% (251/307)*	0.56 (0.38-0.81)
PSG with CPAP	35% (107/307)	43% (136/317)*	0.71 (0.50-0.99)
Started CPAP treatment	32% (34/107)	35% (47/136)	0.88 (0.40-1.56)
Stopped CPAP treatment	65% (22/34)	13% (6/47)*	12.52 (3.68-44.92)

CI = confidence interval; CPAP = continuous positive airway pressure; OSA = obstructive sleep apnea; PSG = polysomnography.
*P < 0.05 compared to public clinic patients (chi-square test).

After diagnosis by PSG, the return for a new schedule was higher in the private group, 79 *vs* 68% (P = 0.002) (Table 2). A new PSG to evaluate CPAP titration and its therapeutic results was performed in 35% (107/307) of public patients and in 43% (N = 136/317) of private patients (P = 0.039). Among patients who performed CPAP titration, 32% in the public clinic and 35% in the private clinic started to use CPAP. The status of CPAP acceptance (i.e., patients who started to use nasal CPAP) was closely similar in both groups, but a large part of patients from the public clinic abandoned treatment (65 *vs* 13, P < 0.0001).

Among the patients using nasal CPAP, the public and private clinics differed in the severity of sleep apnea, with private patients being more severe than public ones, with AHI of 51 ± 23 and 42 ± 28 events/h (P = 0.009; Table 3). Patients using nasal CPAP did not differ in terms of symptoms of nasal obstruction or ESS score. Considering only the patients that stopped using CPAP, the difference between the two groups was about apnea severity but this difference was not statistically significant.

Discussion

The study outcome demonstrated that patients in the 4th and 5th decades of life predominated in both groups, but patients from the private clinic were slightly younger than those from the public clinic. According to the literature, OSA mainly occurs in middle-aged adults and tends to become worse and more prevalent with age (22,23). After the peak between the 4th and 5th decades of age, the distribution showed a decline in the frequency of patients over 60 years of age (Figure 1), a fact that may

represent a low life expectancy for both groups. Lindberg et al. (12) observed this situation in a study of 2,668 men aged 30-69 years followed up for 10 years. The prevalence of apnea in this series increased up to 50-60 years and was followed by a decrease thereafter. This situation reflects the need to diagnose patients with OSA at the youngest possible age for early treatment, with a possible consequent change in the impact of mortality. The influence of OSA on mortality was reported by some investigators and is related to the severity of apnea as well as to patient age (24-26). The probability of survival is higher in less severe patients and age seems to influence mortality only in patients below the age of 50 according to the study by He et al. (24) and, just below the age of 60 according to the study by Lindberg et al. (26).

The typical patient with OSA is described as an overweight adult male and some studies have shown the important influence of obesity (13,15). In our study, close to 88% of all patients in the public and private clinics were overweight. Most patients had a BMI between 26 and 40 kg/m^2 and only a few of them had morbid obesity. The weight distribution was not influenced by social class in the patients studied.

As expected, a high predominance of males was noted in both groups, but the public clinic had a higher frequency of women than the private one, with respective M:F ratios of 2.0:1 for public clinic and 6.9:1 for private clinic. One hypothesis for the gender disparity observed between public and private patients in our study is that women from the private clinic may be under-diagnosed, perhaps because they do not feel so comfortable to admit that they snore and so do not seek medical care. When the patients from the two clinics were classified according to gender and age, an interesting distribution was observed (Figure 3). Considering the percentage of patients for each decade of age, there was a different distribution between men and women in the 3rd and 5th decades of life for public patients. Figure 3 shows an increase in the percentage of women from the 4th to the 5th decade of life, which might correspond to the menopausal period, when women present a higher incidence of sleep apnea. However, we did not observe the same occurrence in the distribution of private patients, with a difference being observed only in the 4th decade of life without an increase in the percentage of women com-

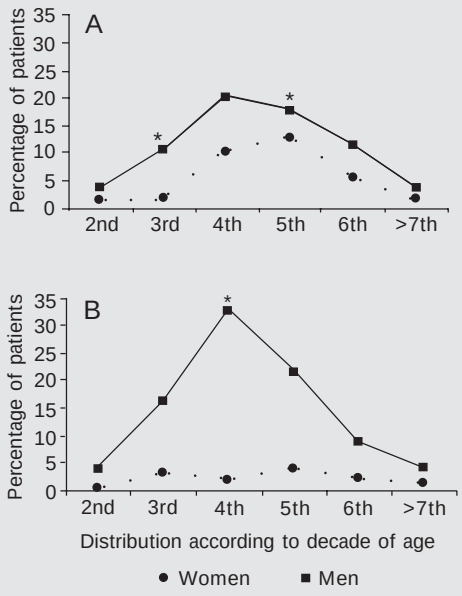

Figure 3. Patient distribution according to age and gender classification for public (A) and private clinics (B) (2nd: up to 29 years; 3rd: between 30 and 39 years; 4th: between 40 and 49 years; 5th: between 50 and 59 years; 6th: between 60 and 69 years; >7th: 70 years and over). *P < 0.05 compared to women (chi-square test).

Table 3. Comparison of patients from public and private clinics who started to use CPAP.

	Public clinic (N = 34)	Private clinic (N = 47)
AHI	42 ± 28	51 ± 23*
Mild apnea	6% (2)	2% (1)
Moderate apnea	41% (14)	11% (5)*
Severe apnea	53% (18)	87% (41)*
ESS	13 ± 6	14 ± 6
AHI of patients who stopped using CPAP	40 ± 28	56 ± 22

AHI = apnea-hypopnea index; CPAP = continuous positive airway pressure; ESS = Epworth Sleepiness Scale; N = number of patients.
*P < 0.05 compared to public clinic patients (Mann-Whitney U-test and chi-square test).

pared to the 3rd decade of life.

One question that has not been fully answered is why men are more prevalent than women. Could this be related to the pathology of OSA, to which men are more susceptible? Or could it be that women are not well diagnosed and we are missing them? Young et al. (27) have shown that current clinical indications to evaluate OSA are as appropriate for women as they are for men. Considering men and women with the same level of AHI, they did not find different reported symptoms between them, and snoring was the most sensitive and strongest predictor of sleep apnea for both sexes. The difference in prevalence between men and women seems to decrease during the postmenopausal period when weight gain and central obesity are observed, also associated with aging (28).

In the public and private clinics studied here, 15 to 19% of subjects had snoring without apnea (AHI <5) and 81 to 85% of them, i.e., the great majority in both groups, had some degree of sleep apnea (AIH >5). Considering the severity of OSA, private clinic patients had a more severe condition according to AIH and also to lowest O_2 saturation. However, this cannot be explained by BMI because the groups had a closely similar BMI distribution, or by age since the most severe group comprised slightly younger patients. It was observed that the gender ratio was different between these two groups. Considering male and female AHI for both private (male AHI = 32 ± 25 and female AHI = 21 ± 21; P = 0.001) and public (male AHI = 28 ± 26 and female AHI = 19 ± 21; P = 0.0001) patients, it is possible to observe that women had a less severe condition in both groups. The fact that among public patients there was a higher proportion of women than among private patients, and women had a less severe condition can explain, at least in part, why public patients had a less severe condition according to AHI. When past medical history was checked, the only difference was a higher frequency of diabetes mellitus among public patients, possibly related to the fact that public patients were older and so had a higher probability to develop diabetes mellitus. The only difference that could influence the severity was that private patients included more males than public ones.

A past history of nasal symptoms was more frequent at both clinics, but was even more frequent in the public group (75.6 *vs* 58.1%), with more than half of all patients usually reporting some nasal problem. These data should be considered with caution since the numbers were collected retrospectively from the charts, where it was more likely that the physicians would record positive symptoms more than negative ones. According to the literature, 21.9 to 66% of patients using nasal CPAP usually report some nasal symptoms (29-32). In our study, nasal obstruction was the major problem for both clinics but was more frequent among private patients.

With respect to the return after the OSA diagnosis, private patients complied with follow-up more than public patients. The private clinic had more severe patients according to the AHI and the lowest O_2 saturation, a fact that could explain why their patients came back for follow-up and performed PSG with CPAP more than public patients. In Brazil, all the investigation with PSG is supported by the Health Care Agencies or by Public Hospitals, but these organs do not provide CPAP devices for the patients. Public and private clinics did not differ in the acceptance of CPAP treatment (patients who started to use nasal CPAP). In our Sleep Laboratory, public and private clinics receive the same CPAP educational program provided by the same staff. However, the group of public patients using nasal CPAP had a less severe condition considering the AHI and more than half of them stopped using nasal CPAP (Tables 2 and 3). The daytime sleepiness symptom, according to ESS score, was similar for patients using

nasal CPAP. Among the patients who stopped using CPAP, public patients tended to show a milder degree of apnea than private patients although the difference was nonsignificant. The fact that their illness was milder may explain, at least in part, why public patients abandoned CPAP more frequently than private patients.

Social status did not influence BMI, neck circumference or ESS, but was of clinical significance in terms of OSA severity (patients from the private clinic had a more severe condition) and of gender distribution (the public clinic had three times more women than the private clinic). Also, private patients were younger than public patients. Nearly 60% of both private and public clinics reported a past history of nasal symptoms. Obesity was highly prevalent in both clinics, but a minority of patients had morbid obesity.

Considering the investigation and treatment of OSA, private patients sought a diagnosis earlier than public ones, came back for follow-up more than public patients did, and abandoned CPAP treatment much less than public ones. Our data indicate that public health programs are needed to improve the use of nasal CPAP by less privileged social class patients and to reduce the occurrence of ineffective treatment.

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