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Nocturnal polygraphy in public transport drivers in Bucharest – cardiovascular and metabolic comorbidities

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Abstract

English:

Obstructive sleep apnoea syndrome (OSAS) is a significant public health concern due to its high prevalence and associated morbidity and mortality. This retrospective descriptive study analyses the cardiovascular comorbidities in 47 public transport drivers from Bucharest who underwent nocturnal polygraphy. This study found that 95.5% of participants had OSAS, with varying severity levels. Hypertension was present in 70.2% of cases, while diabetes mellitus was observed in 31.9%. This study also revealed a strong correlation between obesity and OSAS by measuring apnoea-hypopnoea index (AHI), oxygen saturation levels and body mass index (BMI). Surprisingly, the Epworth Sleepiness Scale did not align with other indicators of sleep apnoea, possibly due to professional bias or fear of job loss. The findings highlight the need for systematic screening of OSAS in high-risk occupational groups. Additionally, emerging research suggests a potential link between intermittent hypoxia in OSAS and increased cancer risk, warranting further investigation.

Keywords

obstructive sleep apnoea • cardiovascular comorbidities • nocturnal polygraphy • public transport drivers • intermittent hypoxia

Poligrafia nocturnă la șoferii de transport public din București - Comorbidități cardiovasculare și metabolice

Rezumat

Sindromul de apnee obstructivă în somn (SASO) reprezintă o problemă semnificativă de sănătate publică datorită prevalenței sale ridicate și morbidității și mortalității asociate. Acest studiu descriptiv retrospectiv analizează comorbiditățile cardiovasculare la 47 de șoferi de transport public din București care au fost supuși poligrafiei nocturne. Acest studiu a constatat că 95,5% dintre participanți aveau SASO, cu niveluri de severitate variate. Hipertensiunea arterială a fost prezentă în 70,2% din cazuri, în timp ce diabetul zaharat a fost observat în 31,9%. Acest studiu a evidențiat, de asemenea, o corelație puternică între obezitate și SASO prin măsurarea indicelui de apnee-hipopnee (AHI), a nivelurilor de saturație a oxigenului și a indicelui de masă corporală (IMC). În mod surprinzător, Scala de somnolență Epworth nu s-a aliniat cu alți indicatori ai apneei în somn, posibil din cauza prejudecăților profesionale sau a fricii de pierderea locului de muncă. Constatările evidențiază necesitatea unui screening sistematic al SASO în grupurile profesionale cu risc ridicat. În plus, cercetările emergente sugerează o legătură potențială între hipoxia intermitentă în SASO și creșterea riscului de cancer, ceea ce justifică investigații suplimentare.

Cuvinte-cheie

Sindrom de apnee în somn tip obstructiv • Comorbidități cardiovasculare • Poligrafie nocturnă • șoferi de transport public • hipoxemie intermitentă

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Introduction

Sleep apnoea syndrome (SAS) is a public health problem because of its widespread prevalence (9%–38%) and effects on associated morbidity and mortality (1). In the general population, the symptoms of SAS are increasingly recognisable by the patient or their relatives, leading to a rise in medical referrals.

Starting in 2019, Romania mandated the inclusion of a pulmonology consultation in the annual medical check-up for category II drivers (trucks, public transportation and tractors), aiming to identify the risk of SAS. This retrospective descriptive study aims to analyse the frequency of cardiovascular comorbidities and to correlate them with objective and quantifiable data such as apnoea-hypopnoea index (AHI), time spent with $SpO_2 < 90\%$, number of hours slept, presence or absence of symptoms/signs or smoking status.

Materials and methods

This study included 47 drivers of the Bucharest Transport Company who presented to the NewMedics Clinic (Bucharest, Romania) for a pulmonologic consultation and a nocturnal cardiorespiratory polygraph examination to assess the risk of sleep apnoea. The result of nocturnal cardiorespiratory polygraph examination was validated manually by a somnology specialist.

Patients were administered the Epworth questionnaire. Other data, such as age, number of hours slept per night, work shift, AHI, time spent with $SpO_2 < 90\%$, smoking status and cardiovascular comorbidities, were also recorded. All patients were male. The resulting database was analysed using IBM SPSS Statistics 20 software.

Results

The study group consisted entirely of male patients with a mean age of approximately 52 years (Figure 1).

The body mass index (BMI) of the patients was analysed, and a mean score of 38.5 was obtained (Figure 2). All 47 patients were overweight and 2 of them had a BMI >40.

Only 2 patients did not meet the criteria for the diagnosis of SAS (AHI >5/hr), while 17 patients had mild SAS (5 < AHI < 15), 13 patients had moderate SAS (15 < AHI < 30) and 15 patients had severe SAS (30 < AHI) (Figure 3). The obtained AHI was, on average, 26.24/hr (Figure 4).

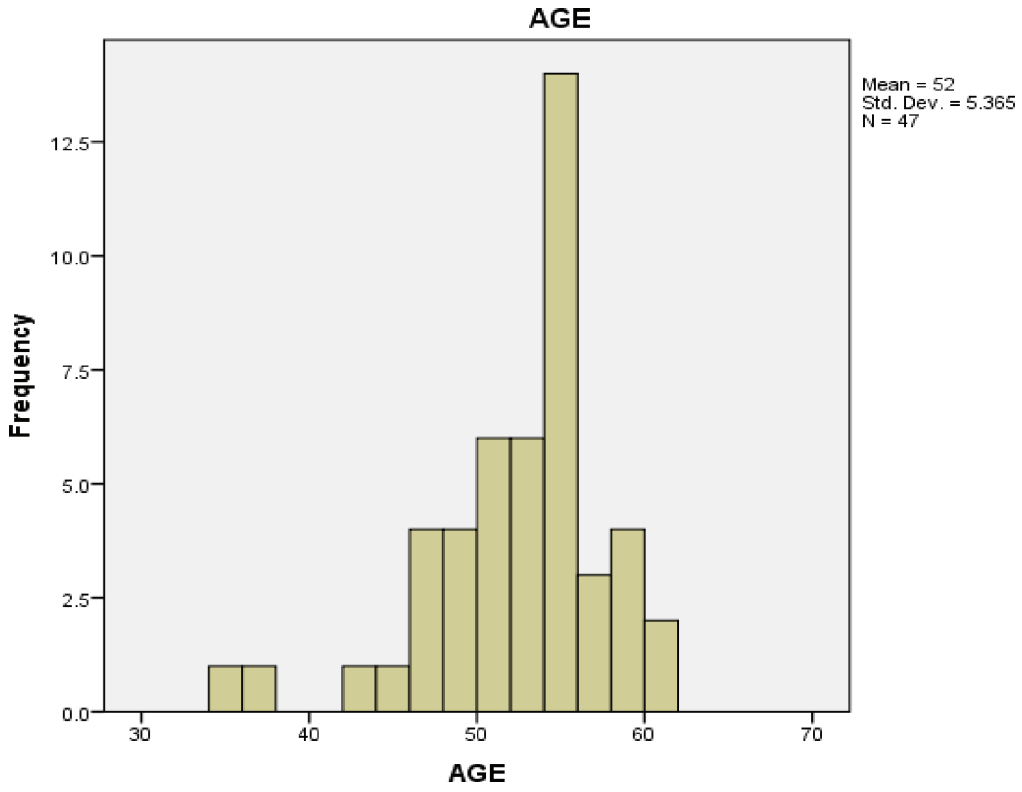

Figure 1. Age histogram.

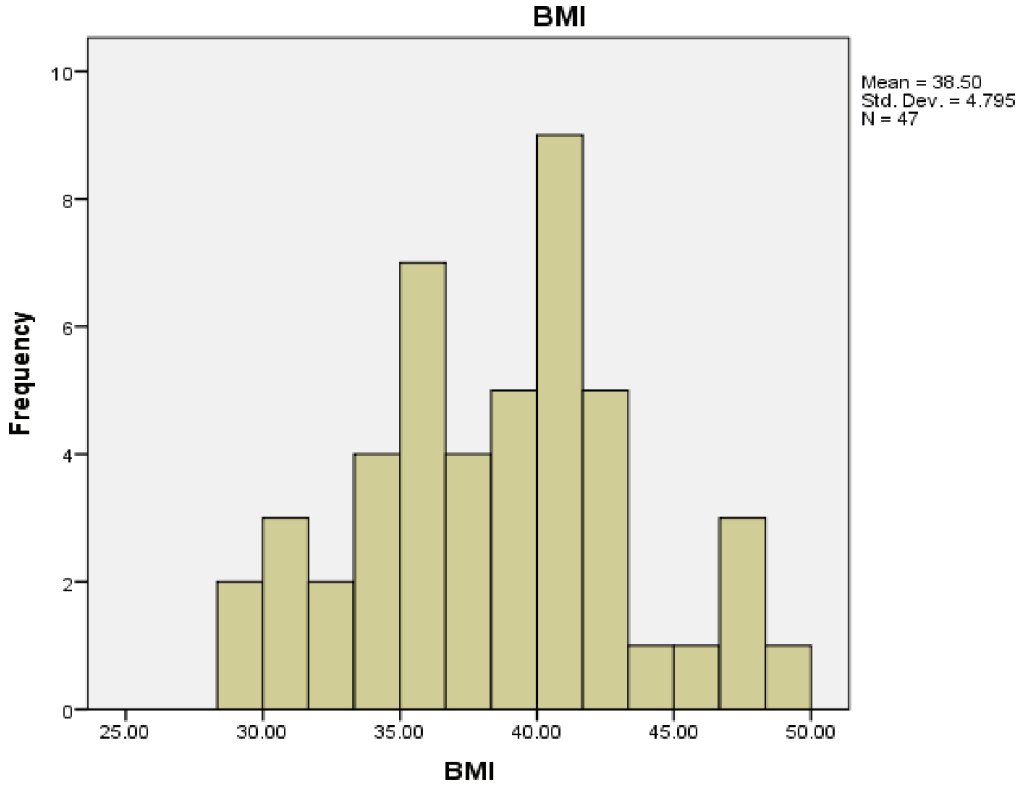

Figure 2. Body mass index.

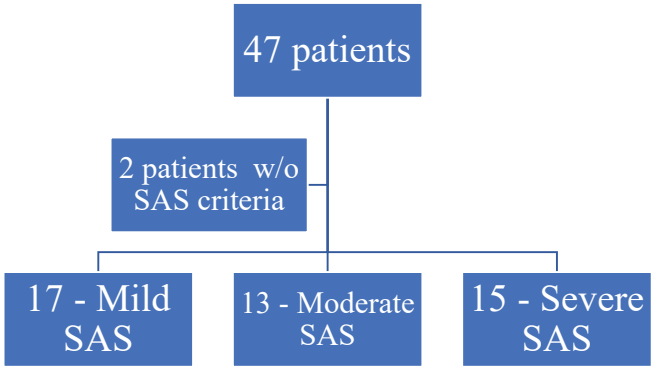

Figure 3. Classification of enrolled patients.

Arterial hypertension was reported in 33 patients (70.2%) (Figure 5), and diabetes mellitus was also diagnosed in 15 patients (31.9%) (Figure 6). Other pathologies, such as ischaemic heart disease, dyslipidaemia and stroke, were identified in a smaller proportion.

Time spent with oxygen saturation <90%, an important marker for cardiovascular risk assessment in patients with SAS, was analysed. On average, patients included in the study spent 17.5% of their total sleep time (TST) with SpO_2 < 90% (Figure 7).

During the pulmonology consultation, patients completed the Epworth questionnaire, and the results were recorded. The cut-off for the Epworth questionnaire was considered to be 10 points. In contrast to the other results obtained, the mean Epworth score of the patients was 3.45 points, indicating the absence of daytime sleepiness and, by extension, a satisfactory quality of sleep. Only 2 patients had scores of 10 points, and none had a score >10 (Figure 8).

Discussions

The literature establishes a link between BMI and the risk of SAS. In our case, all the patients who presented to the clinic were obese or overweight, and the prevalence of SAS was in accordance with the data available in the literature (95.5%) (2, 3).

Two patients had a BMI >40, which placed them directly in the category of 'Obesity class III – morbid'. Patients with BMI >35 can be included in the same category, provided they have at least one associated cardiovascular disease or diabetes mellitus (4, 5).

Although we obtained concerning results related to the frequency of hypertension in patients with SAS (70.21%), it is difficult to establish the cause–effect proportionality with SAS

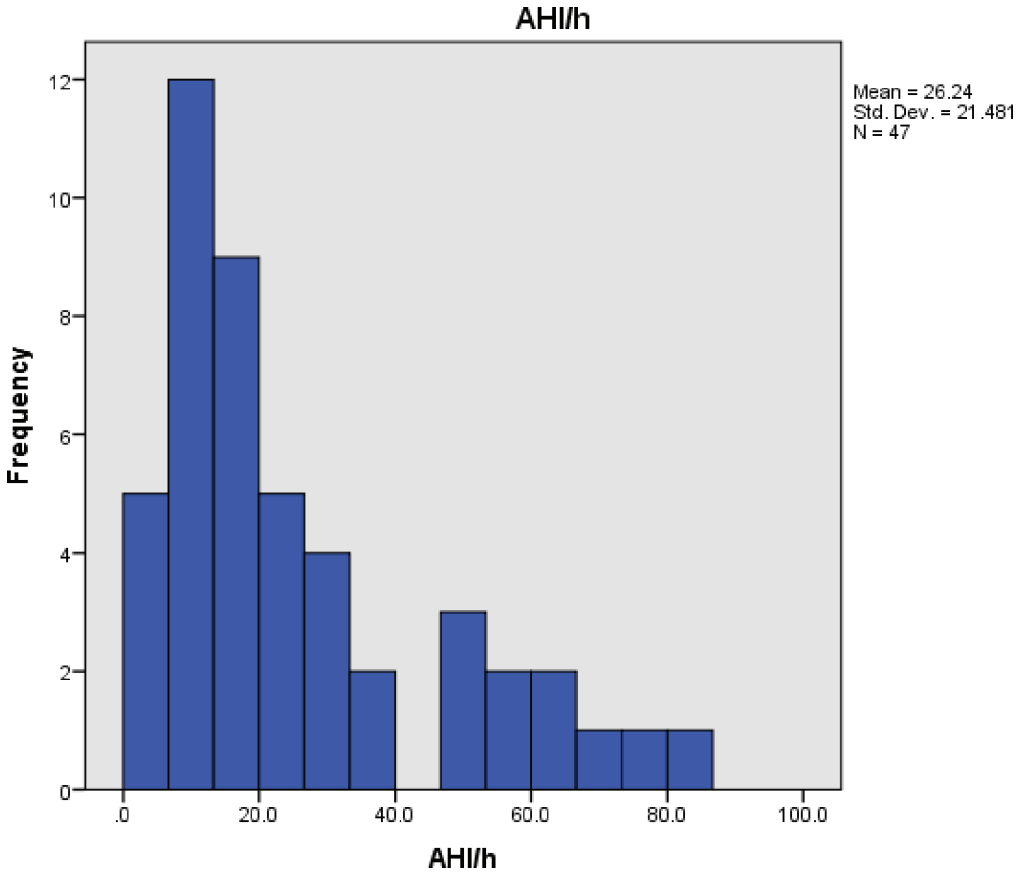

Figure 4. AHI histogram. AHI, apnoea-hypopnea index.

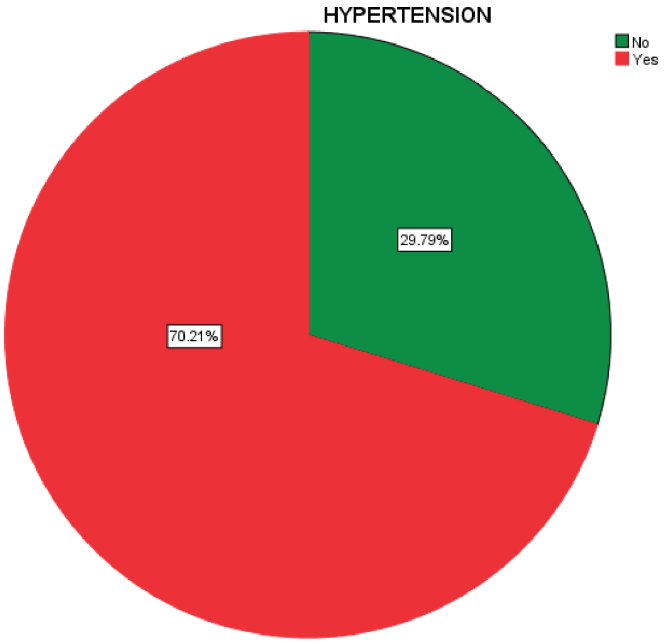

Figure 5. Arterial hypertension.

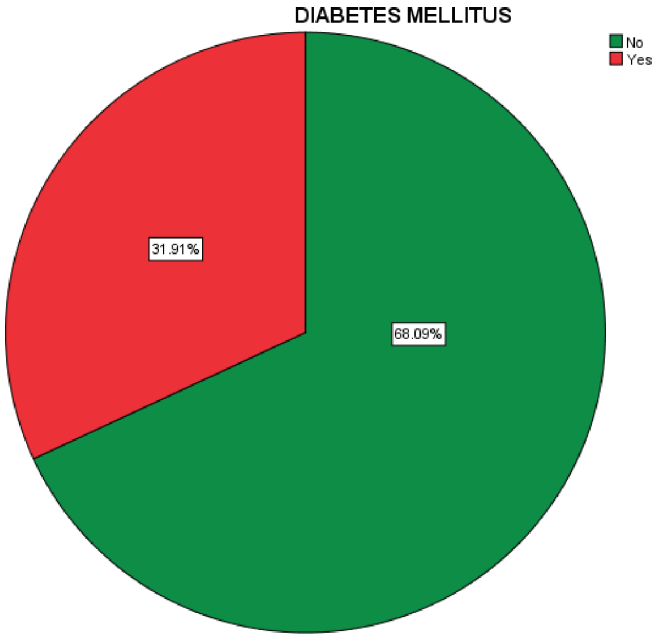

Figure 6. Diabetes mellitus.

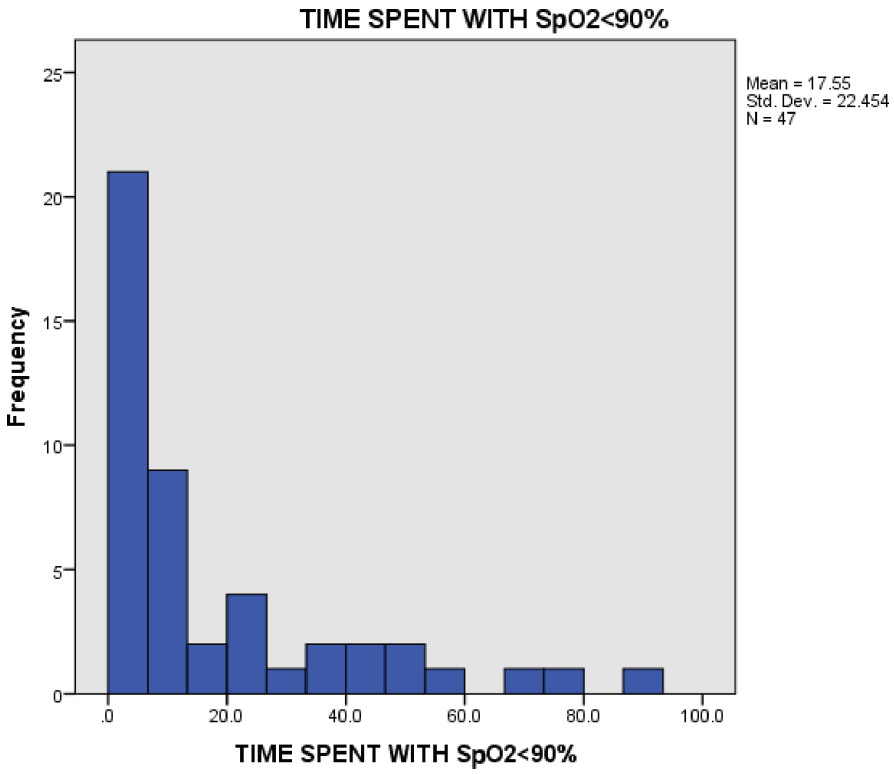

Figure 7. Time spent with oxygen saturation <90%.

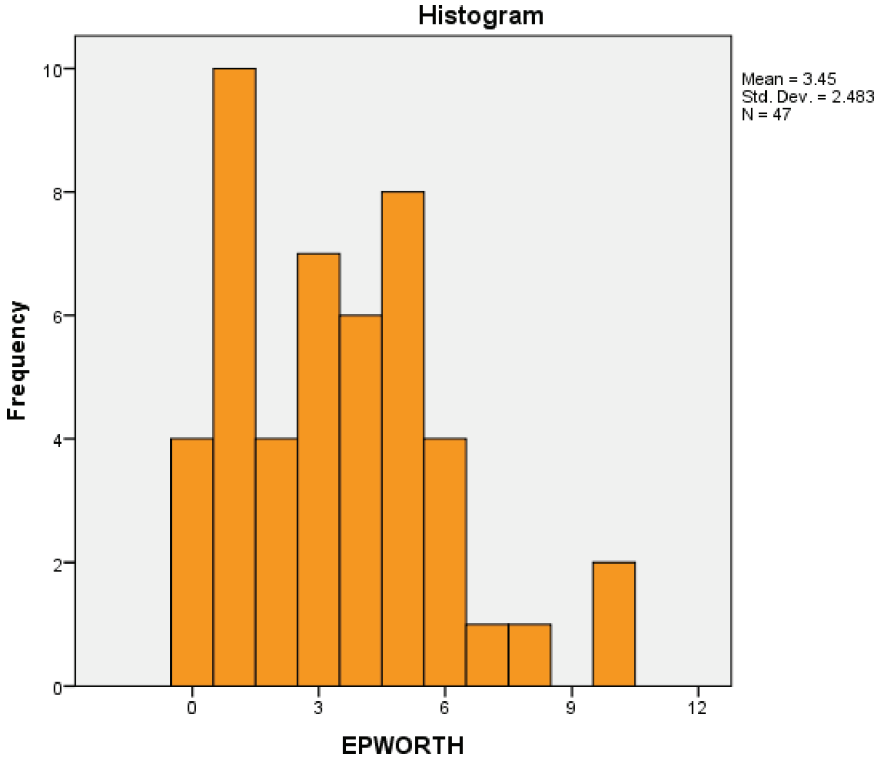

Figure 8. ESS scores. ESS, Epworth Sleepiness Scale.

due to the presence of well-known individual risk factors such as smoking, obesity and stress.

Historically, the indications for screening for SAS include overweight/obesity, neck circumference >44 cm in men or >37 cm in women, the presence of cardiovascular or metabolic comorbidities, and an Epworth score >8 or 10 points (6).

There have been inconsistencies between Epworth questionnaire scores and other data, suggesting a positive diagnosis of SAS and poor-quality sleep. Hypotheses for this may include accommodation to symptoms, patients' egos or, most likely, fear of job loss. As professional drivers (public transportation), a positive diagnosis of SAS requires the patient to initiate positive pressure treatment. Epworth sleepiness score was not a reliable indicator for SAS screening in the study population.

Having a small study group (<500 patients), we were unable to find statistically significant correlations (bivariate correlations) between cardiovascular disease and BMI, AHI, age or time spent with $SpO_2 < 90\%$. However, the prevalence of hypertension and diabetes in study patients is higher than in the general population.

Of particular importance is the time spent with $SpO_2 < 90\%$ in these patients. In 2019, William G. Kaelin Jr, Sir Peter J. Ratcliffe and Gregg. L. Semenza won the Nobel Prize in Medicine and Physiology for 'how cells sense and adapt to available oxygen levels' via hypoxaemia intermittent factor (HIF) (7).

Cheong et al. (8) published a meta-analysis in 2022 showing that patients with obstructive sleep apnoea syndrome (OSAS) have a 30% higher risk of developing neoplasms compared with the general population. This close link between HIF and oncogenic risk is studied and identified by Martinez-Garcia et al. (9). Intermittent hypoxaemia present in patients with OSAS causes overexpression of Hypoxemia intermitent factor – 1a (HIF-1a.)

The literature also identifies other molecules involved in carcinogenesis, such as Programmed death – 1 (PD1) and Programmed death ligand – 1 (PD-L1) (checkpoint proteins), Midkine (MDK) and Tumor Growth Factor – Beta 1 (TGF-beta1), and postulates that intermittent hypoxia caused by OSAS promotes tumour cell proliferation and invasion in both *in vitro* and *in vivo* animal models (10, 11).

This study has several limitations that should be considered when interpreting the results. First, the sample size is relatively small (47 participants), which may limit the generalisability of the findings to a broader population of public transport drivers. A larger cohort would provide more statistically significant correlations between sleep apnoea severity and cardiovascular comorbidities.

Second, all participants were male, preventing an analysis of potential gender differences in the prevalence and impact of OSAS. Including female drivers in future studies would enhance the study's applicability.

Third, the reliance on self-reported data, such as the Epworth Sleepiness Scale (ESS), may introduce bias. Some participants may have underreported symptoms due to concerns about job security, potentially affecting the accuracy of subjective sleepiness assessments.

Finally, this study is observational and cross-sectional, limiting the ability to establish causal relationships between OSAS, cardiovascular conditions and potential oncological risks. Longitudinal studies are needed for stronger conclusions.

Conclusions

In our experience, patients with SAS frequently associate cardiovascular pathologies and diabetes in a higher proportion than the general population. The latest data in the literature draw attention to the high oncogenic risk that SAS, through intermittent hypoxaemia, has. This raises public health concerns in terms of frequency, risks and associated costs and should receive more attention, including screening programmes for SAS in the overweight/obese population or people performing work requiring vigilance.

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Author's contributions

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2. Corresponding author – George Alexandru Diaconu.
3. Coordinating author – Ioana Munteanu.

Conflicts of interest statement

The authors declare no conflict of interest.

Institutional review board statement

This study was conducted according to the Declaration of Helsinki's guidelines and approved by the local Ethical Commission. This study is retrospective-descriptive and included only relevant medical data found in the observation charts of patients who presented for SAS consultation in New Medics clinic, Bucharest, Romania. Confidentiality and anonymity of participant data were strictly maintained

throughout the research process. No invasive procedures were performed, nor did the presence of the patients was necessary.

Informed consent statement

No informed consent was necessary.

Data availability statement

Data used to support the findings of this study are available from the corresponding author upon request.

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