



Knowledge of the Severity of Snoring among Patients of the Dental Clinic. An International Multicentric Study

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Sleep-related breathing disorders increase morbidity and mortality of those patients suffering from them. Snoring is a quite common disorder; however, there are no publications describing the knowledge of the patients that attend to the dental clinic on how snoring can be a severe health problem. To evaluate the knowledge of the severity of snoring and its impact on systemic health among the patients that attend to the dental clinic. Anonymous questionnaires were given to patients at dental clinics in 4 countries. The questionnaires were composed by nine questions related to snoring and how it affects general health in children and adults. A total of 200 subjects participated in this multicentric study. The mean age of the participants was 42.57 years. The results from the present study show that there is a great lack of knowledge on the severity of snoring. Forty-eight percent of the participants affirmed they snore; however, only 20% of the sample think it is important to consult a specialist due to this problem. This study reveals the great lack of knowledge regarding the negative impact of snoring on systemic health and the need of implementing educational programs.

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INTRODUCTION

Sleep-related breathing disorders (SRBDs) increase morbidity and mortality of those patients suffering from them. Even though SRBDs are frequently underdiagnosed, the prevalence is high. The general populations knowledge about any illness, and especially chronic ones, is a key factor for adequate management and control of their pathologies [1].

A snore is the sound produced due to the vibration of soft tissues when air passes through the upper airways. The presence of snoring is the first alarm-sign of sleep-apnea, so it is crucial to treat these patients to avoid greater complications. In this sense, it is highly important that snoring patients themselves understand the gravity of the pathology and the possibly devastating consequences.

Smith et al. [2] established that patients' knowledge about their respiratory disease, leads to improved adherence to treatment. However, patients with chronic pathologies often become complacent in the treatment of their chronic illnesses or they struggle with lack of information [3].

In an attempt to cope with this, problem-based learning programs are carried out in order to advise and inform patients about the chronic disease they are suffering from [4,5].

In the literature, there are no publications describing the knowledge of the general population on how snoring can be a severe health problem with important systemic consequences.

The objective of this study was to evaluate the knowledge of the severity of snoring and its impact on systemic health among the patients that attend to the dental clinic.

METHODS

The current investigation was approved by Ethics Committee of the University of Almeria (Almeria, Spain) with the approbation code EFM 103/2021. Anonymous questionnaires were given to patients at dental clinics in 4 countries on 3 different continents: Mexico City (Mexico), Almeria (Spain), Ontario (Canada) and Agra (India). A total of 50 questionnaires were completed in each country. Thus, the total sample size was 200 questionnaires ($n = 200$). According to ethical statements for human research, patients were informed and signed an informed consent that the questionnaires were anonymous, and the results of the questionnaires will be used for research purposes. No IRB approval was applied because it was not possible any identification of the participants from the data proportionated in the questionnaires.

The questionnaires were composed of nine questions related to snoring and how it affects general health in children and adults. Participants had to indicate age and gender. Possible answers were yes, no, I don't know (Fig. 1).

The questions were formulated using a simple language so any person able to read would understand it, avoiding the need to consult the dentist or auxiliary staff, which could alter their responses.

Statistical Analysis

The statistical analysis consisted of frequencies and percentages for categorical variables, mean values and typical deviations for quantitative variables. The Mann Whitney U-test was carried out for bivariate analysis to compare ages. For the comparison of qualitative variables among men and women, a chi-square test was carried out. A p value less than 0.05 was considered statistically significant.

RESULTS

A total of 200 subjects participated in this multicentric study which was carried out in four different countries: Spain ($n = 50$), Canada ($n = 50$), India ($n = 50$) and Mexico ($n = 50$), regarding their knowledge of the severity of snoring in systemic health. All participants answered the questions presented in their totality.

The mean age of the participants was 42.57 years. For women, the mean (standard deviation) age was 41.93 (15.03) while for men, it was 43.25 (15.64), with no statistical differences among both genders ($p = 0.56$).

Some 51.5% of the participants were women ($n = 103$) and 48.5% were men ($n = 97$).

The mean number of answers guessed for the 9 formulated questions was 3.64 with a range of positive responses from 0 to 8. The mean number of positive responses was higher for men (4.24) than for women (3.06) making this a statistically significant dif-

ference ($p < 0.001$). The results regarding the positive responses are summarized in Table 1.

When participants were asked about the severity of snoring and whether it has repercussions on general health, 70% of the participants answered "yes," 17.5% answered "no" and 12.5% answered "I don't know." Moreover, 72.2% of men and 68% of women considered snoring to be a public health problem, with no significant differences between genders ($p = 0.65$).

Fifty-one percent of the participants ($n = 102$) answered "yes" to the question "Did you know that someone that snores has reduced air flow and it severely affects health?" Comparing the results between genders showed that 57.7% of men and 44.7% of women answered affirmatively but the difference was not statistically significant ($p = 0.06$).

When asked if they know that "snoring worsens in overweight people" 77.5% of the participants responded affirmatively. In this sense, 86.6% of the men answered affirmatively, while just 68.9% of women knew snoring worsens in overweight people, making this a statistically significant difference between genders ($p = 0.003$).

There was a great lack of knowledge regarding whether dentists are able to treat snoring with a mandibular advancement device (MAD). Only 17.5% of the participants answered affirmatively to this question. When analyzing answers comparing genders, 79.4% of the men and 85.4% of the women didn't know that a dentist can treat snoring with a MAD, but the difference was not statistically significant ($p = 0.26$).

Regarding snoring among the pediatric population, 71.5% of the participants knew that "children can also snore." However, 86.5% were not aware of snoring negatively affecting physical and intellectual growth in children. In relation to how physical and mental growth of children can be affected by snoring, 22.7% of the men and only 4.9% of the women answered affirmatively to this question, making this a statistically significant difference ($p < 0.001$).

When participants were asked "Do you snore?," 48% of the sample answered "yes," 25% answered "no" and 27% answered "I don't know." Thirty-five percent of the women and 61.9% of the men confirmed they snored, making these differences statistically significant ($p < 0.001$). In the specific case of Mexico, 100% of the snorers were men.

Most participants understand that snoring is a health problem (affirmative answer to question 1 ranged from 52% to 90%). However, when they were asked if they would consult a specialist due to this motive, percentages reduced drastically: a total of 41.5% said "no," 38.5% said "I don't know." Only 20% answered "yes" to this question. When comparing genders, 32% of the men considered it urgent to consult a specialist because of snoring and only 8.7% of the women, making this difference statistically significant ($p < 0.001$).

The results from the present study show that there is a great lack of knowledge, among the patients that attended to the den-

KNOWLEDGE OF GENERAL POPULATION ABOUT CONSEQUENCES OF SNORING.

Age: // Gender: Male Female

1. Regarding to snoring, do you think it is a health problem?

- Yes
- No, I think it is just an annoying noise.
- I don't know

2. Do you know there is a direct relation between snoring and the increased possibility of having cardiovascular diseases?

- Yes
- No

3. Do you know that people who snore have a reduced airflow that affects their general health in an important way?

- Yes
- No

4. Do you know being overweight worsens snoring?

- Yes
- No

5. Do you know that your dentist can solve the majority of the snoring problems by manufacturing a dental device for using during sleeping?

- Yes
- No

6. Do you know children can snore?

- Yes
- No

7. Do you know that snoring during childhood can reduce mental development and physical growing of children?

- Yes
- No

8. Do you snore?

- Yes
- No
- I don't know

9. Do you think it is urgent to consult with a specialist for that reason?

- Yes
- No
- I don't know

***THIS QUESTIONNAIRE IS ABSOLUTELY ANONYMOUS. IT IS CARRIED OUT WITH RESEARCH AIMS.
THANK YOU FOR YOUR KIND COLLABORATION.***

Fig. 1. Online questionnaires fulfilled by the participants.

tal clinic, on the severity of snoring, its presence in children and how “simple” it is for dentists to treat most cases. Authors consider it is crucial not only to introduce educative programs in order to increase diagnosis and treatment of this pathology, but also train dentists to diagnose critical patients while carrying out the habitual intraoral examination.

DISCUSSION

Snoring can be irritating for anyone that hears it night after night. Often, relatives or friends use a person’s snoring to make jokes. It is important to change this perspective because snoring is a severe health problem that can lead to fatalities.

In the present study, 96 of 200 participants answered affirmatively to the question “Do you snore?.” That represented 48% of

Table 1. Results according to gender in the positive responses obtained for each formulated question

	Women	Men	p-value
Mean number of positive responses for the formulated questions	3.06	4.24	0.001*
Positive responders when asked if they consider snoring a public health problem	68.00	72.20	0.650
Positive responders when asked if they know that snoring reduces air flow and severely affects health	44.70	57.70	0.060
Positive responders in relation to the fact that snoring worsens in overweight people	68.90	86.60	0.003*
Positive responders when asked if they know the dentist can treat snoring with a MAD	14.60	20.60	0.260
Positive responders when asked about the problems of children development due to snoring	4.90	22.70	< 0.001*
Positive responders when asked if they snore	35.00	61.90	< 0.001*
Positive responders when asked if they feel it is urgent to consult an specialist due to snoring	8.70	32.00	< 0.001*

Data are presented as %.

* $p < 0.05$.

MAD: mandibular advancement device.

the total sample. In addition, 54 of the 200 participants answered, "I don't know" (27% of the total sample) which is in concordance with data previously referred to by other authors [6].

According to the study of Bliwise et al. [6], answering "I don't know" must be considered as a potential "yes," because often patients that answer "I don't know," have risk factors similar to those that answer "yes." The authors evaluated 3152 patients; they carried out a medical exploration and evaluated cardiovascular health among other risk factors. Moreover, patients were asked if they snore. The response "I don't know" ranged between 28% and 44%. According to the authors, most of these answers came from patients living alone. Authors concluded that answering "I don't know" should be considered as an indicator of possible presence of SRBD.

Carmago et al. [7] analyzed 208 patients of the Department of Sleep Medicine at Sao Paulo Hospital. Authors concluded that snoring is as prevalent and severe as sleep apnea. They also suggested that among the general population, there is a lack of knowledge about the negative impact on general health, which is in accordance with the results of the present study.

Regarding confessing to snoring by the patients themselves, Westreich et al. [8] carried out questionnaires about the presence and intensity of snoring in 1913 patients. The authors found great differences in the answers of men and women. They concluded that women underreported their own snoring and those that reported it manifested a lower intensity of snoring than the reality.

Communication between health personnel and patients is a key factor. It is necessary to optimize communication skills among the medical and dental community to benefit the general population. Moreover, it is important for the health professional to interpret and understand the perspective of the patient, to be able to detect any doubts in the information given. Emphasis should be put on the implementation of protocols in the private practice sector. Furthermore, national, and international programs should be carried out in order to raise awareness among the population.

Gianoni-Capenakas et al. [9] published a review about the role of the dentist in the treatment of snoring and other SRBD. They

concluded that the dentist has a crucial role in the early diagnosis, treatment, and follow-up of these patients. The current clinical exploration of the oral cavity allows the dentist to be the first person to detect commonly associated risk factors with these disorders, such as mandibular retrognathism, macroglossia or hypertrophic tonsils. However, definitive diagnosis must be confirmed by a specialized physician.

Smith et al. [10] analyzed 81 patients suffering from sleep apnea that were under treatment with continuous positive airway pressure (CPAP). Patients answered 15 questions about their knowledge regarding apnea and the CPAP treatment. Authors concluded that when the patient understands the severity and consequences of the pathology, it leads to higher motivation and adherence to the treatment prescribed.

For their part, Broström et al. [11] evaluated 25 patients through a personal interview. Authors asked about the communication patients maintained with the health staff before and after their treatment with CPAP. The authors concluded that health staff acts as a motivational factor in adherence to the treatment.

Donald et al. [12] evaluated the influence of reading a brief informative pamphlet on the knowledge of obstructive apnea among patients suffering from this condition. Twenty-six patients completed a questionnaire related to their pathology before and after having read the pamphlet. The authors concluded that after reading the pamphlet, their knowledge of the pathology significantly increased, from 69.7% before to 80.8% after.

In 2013, Broström et al. [4] established an educative program for 25 patients that suffered from obstructive apnea. The objective was to increase their adherence to CPAP. Patients were divided in groups of 4–6 people and different activities were developed to increase knowledge about their pathology. After finishing the educative program, patients affirmed being more conscious of the importance of a healthy lifestyle and the severity of their pathology. They also recognized it was not easy to change bad habits nor to adhere to the treatment adequately. They were satisfied having participated in the educative program. Moreover, some of them considered it necessary to meet periodically to re-

inforce their good habits and to feel emotionally supported. The authors concluded that the adherence to CPAP continued for more than 6 months after finishing the program, so the benefit of this education was evident.

In the current study, after completing the questionnaires a lot of patients were surprised by their own lack of knowledge regarding the importance of snoring and stated that this motivated them to obtain more information about this common disorder.

After analyzing the results of the present international multicentric study, authors consider it necessary to develop educational programs to inform the general population about the severity of snoring, the associated comorbidities and the risk factors that increase it. According to the literature reviewed, including informative pamphlets in dental clinics can be of great help, as well as informing the patient that the dentist can treat snoring with a MAD in simple cases and refer to a CPAP treatment for severe cases.

The implementation of meetings in reduced groups is an effective and profitable method to obtain motivation and knowledge of the patient about their breathing disorder [1,4]. Smith et al. [10] evaluated 34 patients with obstructive sleep apnea which followed an educational program about their pathology. Their knowledge was evaluated before, during and after the educational program. The authors concluded that the establishment of educational programs increases the knowledge about the pathology, its consequences and severity.

Jones et al. [13] concluded that giving parents an informative pamphlet made them more conscious about the importance of good sleep habits in children. In addition, they felt motivated to improve the sleep hygiene of their sons and daughters.

Educational programs, the establishment of periodical revisions and long-term follow-up programs were shown to improve outcomes in the management of patients with chronic diseases [14].

Dentists must be emphatic and able to solve all possible doubts from the patient, always adapting language to guarantee that the message transmitted is understood in the right way [11]. In this sense, informative pamphlets must use a simple language, emphasize the importance of early diagnosis and treatment to minimize the negative consequences and make the patient realize that maintaining good health status and adhering to treatment mainly depends on him/herself [14,15].

It is important to remark some limitations of the current investigation: neither the level of education nor the occupation of the participants were registered. It would be interesting to correlate the cultural level with the knowledge of such a common entity as snoring. Moreover, it had been important to include body mass index to associate this factor with gender and prevalence of snoring. This is the first international multicentric study carried out throughout 3 different continents and the results obtained give us a general idea about the lack of knowledge regarding the negative impact of snoring on systemic health and it signals the need to improve this knowledge in order to reduce

its possible devastating consequences. However, the sample evaluated is not enough to represent the general population of each country and deep demographic and clinical information of the sample must be registered.

Authors of the current study consider it is necessary to conduct further research after the implementation of educational programs and then be able to evaluate how people's knowledge and perception of snoring has changed.

Conclusions

Snoring is one of the main symptoms of SRBD and is very easily identified by anyone. Because SRBD are a severe health problem, it is crucial that the population is conscious of the devastating consequences "just" snoring can have on health. The establishment of educative programs is a priority at all levels of society and dental clinics can be the first step for that purpose.

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None.

Conflicts of Interest

The authors have no financial conflicts of interest.

Authors' Contribution

Conceptualization: Ana BC, Pedro MS. Data curation: Ana BC, Juan-Manuel CM, Raquel AS. Formal analysis: Raquel AS. Investigation: Ana BC, Juan-Manuel CM. Methodology: Ana BC. Project administration: Ana BC. Resources: Ana BC, Raquel AS, Pedro MS. Software: Raquel AS. Supervision: Ana BC, Juan-Manuel CM. Validation: Ana BC, Raquel AS. Visualization: all authors. Writing—original draft: Ana BC. Writing—review & editing: all authors.

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