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# Effectiveness of Structured Teaching Program on Level of Knowledge Regarding Obstructive Sleep Apnea (OSA) among Nursing Students

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**ABSTRACT**

*Background/Aim:* The increasing prevalence of obstructive sleep apnea (OSA) necessitates the timely diagnosis and treatment of patients. Knowledge of OSA is limited among student doctors and nurses. Hence, we assess the level of knowledge regarding OSA among nursing students and evaluate the effectiveness of a structured teaching program.
*Methods:* This was a quasi-experimental research study, that included 90 nursing students, selected by purposive sampling. They were asked to fill out a questionnaire consisting of questions regarding OSA, followed by a structured training program about OSA. They were assessed for their level of knowledge regarding OSA post-test.
*Results:* Mean knowledge score pre-test was 5.39±3.37, and post intervention was 15.9±2.45 (P =0.0001). Majority of the students (82.2%, n=74) had no prior knowledge about OSA, and none had adequate knowledge pre-test. Post-test majority had adequate knowledge (71.11%, n=64). Having prior knowledge about OSA pre-test was significantly associated with increased level of pre-test knowledge (P =0.0001).
*Conclusion:* The knowledge of OSA among nursing students was inadequate, but the structured training program substantially increased their level of knowledge.

Obstructive sleep apnea (OSA) is a common sleep disorder. It occurs due to complete or partial upper airway closure during sleep, causing desaturation of oxyhemoglobin and sleep disturbances. When left unattended or untreated could result in major neurocognitive and cardiovascular outcomes. Common symptoms of OSA include snoring, daytime sleepiness, inability to feel refreshed after waking up from sleep, disturbed sleep at night, nocturia, etc., that overall impair quality of life and day-to-day functioning (Benjafield et al., 2019; Patel, 2019). It is also known to increase the risk of motor-vehicle accidents and poor work performance (Dragonieri & Bikov, 2020).

Based on the apnea-hypopnea index (AHI), which represents the severity of sleep-disordered breathing, OSA was prevalent among 936 million individuals between 30 and 69 years. They had an incidence of >5 events per hour and with an AHI >15 events per hour. It is prevalent in 425 million individuals worldwide. India ranks

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4th after China, the USA, and Brazil, with the highest cases of OSA. Prevalence in India was found to be 534 million, among which 9.6% had an incidence of >5 events per hour and 5.4% had >15 events per hour (Benjafield et al., 2019). Despite the increasing prevalence of OSA, symptoms go unnoticed; hence, the patients remain undiagnosed and untreated (Dragonieri & Bikov, 2020).

Poor knowledge and lack of awareness of OSA were reported among the public and (Arous et al., 2017; Sia et al., 2017) adequate knowledge of OSA was observed among physicians and healthcare professionals (Beck et al., 2020; Chang et al., 2020; Devaraj, 2020). However, in India, medical students and graduates are uninformed about the incidence of OSA in adults and children (Goyal et al., 2018; Wadhwa R et al., 2020). Awareness among students can be created by case-based studies during residency and grand rounds, and lecture series. Noting that the public health implications of OSA are high, involving nursing practitioners to promote awareness of sleep hygiene and sleep disorders, can help increase patient knowledge, timely symptom identification and treatment compliance (Assad et al., 2016).

Therefore, this study was carried out to assess the knowledge regarding OSA among nursing students and evaluate the effectiveness of a structured teaching program in improving their knowledge regarding OSA. This study hypothesized that there will be a significant difference between the mean pre-test and mean post-test level of knowledge regarding Obstructive sleep apnea among Nursing students.

We also hypothesized that there will be a significant association between the pre-test level of knowledge regarding obstructive sleep apnea with selected demographic variables among Nursing students.

## Methodology

### Research Design

The study followed a quasi-experimental one group pre-posttest design. This design was used because the study examined the effectiveness of one group therefore, it was not possible to randomly assign participants to that group. (Polit & Beck, 2021)

This study was conducted at a selected nursing college in Coimbatore, Tamil Nadu, India.

### Study Sample

The study sample was selected using purposive sampling technique. This technique carefully selects subjects based on study purpose with the expectation that each participant will provide unique and rich information that adds value to the study(Wu Suen et al., 2014)and included nursing students in their second year of Bachelor of Nursing program with a basic knowledge of the anatomy and physiology of the respiratory system and excluded students who were absent during data collection.

### Sample Size

Sample size was calculated by power analysis:

$$n = \frac{(z^2 \times N \times SD^2p)}{(N-1)e^2 + z^2 \times SD^2p}$$

where, N is size of study population (students in 2nd year Nursing program) =93,
$e^2$ is acceptable error = 0.02,
$SD^2p$ is standard deviation of population =14.62,
$z^2$ is standard variation at given confidence interval = 1.96.

Substituting for the formula, n, that is estimated sample size was 90. Therefore, we enrolled 90 students for the study.

### Instruments

The level of knowledge on obstructive sleep apnea instrument was developed internally which included a questionnaire with two sections, where one section recorded the demographic details of the students, that is age and prior knowledge of OSA; and second section consisted of the OSA knowledge (OSAK) questionnaire obtained from the OSA knowledge and attitude (OSAKA) questionnaire by Schotland and Jeffe (2003).(Schotland & Jeffe, 2003) that covered 18 items including 3 questions on epidemiology, 4 on pathophysiology, 4 on symptoms, 3 on diagnosis and 4 on treatment. Each response was in true or false format, and correct response carried 1 mark and incorrect response carried 0 mark, each. Total highest score was 18, where scores <10 (<50%) was considered inadequate knowledge, 11-15 (50% -75%) was moderately adequate and 16-18 (>75%) was adequate knowledge (Schotland & Jeffe, 2003).The internal consistency was assessed by Kuder Richardson 20-21 of the questionnaire was found to be 0.70, which indicated that OSAKA was the most efficient questionnaire for the student sample. The content validity was obtained from experts from the fields of psychiatric nursing, psychiatry, clinical psychology, biostatistics and nursing research.

### Structured teaching program

Based on modified Wiedenbach's helping art of clinical nursing theory, (Wiedenbach's Helping Art of Clinical Nursing - Nursing Theory, n.d.) the structured training program was formulated after an extensive literature review and discussed with experts before finalizing.

The structured teaching program included lecture sessions using PowerPoint presentations and charts for a duration of 45 minutes, that lasted for a week. The students were extensively taught about OSA characteristics, epidemiology, pathophysiology, symptoms, diagnosis, and treatment. The study was conducted in August 2021. The structured teaching program was undertaken as OSA was covered only as a theory in brief during the Nursing education program, hence, it was necessary to stress on the practical aspects of OSA to the students.

### Ethical considerations

The study was approved by Institutional Human Ethics Committee (IHEC) (Project No. 21/064) with reference number PSG/IHEC/2021/Appr/Exp/069, dated April 05, 2021. Written informed consent was obtained from each participating student.

### Process

After obtaining informed consent, 90 students were enrolled in the study. Pre-test was conducted using the structured questionnaire for demographics and OSAK, followed by structured training program and finally, post-test was conducted using the OSAK questionnaire. The data was collected from 23rd till 28th August 2021.

### Data analysis

Data was recorded in Microsoft Excel and was analysed using IBM SPSS 24.0. Demographics, pre-test, and post-test knowledge was analysed using descriptive statistics. Paired t-test was used to compare pre-test and post-test knowledge scores, and chi-square test was used to evaluate association of age and prior knowledge of OSA with pre-test level of knowledge. Statistical significance was considered at a P value <0.05.

## Results

Among the 90 students enrolled for the study, more than half of them (56.7%, n= 51) were 19 years old and the remaining were 20 years old. It was also observed that the majority of the students (82.2%, n=74) had no previous knowledge about OSA.

### Distribution of pre-test and post-test level of knowledge about OSA

Table 1 demonstrates the distribution of knowledge about epidemiology, pathophysiology, symptoms, diagnosis, and treatment of OSA, pre- and post-test, respectively. Overall, it was observed that, none of them had adequate knowledge pre-test. However, on assessing post-test, most of them (71.11%, n=64) had adequate knowledge.

**Table 1.** Distribution of pre-test and post-test level of knowledge regarding obstructive sleep apnea.

| Obstructive sleep apnea-related topics | Pre-test | | | Post-test | | |
|---|---|---|---|---|---|---|
| | Inadequate n (%) | Moderate n (%) | Adequate n (%) | Inadequate n (%) | Moderate n (%) | Adequate n (%) |
| Epidemiology | 71 (78.89%) | 19 (21.11%) | - | - | 10 (11.11%) | 80 (88.89%) |
| Pathophysiology | 66 (73.33%) | 24 (26.67%) | - | - | 21 (23.33%) | 69 (76.67%) |
| Symptoms | 76 (84.44%) | 14 (15.56%) | - | - | 21 (23.33%) | 69 (76.67%) |
| Diagnosis | 72 (80%) | 18 (20%) | - | - | 10 (11.11%) | 80 (88.89%) |
| Treatment | 77 (85.56%) | 13 (14.44%) | - | - | 21 (23.33%) | 69 (76.67%) |
| Overall | 80 (88.89%) | 10(11.11%) | - | - | 26 (28.89%) | 64 (71.11%) |

### Effectiveness of structured teaching program regarding OSA on level of knowledge

In each individual topics related to OSA, the mean knowledge scores significantly increased post-test (Table 2). Overall mean score pre-test (5.39±3.37) had increased significantly (t=23.515, P = 0.0001) post-test (15.9±2.45), indicating the effectives of the structured training program.

**Table 2.** Effectiveness of structured training program on obstructive sleep apnea by comparing pre- and post-test mean knowledge scores.

| Level of knowledge on obstructive sleep apnea | Test | Mean ± S.D | Paired "t" value | P value |
|---|---|---|---|---|
| Epidemiology | Pre-Test | 1.16 ± 0.94 | t = 15.703 | 0.0001* |
| | Post Test | 2.89 ± 0.32 | | |
| Pathophysiology | Pre-Test | 1.23 ± 1.13 | t = 13.878 | 0.0001* |
| | Post Test | 3.28 ± 0.82 | | |
| Symptoms | Pre-Test | 0.96 ± 0.14 | t = 17.711 | 0.0001* |
| | Post Test | 3.48 ± 0.85 | | |
| Diagnosis | Pre-Test | 1.02 ± 0.75 | t = 20.2 | 0.0001* |
| | Post Test | 2.89 ± 0.32 | | |
| Treatment | Pre-Test | 1.02 ± 0.95 | t = 17.346 | 0.0001* |
| | Post Test | 3.37 ± 0.84 | | |

*Note.* S.D. – standard deviation
*Indicates significance at p<0.05

### Association of pre-test level of knowledge with age and prior knowledge about OSA

There was no significant association between pre-test level of knowledge and age ($\chi 2$ =3.258, degrees of freedom (df) =1, P=0.05), but significant association was observed with previous knowledge of OSA ($\chi 2$=12.031, df=1, P =0.0001) (Table 3).

**Table 3.** Association of pre-test level of knowledge regarding obstructive sleep apnea with selected demographic variables among research participants.

| Demographic Variables | Inadequate knowledge | | Moderately adequate knowledge | | Chi-Square Value |
|---|---|---|---|---|---|
| | f | % | f | % | |
| Age in year | | | | | $\chi 2$ =3.258, d.f=1, p=0.05, NS |
| 19 | 48 | 53.33 | 3 | 3.33 | |
| 20 | 32 | 35.56 | 7 | 7.78 | |
| Previous Knowledge on obstructive sleep apnea | | | | | $\chi 2$ =12.031, d.f=1, p=0.001, S*** |
| No | 74 | 82.22 | 0.00 | 0.00 | |
| Yes | 6 | 6.67 | 10.00 | 11.11 | |

****p<0.001, N.S – Not Significant*

## Discussion

Obstructive sleep apnea, despite its high prevalence worldwide, is underdiagnosed and hence, untreated leading to cardiovascular and neurocognitive complications. Increasing awareness among students of nursing and medicine can help in the timely recognition of OSA, its treatment, and educating patients. (Assad et al., 2016; Benjafield et al., 2019)

In the present study, knowledge levels of nursing students regarding OSA were assessed using the 18-item OSA knowledge part of the OSAKA questionnaire developed by Schotland and Jeffe which is a useful tool with high internal consistency that assesses the knowledge of physicians and can help in identifying and treating patients with OSA (Schotland & Jeffe, 2003) This questionnaire was previously employed in many other studies conducted across geographies, to assess knowledge and attitudes regarding OSA among medical graduates, primary care physicians, speech-language pathologists, etc. (Al-Khafaji H et al., 2021; Chérrez-Ojeda I et al., 2018; Wallace ES et al., 2021).

Different studies that assessed knowledge regarding OSA conducted on nursing practitioners and medical undergraduate students reported fair knowledge among the former, owing to years of experience, (Valerio & Heaton, 2014) but among the latter, the knowledge related to OSA was limited.(Goyal et al., 2018; Ozoh OB et al., 2015; Wadhwa R et al., 2020; Zaidi et al., 2021)In India, medical students and graduates were largely unawareof the incidence of OSA in adults and children. (Goyal et al., 2018; Wadhwa R et al., 2020)(Goyal et al., 2018; Wadhwa R et al., 2020) This was consistent with the current study findings where the majority of the nursing students had inadequate knowledge about OSA. On item-wise analysis, it was found that they lacked adequate knowledge related to the treatment of OSA, followed by symptoms, diagnosis, then epidemiology, and pathophysiology. In the study conducted by Wadhwa et. al.,(Wadhwa R et al., 2020) item-wise assessment was inconsistent, in that there was no demarcation of subsections of the questionnaire unlike the one used in the present study, however, they saw a lack of knowledge regarding treatment using uvulopalatoplasty, normal AHI, and collar size in men with OSA, which covered aspects of treatment, pathophysiology, and epidemiology, respectively. These three aspects were observed to be lacking in other studies as well. (Goyal et al., 2018; Ozoh OB et al., 2015; Zaidi et al., 2021)

The teaching methods employed in the current study involved lecture series and presentations that extensively focused on OSA characteristics, epidemiology, pathophysiology, symptoms, diagnosis, and treatment. Similar training methodologies have been employed across studies to improve awareness related to OSA. Valerio et. al., (Valerio & Heaton, 2014) included concepts on the significance of OSA knowledge, analysis of OSA signs and symptoms, and evaluate clinical symptoms, 16 while Glueckertet. al., (Glueckert et al., 2019) focused on OSA definition, background including symptoms, associated health conditions and consequences, diagnosis, screening methods, and treatment options, along with a case study.

The effectiveness of the teaching method employed in the current study was evident with the significant (increase in mean knowledge post-test when compared to the pre-test. Significant improvement was observed among knowledge scores in sub-sections as well. Similarly, significant improvement in OSA knowledge scores was observed in a study conducted among dental hygiene students, where the mean pre-test score was increased post-test. (Glueckert et al., 2019) A recent study conducted on nurse-practitioner students also revealed

significant improvement in sleep knowledge, after going through case-based modules that addressed sleep health and disorders. (Sawyer AM et al., 2022) This highlights the overall need of educating young practitioners and students regarding sleep hygiene and associated disorders which must be included as part of their curriculum (Goyal et al., 2018).

The present study also looked at any association of pre-test knowledge scores of OSA with age and prior knowledge of OSA. Pre-test knowledge scores were found to be significantly associated with prior knowledge of OSA and not age. This study promotes the incorporation of a teaching program regarding OSA as part of the nursing curriculum. An in-service education program, which includes meeting of nursing students with OSA patients, interacting and imparting knowledge about the same to the patients, and educating the patients about management strategies could be taken up by the student nurses.

## Limitations

The present study employs a purposive sampling technique that can lead to bias. Hence, a randomized controlled intervention study with a broader category of nursing students across all the years of their education, along with entry-level nurses, needs to be considered for further studies. While the present study focused only on knowledge aspects, future studies should also look at attitudes and practices related to OSA.

## Conclusions

This study's findings revealed overall inadequate knowledge related to obstructive sleep apnea among nursing students in the selected nursing college. Educating the students using a structured teaching program significantly improved their knowledge levels related to OSA, revealing the effectiveness of the teaching program.

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