Knowledge and Attitude Regarding Sleep Medicine among Medical Students at Qassim University, Saudi Arabia

Yazeed Mohammad Alrebdi¹, Abdulrahman Khalid Ibn Awadh²*, Mohammad Saleh Alfehaid¹, Abdullah Abdulaziz Alsindi¹, Ali Alaraj²

¹Qassim College of Medicine, Qassim University, Qassim - Almulyda, Saudi Arabia; ²Pulmonary Medicine, Dr Suliman Alhabib Medical Group, Riyadh, Saudi Arabia

Abstract

BACKGROUNDs: Sleep disorders and sleep medicine are underrecognized by both the general public and health care workers. Lack of education and training in sleep medicine has resulted in a culture of physicians who have very limited knowledge about sleep disorders and, as a result, are likely to underdiagnose and under-treat patients.

AIM: This study aimed to assess the knowledge of and attitude regarding sleep medicine among medical students at Qassim University.

METHODS: This was a cross-sectional study of 4th and 5th-year medical students, conducted at Qassim University (Central and Unaizah branches), Saudi Arabia. We used a self-administered data collection tool to collect personal information (age, name, sex, medical school), and assessed general attitude toward sleep medicine and the students’ current knowledge about sleep medicine using the Assessment of Sleep Knowledge in Medical Education (ASKME) survey.

RESULTS: The prevalence of medical students who had a special interest in sleep medicine was 23.3%. Poor knowledge about sleep medicine was detected in 94.8% of students, while good knowledge was observed in only 5.2%. The attitude of the students toward sleep medicine was negative among 40.5% and positive among 59.5%.

CONCLUSION: This study found that medical students’ knowledge of sleep medicine was very low, despite the majority of them having a positive attitude toward it.

Introduction

Sleep is known to influence the physical and emotional wellbeing of adolescents by exerting substantial control over biological and psychosocial processes [1]. Sleep not only impacts physical growth and emotional development but also influences cognitive function and learning [2], [3]. Despite the magnitude and clinical importance of sleep issues, several studies have documented poor recognition of sleep disorders [3], [4].

In Saudi Arabia, the first certification exam for sleep medicine as an independent specialty was approved in 2009 [5], and sleep medicine was recognised as an independent specialty in 2012 [6], though studies investigating the prevalence of sleep disorders in the Kingdom of Saudi Arabia (KSA) are limited. Based on available data and waitlists for participation in sleep studies [7], however, it appears that sleep disorders are prevalent among Saudis. Using the Berlin questionnaire to assess the prevalence of obstructive sleep apnea (OSA) risk and symptoms among middle-aged Saudi men and women in their primary care setting, it was revealed that 3 out of 10 Saudi men and 4 out of 10 Saudi women are at a high risk of OSA [8], [9]. A recent national survey quantitatively assessed sleep medicine service in the KSA [7], revealing that the field is nascent compared to developed countries. The survey identified nine sleep disorder facilities; seven were defined as sleep disorder centres that provide clinical diagnostics and therapeutic services for...
countries have shown that OSA is common among patients attending PHC clinics [8], [9], [17]. With the limited number of sleep medicine specialists in the KSA, it is impractical to expect that they will be able to be the primary caregivers for all patients with sleep disorders. Therefore, an alliance of sleep medicine specialists, PHC physicians, and general physicians (including those in internal medicine and paediatrics) becomes essential. Educational interventions are effective in increasing the rates of recognition of OSA among PHC physicians [18], though the level of knowledge and attitude regarding sleep medicine among medical students of the Qassim region is still unknown.

Hence, the present study aimed to determine the knowledge of and attitude towards sleep medicine among medical students at Qassim University, KSA.

Methods

Selection and description of participants

This was a cross-sectional study based on a survey conducted at two medical branches of Qassim University in Saudi Arabia. The study population consisted of 4th and 5th-year medical students in the two medical colleges of Qassim University (main campus and Unaizah campus). Random number generator software was used to randomly select participants from a list of all upper-year medical students to reach the required sample size to ensure adequate statistical power. Inclusion criteria were 4th and 5th-year medical students. Exclusion criteria were 1st, 2nd, and 3rd-year medical students as well as those whose data was incomplete.

Sample size calculation

Based on the article published by Almohaya et al. [15], the prevalence of medical students who were aware of sleep medicine was 27.7%. This prevalence was used to determine the required sample size using the categorical formula: 

\[ n = \frac{z^2 \times pq}{e^2}, \]

where

- \( n \) = sample size
- \( z \) = score from z distribution associated with confidence level (1.96 for 95% confidence)
- \( p \) = estimated proportion of the event in the population
- \( q = 100 - p \)
- \( e \) = margin of error (0.05)

The sample size required to detect a statistically significant result with 95% confidence and a narrow margin of error of 0.05, should be 158. Since

The health system in the KSA relies on a referral system, where the patient’s first exposure is usually to a PHC physician, who assesses and decides the patient’s management plan. Thus, early detection and treatment of patients with sleep disorders depend, considerably, on the knowledge and awareness of PHC physicians. PHC physicians have limited knowledge about sleep disorders, sleep disorders among their patients are likely under-recognised, and patients with these disorders may be inaccurately diagnosed and may receive inappropriate treatment [16]. Studies in the KSA and Western
Qassim’s main campus has a bigger population, about 70% of the calculated sample size was recruited from the main campus; 30% were recruited from Unaizah campus.

**Ethical review and confidentiality**

The study was approved by the Regional Research Ethics Committee, registered at the XXX (Registration No. XXX). All information is kept strictly confidential and used only for research purposes.

**Data collection**

A self-administered questionnaire collected demographic data of the participants (age, name, sex, medical school) and their attitude toward sleep medicine [19, 20]; knowledge about sleep medicine was assessed using the Assessment of Sleep Knowledge in Medical Education (ASKME) survey [19]. The ASKME survey is a 30-item questionnaire regarding the knowledge of sleep medicine. The questionnaire was previously tested in a pilot study of 10 medical students to identify the optimal time for questionnaire completion by participants. The ASKME survey has face validity, and the statistical analysis for internal consistency revealed a Cronbach's alpha value of 76%, which indicates a moderately good internal consistency.

Items were presented in a “true,” “false” or “I don’t know” format. For the ease of analysis, the knowledge questionnaire was re-coded into two categories where the correct answer for each question was identified and coded with 1, whereas the wrong answer was coded with 0. The total knowledge score was obtained by summing up the 30 questions. The minimum score was 0 and the maximum score was 30; a higher score signifies greater knowledge, and by using the cutoff points of 18/30 (60% of the total score), participants were classified as having poor knowledge if the score range was from 0-17 points, whereas good knowledge was determined if the score range was from 18-30 points.

Attitude toward sleep medicine was assessed using the 10-question attitude questionnaire adapted from ASKME [19, 20]. This questionnaire is scored on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The lowest possible score was 10, and the highest score was 50 points. Attitude scores were obtained by taking the sum of the scores of the ten questions. We then categorised participants who scored 30 (60% of the total score) or more as having a positive attitude and those whose score was less than 30 were categorized as having a negative attitude.

**Statistics**

Statistical Package for Social Sciences (SPSS) version 21 (Armonk, NY: IBM Corp.) was used for all data analyses. Descriptive statistics are presented as numbers and percentages for all qualitative variables, while the mean ± standard deviation is presented for all quantitative variables. Knowledge and attitude scores among sociodemographic characteristics of participants were compared using independent t-tests (two-tailed). A p-value cut off point of 0.05 at 95% CI was deemed statistically significant. The normality of the distribution of data was assessed using Shapiro Wilk and Kolmogorov-Smirnov tests. Data violating assumptions of normality were instead compared using non-parametric tests.

**Results**

A total of 158 questionnaires were distributed randomly among the students (4th and 5th years); 116 were returned (response rate of 73.4%). Table 1 presents the sociodemographic characteristics of students who were involved in this study. Students’ ages ranged from 22 to 27 years; a majority was of a younger age (22 - 23 years age group). The majority of the students were recruited from the Qassim main campus (62.1%), and the rest were from the Unaizah branch (37.9%); most respondents were male (56.9% vs 43.1% female).

**Table 1: Sociodemographic characteristics of respondents (n=116)**

| Study Variables         | N (%)               |
|-------------------------|---------------------|
| University branch       |                     |
| • Unaizah branch        | 44 (37.9%)          |
| • Main campus branch    | 72 (62.1%)          |
| Age group               |                     |
| • 22 – 23 years         | 76 (65.5%)          |
| • 24 – 27 years         | 40 (34.5%)          |
| Year of study           |                     |
| • 4th year              | 65 (56.0%)          |
| • 5th year              | 51 (44.0%)          |
| Gender                  |                     |
| • Male                  | 66 (56.9%)          |
| • Female                | 50 (43.1%)          |
| GPA                     |                     |
| • 2.4 – 4.0             | 64 (55.2%)          |
| • 4.1 – 5.0             | 52 (44.8%)          |
| Preferred specialty     |                     |
| • Medicine              | 42 (36.2%)          |
| • Surgery               | 47 (40.5%)          |
| • Others                | 27 (23.3%)          |
| Specific interest in sleep medicine |                     |
| • Yes                   | 27 (23.3%)          |
| • No                    | 89 (76.7%)          |
| Importance of sleep medicine |                 |
| • Absolutely not important | 03 (02.6%)          |
| • Not important         | 13 (11.2%)          |
| • Average               | 48 (41.4%)          |
| • Important             | 41 (35.3%)          |
| • Very important        | 11 (09.5%)          |

A high proportion of students were in their 4th-year level (56%), and most had a 4.0 or lower grade point average (GPA) (55.2%) (the highest GPA in our
institution was 5.0). Based on the preferred area of specialisation, 40.5% of students preferred surgery, 36.2% preferred medicine, and the rest expressed mixed speciality interests. Most of them had no interest in sleep medicine (76.7%), with 41.4% having an average knowledge of sleep disorders.

Table 2: General knowledge toward sleep medicine (n=116)

| Knowledge statement | Correct answer |
|---------------------|----------------|
| K1. The need for sleep decreases in persons above 50 years of age. | 54 (46.6%) |
| K2. Melatonin is a natural body hormone that typically increases during nighttime hours. | 87 (75.0%) |
| K3. Dream sleep (REM) occurs more in the second half of the night. | 41 (35.3%) |
| K4. Sleeping longer on weekends is recommended as a regular practice to make up for the loss of sleep during the workweek. | 34 (29.3%) |
| K5. Newborn infants spend about 16-18 hours per 24-hour period sleeping. | 94 (81.0%) |
| K6. Incidence of insomnia is twice as common in older men as in older women. | 20 (17.2%) |
| K7. A young (pre-adolescent) child who regularly has trouble getting to sleep at night should be allowed to sleep later in the morning. | 45 (38.8%) |
| K8. The typical age of symptom onset for narcolepsy is 40 years or older. | 25 (21.6%) |
| K9. The ability to sleep increases in persons 50 years of age. | 39 (33.6%) |
| K10. Slow-wave sleep is more prominent in the second half of the night. | 17 (14.7%) |
| K11. The amount of slow-wave sleep increases in persons above 50 years of age. | 13 (11.2%) |
| K12. Episodes of sleepwalking tend to occur in the last third of the night. | 13 (11.2%) |
| K13. Episodes of REM sleep tend to lengthen throughout the night. | 28 (24.1%) |
| K14. Periodic limb movements during sleep are typically decreased in REM sleep. | 29 (25.0%) |
| K15. Hyperactivity in children can be exacerbated by inadequate sleep. | 49 (42.2%) |
| K16. In alcoholics in recovery, sleep normalises within one month of alcohol abstention. | 12 (10.3%) |
| K17. Daytime napping is recommended for patients with difficulty initiating sleep. | 31 (26.7%) |
| K18. Weight loss is often indicated in the treatment of primary snoring or mild OSA. | 70 (60.3%) |
| K19. Slow-wave sleep is enhanced following daytime exercise. | 30 (25.9%) |
| K20. Chronic bedwetting in children responds to treatment with anticholinergic drugs. | 11 (9.5%) |
| K21. Nightmares are more common within the first two hours of sleep. | 22 (19.0%) |
| K22. Heart rate, respiration, and blood pressure are more variable during REM sleep compared to non-REM sleep. | 53 (45.7%) |
| K23. Antihypertensive drugs may cause sleeping difficulties as a side effect. | 27 (23.3%) |
| K24. Early morning awakenings in the elderly are often associated with changes in the timing of their biological rhythms. | 39 (33.6%) |
| K25. Alcohol can be beneficial in reducing the effects of jet lag. | 24 (20.7%) |
| K26. Night shift workers are more likely to fall asleep on the job compared to employees with regular, daytime hours. | 56 (48.3%) |
| K27. Episodes of sleepwalking commonly occur during REM sleep. | 12 (10.3%) |
| K28. Menopausal women are at higher risk for developing symptoms of sleep apnea compared to pre-menopausal women. | 29 (25.0%) |
| K29. Irregular sleep scheduling can increase the incidence of sleepwalking in children. | 43 (37.1%) |
| K30. Symptoms of narcolepsy are related to seizure activity in the brain. | 15 (12.9%) |

Results of the ASKME questionnaires are shown in Table 2, which also indicates the correct answer for each question asked. Based on students' responses, the most commonly agreed with statements were: “newborn infants spend about 16-18 hours per 24-hour period sleeping”, “melatonin is a natural body hormone that typically increases during nighttime hours”, and “weight loss is often indicated in the treatment of primary snoring or mild OSA”. Students exhibited the least knowledge concerning the statement, “chronic bedwetting in children responds to treatment with anticholinergic drugs.”

Details of the general attitude of medical students toward sleep medicine are shown in Figure 1; nearly all students strongly agreed/agreed with the statement, “asking about symptoms of sleep disturbances is an essential component of a comprehensive medical evaluation”, whereas most strongly disagreed/disagreed with the statement, “compared to other medical problems, sleep disturbances are usually less important for a patient's health”. Details of the general attitude of medical students toward sleep medicine are displayed in Figure 1. The results showed that nearly all respondents either agreed or strongly agreed with the statement, “Sleep disturbances is an essential component of a comprehensive medical evaluation”, whereas most students correctly disagreed with the following statements: “Compared to other medical problems, sleep disturbances are usually less important for a patient’s health?”. “Sleep disorders are individual problems that are not important for a wide population”, and “Inadequate sleep is a lifestyle issue, not a medical problem”.

![Figure 1: General attitude of the students toward sleep medicine](https://www.id-press.eu/mjms/index)
When comparing the knowledge and attitude scores among sociodemographic characteristics of participants, we found that the attitude of the students in Unaizah branch was significantly higher compared to the main campus branch ($T=2.622$, $p=0.010$), where female students had a better attitude compared to males ($T=-2.867$, $p=0.005$). The attitude of those students expressing interest in a non-inner medicine specialty was higher compared to those students with internal medicine specialty ($T=-2.491$, $p=0.014$). Additionally, those students with interest in sleep medicine had better knowledge ($T=2.098$, $p=0.038$) and better attitude ($T=2.585$, $p=0.011$), and those who responded that knowledge of sleep disorders was important had significantly higher levels of current knowledge ($T=-2.800$, $p=0.006$) and more positive attitudes ($T=-3.209$, $p=0.002$) (Table 4).

### Table 4: Comparison between knowledge and attitude scores among sociodemographic characteristics of students (n=116)

| Factor                        | Knowledge Score | Attitude Score |
|-------------------------------|-----------------|----------------|
|                               | Total Score (50) | Total Score (50) |
|                               | Mean ± SD       | Mean ± SD       |
| University branches           |                 |                |
| Unaizah branch                | 08.3 ± 4.0      | 01.04 ± 0.312  |
| Main campus branch            | 09.5 ± 0.5      | 00.10 ± 0.009  |
| Age group                     |                 |                |
| 22 – 23 years                 | 08.3 ± 4.9      | 01.04 ± 0.610  |
| 24 – 27 years                 | 09.3 ± 4.9      | 01.05 ± 0.450  |
| Year of study                 |                 |                |
| 4th Year                      | 08.3 ± 0.5      | 01.589 ± 0.115 |
| 3rd Year                      | 09.9 ± 0.5      | 01.379 ± 0.071 |
| Gender                        |                 |                |
| Male                          | 09.3 ± 0.8      | 01.259 ± 0.796 |
| Female                        | 09.0 ± 0.5      | 01.00 ± 0.684  |
| Grade point average (GPA)     |                 |                |
| 2.4 – 4.0                     | 08.8 ± 0.4      | 01.879 ± 0.381 |
| 4.1 – 5.0                     | 08.8 ± 0.5      | 01.993 ± 0.353 |
| Preferred speciality          |                 |                |
| Medicine                      | 08.6 ± 0.5      | 01.933 ± 0.335 |
| Non-Medicine                  | 09.5 ± 0.4      | 01.958 ± 0.989 |
| Interest in sleep medicine    |                 |                |
| Yes                           | 10.9 ± 0.4      | 02.099 ± 0.038 |
| No                            | 09.6 ± 0.4      | 01.993 ± 0.484 |
| Importance of sleep disorders |                 |                |
| Not important                 | 08.0 ± 0.4      | 02.800 ± 0.006 |
| Important                     | 10.4 ± 0.5      | 03.209 ± 0.002 |

**Significant at p ≤ 0.05.**

### Discussion

The purpose of the present study was to assess the knowledge and attitude regarding sleep medicine among medical students at Qassim University. This study revealed that the medical students’ knowledge toward sleep medicine was relatively poor (94.8%), highlighting the need for sleep medicine to be added to the medical school’s curriculum, which could be beneficial and will improve their knowledge of the subject. Our finding is consistent with a previous study conducted by Almohaya and colleagues [15]. Using the ASKME questionnaire, respondents were identified as having poor (score of < 60%) or good (score of ≥ 60%) knowledge of sleep issues. Among 348 recruited students in their study, the mean score was 10.4 ± 4.4, with more than 80 per cent of them being classified as having poor knowledge. In Croatia [21], among 112 respondents surveyed, poor knowledge of sleep issues was identified in most of the medical students, postgraduate physicians and specialists, which corroborates our results. In another study published locally (in the KSA), Saleem et al. [14] surveyed 88 primary care centres comprising 223 primary care physicians (PCP). They reported that the mean knowledge of PCP based on the ASKME questionnaire was 14.4 ± 4. The majority of PCPs obtained a score between 11 and 20. These scores were higher than what we observed, though we only investigated medical students, not physicians. In Egypt, Zaki et al. assessed the knowledge of final year medical students and house-officers about normal sleep and sleep disorders [22], also using the ASKME questionnaire. They reported that 91 per cent of the participants exhibited a low level of knowledge, which was also in agreement with our results. However, in China, Luo and associates reported poor knowledge about sleep in more than 60 per cent of students, and the majority of them were not aware of any medical school offering sleep medicine-related courses [23].

In this study, less than half of the students expressed a negative attitude; more than 60% viewed sleep science in a positive light. The mean score was 37.9 out of 50 points. In Singapore, Mahendran et al. reported the mean attitude of the medical students was 35 (±4.3) [24]. This result was comparable to our study outcome. However, they measured the attitude of the students by Medical Education (MED) sleep survey. Also, Kovaæiæ et al. reported that the majority of respondents exhibited positive attitudes toward sleep medicine, which was consistent with our study results [21]. We also discovered that even though Unaizah branch has fewer students, they demonstrated a significantly better attitude compared to students from the main campus branch. Females exhibited a better attitude than males, and those who preferred non-medicine specialities also had a more positive attitude toward sleep medicine. We also
found out that those with interest in and those who believed knowledge of sleep medicine was important had significantly greater levels of knowledge and more positive attitudes toward the subject. Various studies have reported negative associations between knowledge and attitude based on sociodemographic factors [14], [15], [21], [22], [24]. Saleem et al. [14] observed that participants who attended lectures about medicine scored significantly better for the level of knowledge, but that knowledge had no relation to gender or the number of years of practice, whereas Almohaya and colleagues reported that the knowledge score did not differ by sex, GPA, level of academic achievement, or university attended [15]. A study from Egypt [22] reported that the knowledge score did significantly differ based on faculty location and gender, but no significant difference was observed based on years of study. In Singapore [24], researchers found no significant effect of age, gender, or medical qualifications on knowledge of basic sleep medicine, whereas, in Croatia, significant differences were found between the level of knowledge, but the attitude toward sleep medicine did not differ [21].

Our study demonstrates that one out of four students was interested in sleep medicine. This finding is by papers published locally [14], [15] Saleem et al. [14] reported more than 30 percent of the PCPs were interested in the subject, as did Almohaya et al. [15]. However, in China, more than 80 percent of medical students have demonstrated a strong interest in coursework related to sleep medicine, though most of them were not aware of any medical schools teaching the subject [23].

It is recommended that replication of this study be carried out with larger sample size, involving multiple institutions to better assess the knowledge and attitude of medical students toward sleep medicine in a broader, more generalizable context.

In summary, medical student knowledge regarding sleep medicine was very low, even though a majority of students expressed a positive attitude toward it. In this regard, faculty members such as lecturers, professors, and other related teaching staff should provide better sleep medicine education to increase their awareness. Although this subject might not be popular in the Saudi medical school, it is expected that better education on this subject will be part of the curriculum within the foreseeable future.

Acknowledgements

The authors would like to thank the students who participated in data collection: Ghadah Abdulaziz Aloyaidi, Raghad Taha Fouly, Fai Mohammed Almarshud, Malek Abdulrahman Alburayh, Muath Abdullah Alhasson.

References

1. Shaikh WA, Patel M, Singh SK. Sleep deprivation predisposes Gujrati Indian adolescents to obesity. Indian J Community Med. 2009; 34(3):192-4. https://doi.org/10.4103/0970-0218.55282 PMid:20049294 PMCid:PMC2800896
2. Gupta R, Bhatia MS, Chhabra V, Sharma S, Dahiya D, Semalti K, et al. Sleep patterns of urban school-going adolescents. Indian Pediatr. 2008; 45(3):183-9.
3. Javadzadeh M, Hashemi Z, Roudbari M, Mahvelati F, Jalilighadr S. Sleep patterns and sleep disorders in primary school children in Qazvin, Iran. Iran J Child Neurol. 2008; 2(4):15-9.
4. Bosie GD, Tefera TW, Hailu GS. Knowledge, attitude and practice with respect to sleep among undergraduate medical students of Mekelle University. Sleep and Biological Rhythms. 2012; 10(4):264-9. https://doi.org/10.1111/j.1479-8425.2012.00569.x
5. Bahammam AS. Sleep medicine in Saudi Arabia: Current problems and future challenges. Ann Thorac Med. 2011; 6(1):3-10. https://doi.org/10.4103/1817-1737.74269 PMid:21264164 PMCid:PMC3023868
6. Bahammam AS, Al-Jahdali H, Alhari AS, Alotaibi G, Asiri SM, Alsayedegh A. Saudi regulations for the accreditation of sleep medicine physicians and technologists. Ann Thorac Med. 2013; 8(1):3-7. https://doi.org/10.4103/1817-1737.105710 PMid:23440060 PMCid:PMC3573555
7. Bahammam AS, Aljafen B. Sleep medicine service in Saudi Arabia: A quantitative assessment. Saudi Med J. 2007; 28(6):917-21. https://doi.org/10.4103/0256-4947.51717 PMid:18500190 PMCid:PMC6074414
8. Bahammam AS, Al-Rajeh MS, Al-Ibrahim FS, Arafah MA, Sharif MM. Prevalence of symptoms and risk of sleep apnea in middle aged Saudi women in primary care. Saudi Med J. 2009; 30(12):1572-6.
9. Bahammam AS, Alrajeh MS, Al-Jahdali HH, BinSaeed AA. Prevalence of symptoms and risk of sleep apnea in middle-aged Saudi males in primary care. Saudi Med J. 2008; 29(3):423-6.
10. American Academy of Sleep Medicine Accreditation Committee. Standards for accreditation of a sleep disorders center. March 2002; revised edition. Rochester (MN): American Academy of Sleep Medicine; 2002.
11. Alotair HA, Bahammam AS, Continuous positive airway pressure compliance in Saudi men and women with sleep apnea. Saudi Med J. 2008; 29(7):1064-5.
12. BaHammam AS. Sleep medicine in Saudi Arabia: Current problems and future challenges. Ann Thorac Med. 2011 Jan; 6(1):3-10. https://doi.org/10.4103/1817-1737.74269 PMid:21264164 PMCid:PMC3023868
13. BaHammam AS. Knowledge and attitude of primary health care physicians towards sleep disorders. Saudi Med J. 2000; 21(12):1164-7.
14. Saleem AH, Al Rashed FA, Alkharboush GA, Almazyed OM, Olaish AH, Almeneessier AS, et al. Primary care physicians’ knowledge of sleep medicine and barriers to transfer of patients with sleep disorders. A cross sectional study. Saudi Med J. 2017; 38(5):553-9. https://doi.org/10.15537/smi.2017.5.17936 PMid:28439609 PMCid:PMC5447220
15. Almohaya A, Qrmli A, Almagal N, Alamri K, Bahammam S, AlEnizi M, et al. Sleep medicine education and knowledge among medical students in selected Saudi medical schools. BMC Med Ed. 2013; 13:133. https://doi.org/10.1186/1472-6920-13-133 PMid:24070217 PMCid:PMC3849688
16. Thornton JD, Chandrani K, Thornton JG, Farooq S, Moalleem M, Krishnan V, et al. Assessing the prioritization of primary care referrals for polysomnograms. Sleep. 2010; 33(9):1255-60. https://doi.org/10.1093/sleep/33.9.1255 PMid:20857874
17. Netzer NC, Hoegel JJ, Loube D, Netzer CM, Hay B, Alvarez-Sala R, et al. Prevalence of symptoms and risk of sleep apnea in primary care. Chest. 2003; 124(4):1406-14. https://doi.org/10.1378/chest.124.4.1406 PMid:1455573

18. Zozula R, Rosen RC, Jahn EG, Engel SH. Recognition of sleep disorders in a community-based setting following an educational intervention. Sleep Med. 2005; 6(1):55-61. https://doi.org/10.1016/j.sleep.2004.09.004 PMid:15680297

19. Zozula R, Bodow M, Yatcilla D, Cody R, Rosen RC. Development of a brief, self-administered instrument for assessing sleep knowledge in medical education: “the ASKME Survey”. Sleep. 2001; 24(2):227-33.

20. The Med Sleep Survey; c2012. [cited 2002 Jan 4]. Available from: http://www.aasm-net.org/MEDSleep/Survey/MEDSleep_Survey.htm.

21. Kovacic Z, Marendic M, Soljic M, Pecotic R, Kardum G, Dogas Z. Knowledge and attitude regarding sleep medicine of medical students and physicians in Split, Croatia. Croat Med J. 2002; 43(1):71-4.

22. Zaki NFW, Marzouk R, Osman I, Alamah HY, Zaied WS, Haggag A, et al. Sleep medicine knowledge among medical students in seven Egyptian medical faculties. J Sleep Disord Ther. 2016; 5(2):239. https://doi.org/10.4172/2167-0277.1000239

23. Luo M, Feng Y, Li T. Sleep medicine knowledge, attitudes, and practices among medical students in Guangzhou, China. Sleep Breath. 2013; 17(2):687-93. https://doi.org/10.1007/s11325-012-0743-x PMid:22752711

24. Mahendran R, Subramaniam M, Chan YH. Medical students’ behaviour, attitudes and knowledge of sleep medicine. Singapore Med J. 2004; 45(12):587-9.