UNIVERSITI PUTRA MALAYSIA

PREVALENCE AND ASSOCIATED FACTORS OF SNORING AND EXCESSIVE DAYTIME SLEEPINESS AMONG MEDICAL STUDENTS IN FACULTY OF MEDICINE AND HEALTH SCIENCES, UNIVERSITI PUTRA MALAYSIA, SERDANG, SELANGOR 2020.

GROUP 17

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Executive Summary

Snoring and excessive daytime sleepiness have always been one of the major health problems concerning the world population. Snoring is a risk to the population as it may lead to cardiovascular diseases whereas excessive daytime sleepiness leads to road traffic accidents.

The general objective of this study is to determine the prevalence of snoring and excessive daytime sleepiness respectively among medical students in Universiti Putra Malaysia in 2020. In addition, this study also determines the association between gender, body mass index (BMI), obesity and sleep quality with the prevalence of snoring and excessive daytime sleepiness respectively.

This study will be conducted from 27th April 2020 until 28th of September 2020. A cross-sectional study will be used to carry out this study. The data for this research will be collected through online questionnaires from the 17th August 2020 until 25th August 2020, and will be distributed to the medical students of the Faculty of Medicine and Health Sciences, Universiti Putra Malaysia via their preferred social platform. Simple random sampling method will be used to get the responses in this study.

In this study, excessive daytime sleepiness of the respondents will be assessed by using the Epworth Sleepiness Scale (ESS); snoring will be assessed by using the Berlin Questionnaire scoring; and sleep quality will be assessed by the Pittsburgh Sleep Quality Index (PSQI).

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CHAPTER 1: INTRODUCTION

1.1 Background

There are three main types of sleep disordered breathing (SDB) which are obstructive sleep apnoea (OSA), central sleep apnoea (CSA) and complex sleep apnoea. The premiere symptom of SDB is snoring.

Obstructive sleep apnea (OSA) is a common condition with significant increased occurrence over the past 2 decades. From the clinical aspects, OSA is associated with decreased quality of life, daytime sleepiness, and increased incidence of motor vehicle accidents and work-related accidents. In several studies, OSA was also found to be an independent risk factor for stroke and hypertension. The most common sign of OSA is snoring, which is found in 85% to 98% of patients in whom OSA is diagnosed. Furthermore, the correlation between OSA and snoring is so strong that many physicians use it as a screening question to predict the presence of OSA (Roi Westreich et al.,2019) [1].

According to the Ministry of Health Malaysia, snoring is defined as breathing during sleep with hoarse or harsh sounds as caused by the vibration of the soft palate through the open mouth and the nose when asleep [2]. Habitual snoring (snoring on more than 3 nights of week) has been said to be the best predictor of obstructive sleep apnea (OSA). Snoring can be harmless or harmful, high intensity of snoring can lead to some serious diseases. According to Sleep foundation, the two most common adverse health effects of snoring are daytime dysfunction and heart disease. Furthermore, it was found that about one-half of people who snore loudly have obstructive sleep apnea [7].

Excessive daytime sleepiness is one of the most common sleep-related patient symptoms, and it appears to affect an estimated 20 percent of the population. Several studies have been conducted and it is found that persons with excessive daytime sleepiness are at risk of motor vehicle and work-related incidents, and have poorer health than comparable

adults [3]. Poor sleep habits, such as reduced opportunity for sleep or irregular sleep schedule, a sleep disorder like obstructive sleep apnea, side effects from certain medications, and other underlying medical conditions are the possible causes of excessive daytime sleepiness [7]. Furthermore, Thomas Roth, 2015 stated in his article on Effects of Excessive Daytime Sleepiness and Fatigue on Overall Health and Cognitive Function that excessive daytime sleepiness (EDS) can cause negative behavioral, physiologic, and cognitive effects, which limit patients' function and quality of life [65].

Obstructive sleep apnea is a particularly significant cause of excessive daytime sleepiness. The prevalence of adults who are at risk of or have obstructive sleep apnea is estimated to be 26 to 32 percent and the prevalence is expected to increase [4].

The 2006 National College Health Assessment reported that the third largest impediment on academic performance in college students is sleeping difficulties. Hui et al studied first-year Chinese college students and found that 26% of participants reported snoring, 11% reported impaired performance ability, and 42% reported excessive daytime sleepiness (EDS). (Minal Patel BA et al, 2010). [5]

In a survey on 111 Pakistani medical students, Pasha and Khan found that 27% of men and 12% of women reported snoring. Ficker et al studied self-reported snoring among medical students taking exams and found that 49% claimed to be occasional snorers and 12% frequent snorers. Regression analysis showed an association between exam failure and snoring. The relative risk of exam failure for snorers adjusted for age, sex, and body mass index (BMI) was 1.26 [5].

We conducted this study to determine the prevalence of snoring and excessive daytime sleepiness among medical students in UPM. We also wanted to investigate the association between gender with snoring or excessive daytime sleepiness, the association between body

mass index with snoring or excessive daytime sleepiness, and the association between sleep quality with snoring or excessive daytime sleepiness among medical students in UPM.

1.2 Problem Statement

Excessive daylight sleepiness (EDS) might not sound like lethal disease but it is something about to worry about. Certainly, excessive daylight sleepiness has been one of the public health issues as it contributes to cardiovascular diseases, road traffic accidents , low academic performances and psychological problems [6].

Based on the National Sleep Foundation, it is estimated that roughly 20% of the population can be classified as having excessive daylight sleepiness.[7]

There are minimal studies performed within the medical students population in Malaysia based on this issue specifically. There was a study conducted by International Medical University students based on excessive daylight sleepiness. However this study could not apply generally as this study was limited to their students only, in other word, not including local medical students.[6]

Snoring on the other hand might be either harmless or not harmless. Light sighs during sleep would not cause trouble[8]. However, snoring is potentially linked to two common adverse health effects ,that is, daytime dysfunction and cardiovascular disease. It was reported on the National Sleep Foundation that about half of the people have obstructive sleep apnea if they snore loudly [9].

According to a study based on the prevalence of snoring in medical and nursing students in University Malaysia Sarawak (2004), there were 7.2% of students having habitual snoring. However, this study did not relate snoring and its effect of daylight sleepiness.Not only that, it

has already been 16 years which means the study's results is not the latest one[10]. Thus, a new study has to be conducted.

Furthermore, no study was conducted based on the prevalence of snoring and excessive daylight sleepiness among medical students in Malaysia. Thus, this study was done in order to educate the public , especially medical students on the importance of this topic . Both excessive daytime sleepiness and snoring are becoming a public health issue so this study was conducted to cover both of them wholly in many aspects as it affect the quality of life of a person.

1.3 Significance of Study

This study was carried out to determine the prevalence of snoring and excessive daytime sleepiness and its association with several factors among the medical students of Faculty Medicine and Health Sciences, UPM as snoring and excessive daytime sleepiness are the two main indications of obstructive sleep apnea. This study was conducted in hope to contribute to the early detection of obstructive sleep apnea. Although this finding might not accurately represent all medical students in Malaysia, however the results can be used as reference for future studies.

Subsequently, this study was done to indirectly encourage students to assess their own prevalence of excessive daytime sleepiness by using the standard Epworth Sleepiness Scale (ESS) calculator online or by answering the self-administered Berlin questionnaires [11].

A better understanding of the prevalence and associated factors of snoring and excessive daytime sleepiness may lead to healthier lifestyles and sleeping habits which can subsequently improve the overall wellness of the students. This improvement may potentially reduce the risk of obstructive sleeping apnea (OSA) among medical students. Finally, as most

of the students in this faculty are budding health care professionals, having this knowledge equipped with them can aid them in guiding the community towards a healthier future.

1.4 Research Questions

1. What is the prevalence of snoring among medical students?
2. What is the prevalence of excessive daytime sleepiness among medical students?
3. Is there an association between gender and the prevalence of snoring among medical students in UPM?
4. Is there an association between body mass index and the prevalence of snoring among medical students in UPM?
5. Is there an association between sleep quality and the prevalence of snoring among medical students in UPM?
6. Is there an association between gender and the prevalence of excessive daytime sleepiness among medical students in UPM?
7. Is there an association between body mass index and the prevalence of excessive daytime sleepiness among medical students in UPM?
8. Is there an association between sleep quality and the prevalence of excessive daytime sleepiness among medical students in UPM?

1.5 Objectives

1.5.1 General Objectives

To determine the prevalence and associated factors of snoring and excessive daytime sleepiness among medical students in Universiti Putra Malaysia.

1.5.2 Specific Objectives

1. To determine the prevalence of snoring among medical students in UPM.
2. To determine the prevalence of excessive daytime sleepiness among medical students in UPM.
3. To determine the association between several factors with snoring.
    a. association between gender and snoring.
    b. association between body mass index with snoring.
    c. association between sleep quality and snoring.
4. To determine the association between several factors with excessive daytime sleepiness.
    a. association between gender and excessive daytime sleepiness.
    b. association between body mass index and excessive daytime sleepiness.
    c. association between sleep quality and excessive daytime sleepiness.

1.6 Hypothesis

1.6.1 Null hypothesis

H01: There is no significant association between gender and snoring among medical students in UPM.

H02: There is no significant association between gender and excessive daytime sleepiness among medical students in UPM.

H03: There is no significant association between body mass index and snoring among medical students in UPM.

H04: There is no significant association between body mass index and excessive daytime sleepiness among medical students in UPM.

H05: There is no significant association between sleep quality and snoring among medical students in UPM.

H06: There is no significant association between sleep quality and excessive daytime sleepiness among medical students in UPM.

CHAPTER 2: LITERATURE REVIEW

2.1 Definition

2.1.1 Snoring

Snoring is defined as a sound produced when a person breathes during sleep as a result of the turbulence of air passing through the partially obstructed airway. It is considered as one of the most common clinical symptoms of obstructive sleep apnea (OSA) [12]. Snoring can result in excessive daytime sleepiness, lack of concentration, and psychological imbalances that may affect deterioration of the patient life quality unless treated [13]. It was estimated that the incidence of snoring ranged between 16% and 89% of the general population. This wide range is due to the differences in the populations studied, study design, investigations performed, ethnic group, age, and sex of the subjects [14].

2.1.2 Excessive Daytime Sleepiness

Excessive Daytime Sleepiness (EDS) is defined by having a high chance to fall asleep during typical wake hours or daytime. It is a common complaint of many children and adults . People with sleep disorders will have this symptom commonly. It causes fatalities from motor vehicle accidents as people fail to keep awake resulting could not able to concentrate on the road. It is also sometimes referred to as “Hypersomnia“, which is a non-specific symptom [12].

2.2 Prevalence

2.2.1 Prevalence of Snoring Worldwide

In order to learn more about our topic, we have studied multiple published journals and articles similar to our study which is the prevalence of snoring worldwide. Prevalence of snoring in adolescents and students in different countries seem to show varied results. For developed

countries such as the US, a research done on 2601 Californian college students by Patel et.al (2010) concluded that 30% of the participants were reported to have a prevalence of snoring [16]. Hui et. al (1999) found out that the prevalence of snoring among 1910 year 1 students in the chinese University of Hong Kong was 25.7% [17]. In Germany, Ficker et. al (1999) stated in his research that out of 201 medical students, 43.9% were occasional snorers and 11.9% were frequent snorers [18].

Meanwhile for developing countries such as Egypt, according to Al-Madani et.al (2015), his research on 840 adult male in University of Science and Technology, Sana'a, Yemen and Tanta University, Egypt showed that 16.28% of the male students and employees were snorers [19]. In Nigeria, Aladesuyi et.al (2019) stated that the prevalence of snoring among 300 postgraduate students was 36.9% among males and 25.2% among females [20]. A research done by Singh et. al (2012) on 548 undergraduates in a university in India showed that 17.7% of the participants were snorers [21]. Similarly, a research done on middle-aged Indian urban men showed 26% out of 658 respondents were snorers (Udwadia et.al, 2004) [22].

2.2.2 Prevalence of Snoring in Malaysia

Snoring is considered as the most common clinical symptom of obstructive sleep apnea-hypopnea syndrome. However, data and research done in Malaysia is scarce compared to other countries. The range of prevalence of snoring in Malaysian citizens are that preschoolers aged 3 - 5 years old [23] show a prevalence of 30% (Monash a university, 2017) [24] ; a study carried out in Hospital Kuala Terengganu in 2007 showed children aged 7 - 15 years old had prevalence of 14.51 % [25] ; a study conducted by Universiti Tunku Abdul Rahman (UTAR) showed undergraduate students that snore 3 or more times a week had a prevalence of 5.3% [26] ; while, adults aged 30 - 70 years old had a prevalence of 47.3% [27].

Not only that, there had also been studies done specifically on Medical students in Malaysia. In 2004 and 2005, a research done in University Malaysia Sarawak (UNIMAS) showed that the percentage of snoring for all years, first year and final year medical students are 7.2, 9.9, and 3.6 respectively [28] .

2.2.3 Prevalence of Excessive Daytime Sleepiness Worldwide

In order to learn more about our topic, we have also studied multiple published journals and articles who have done research on the topic similar to ours which is the prevalence of excessive daytime sleepiness worldwide. Prevalence of excessive daytime sleepiness in adolescents and students in different countries seem to show varied results. For developed countries such as America, 53.7% of men and 55.2% of women were reported to have excessive daytime sleepiness in a study done on 191 undergraduates to determine the prevalence of sleep difficulties in a sample of US college students [29]. According to Joo et. al (2005), the prevalence of excessive daytime sleepiness in 3871 high school students were reported to be 15.9% (14.9% for boys and 18.2% for girls) [30] .

Meanwhile, for developing countries, Sedigheh et.al (2018) stated in his research done on 400 Iranian medical students, 17.9% experienced excessive daytime sleepiness, where 18.37% and 17.85% among those who experienced excessive daytime sleepiness were married were single respectively [31]. In Columbia, a cross sectional study done on 544 medical students gave a result of 65% facing excessive daytime sleepiness, where majority were those with lower grades (Barahona-Correa, 2018) [32]. Kaur & Singh (2017) in their cross-sectional

study found out that there was a prevalence of 45% out of 1215 undergraduate Indian students who faced excessive daytime sleepiness [33]. In Morocco, North Africa, 36.3% out of 600 students had excessive daytime sleepiness and there was a female predominance over male students (Hangouche et. al , 2018) [34].

2.2.4 Prevalence of Excessive Daytime Sleepiness in Malaysia

Excessive daytime sleepiness especially among adults had been notified as a public health issue. It has been reported to be linked with many side effects such as cardiovascular events, road traffic accidents, poor academic and work performance and psychological distress [35]. Most of the studies done in Malaysia documented that it is prevalent in most populations but only a few of the documents show the prevalence of excessive daytime sleepiness among medical students.

In 2013, a research done on rural and urban Malaysian children showed that prevalence of excessive daytime sleepiness in children ranged from 16.5% to 21% which vary according to several factors associated with the study [36]. Zailinawati, Ariff , etc (2008) stated that in a research done on Malaysian adults with insomnia, a total of 22.2% of the respondents had excessive daytime sleepiness based on their Epworth Sleepiness Score (P = <.001) [35]. Meanwhile, as for teenagers, a research done on undergraduate students by Universiti Tunku Abdul Rahman found out that prevalence of excessive daytime sleepiness of students was 30.6%, which is higher compared to the adults and the children [37].

Napping in the lecture halls is commonly observed among medical students, therefore there were also researches done specifically on medical students in Malaysia. A research done by International Medical University, Malaysia in 2009 by using the Epworth Sleepiness Scale

(ESS) > 11 as a cut off point for students having excessive daytime sleepiness found out that 35.5% of the students had this problem, and that excessive daytime sleepiness was reported to be more common among the clinical students, those with self-reported bad sleep quality and those having psychological distress [35]. Excessive daytime sleepiness is not only a frequent complaint among medical students, it is also a serious condition among young age health professional workers and doctors, which has been giving trouble to both the doctors and their patients. In a research done by Yasin, Muntham & Chirakalwasan (2016), it is shown that the prevalence of excessive daytime sleepiness among young doctors (age) is 15.4% with the factors of being male, snoring and inadequate sleep [36]. Another interesting published research compares excessive daytime sleepiness among a total of 152 medical students and non-medical students of Management and Science University (MSU), Shah Alam, which gave the results of a total 56.6% students facing excessive daytime sleepiness, which 52.3% were medical students while 47.7% were non-medical students [37] .

2.3 Factors Associated With Snoring and Excessive Daytime Sleepiness

2.3.1 Gender

Sex differences in sleep apnea have been reported in general populations. Most epidemiological studies have found the prevalence of sleep apnea to be higher in men than in women, with the male-to-female ratio ranging from approximately 2:1 to 3:1 in adults.

A study was done on a total of 12,672 high-school students in South Korea consisting of 6,056 (47.8%) females and 6,616 (52.2%) males. Self-perceived snoring was observed in

2,883 (22.8%) students (18.8% for females and 26.4% for males) occasionally (in 16.5%), often (in 4.2%), and always (in 2.0%). In total, 2,254 (17.8%) students had a modified ESS score of ≥11. Meanwhile, Kwak Ik Yang et al., 2017 found that EDS was found more common in females with the prevalence of Excessive Daytime Sleepiness (modified ESS score ≥11) was significantly higher in females (20.4%) than males (15.4%) [38].

Paul L. et al.(n.d) stated that males were more likely to report that others had complained about their loud snoring with a prevalence of 33% (males) vs. 19% (females). Same studies also showed that the prevalence of excessive daytime sleepiness was slightly higher in males than in females which are 17% and 15% respectively [81].

In a study involving 600 medical university students randomly recruited from the Faculty of Medicine and Pharmacy of Rabat in Morocco, 6.3% of students had excessive daytime somnolence (ESS >10) and they found out that EDS is more frequently in the female students(43%) than male students (20.1%). Another study was done by Adewole, O. O. et al. in 2008 on the prevalence and correlates of snoring among adults in Nigeria. They found out that in 31% (n=370) of all the respondents, there was a reported history of snoring in 36% of males and 27% of females [44].

2.3.2 Body Mass Index

Sleep-related breathing disorders (SRBD) and snoring have been identified as a major public health problem closely related to adolescent obesity. The difference in snoring distribution by BMI classification was significant ($p < 0.05$). The result showed that the prevalence of snoring is higher in those who are overweight than in normal BMI (Ma Y. et al. 2017) [46].

In another population based study, Ursavaş, Ahmet et al., n.d conducted a study on the association between snoring, daytime sleepiness and obesity in professional wrestlers. From the study, it was reported that obesity was significantly more common among wrestlers (14.5%) than in control (2.3%) subjects (p=0.004) and the results of the study showed that 9.1% of the wrestler reported habitual snoring compared to only 6.8% of control subjects that reported habitual snoring (p>0.05) [48].

A study was conducted by Patel M et al. on the prevalence of snoring in college students in 2008. The result showed a significant association between BMI and snoring with that participants who reported snoring have a higher BMI (23.35 kg/m2 ± 3.68) than those participants who reported not snoring (21.85 kg/m2 ± 3.09) [16].

Marchesini, G. et al. conducted a study on 1890 obese patients from 25 obesity Italian centers, with low prevalence of clinical manifestations of cardiovascular disease. From the study, they found out that habitual snoring was reported in 56% of the cases. The prevalence of reported habitual snoring increased with increasing BMI (47% in class I obesity (30–34.9 kg/m^2), 56% in class II (35–39.9 kg/m^2) and 67% in class III(>40 kg/m^2) [43].

Yue Ma et al., 2017 stated that there is a relation between overweight and snoring was shown in the present study. The results showed that mean BMI is slightly higher in the snoring group than in the non-snoring group which are 20.22 kg/m2 and 19.48 kg/m2 respectively. Snoring was reported higher in overweight and obese respondants with the results of their study showed that 6.1% of overweight respondents reported snoring compared to only 2.9% in normal BMI respondents. Furthermore, they stated that the possible causes that lead to high prevalence of snoring in overweight people is that overweight people tend to have fat deposits in upper airway tissues that might narrow the upper airway, which causes air turbulence and

vibrations and might generate snoring during sleep. Therefore, weight control is essential to prevent the development of SRBD in adolescents [49].

According to study done by Somayyeh M. et, al., 2014 on comparing the Excessive Daytime Sleepiness of Obese and Non-obese Patients. They compared 55 obese patients with 55 control with normal BMI. They found out that there is a significant association between BMI and sleepiness in cases; their likelihood of reporting sleepiness increased significantly as their BMI increased (OR = 1.01 (95% CI 1.01 - 1.20)). The prevalence of sleepiness was 29 (52.7%) in the case group and 17 (30.9%) in the control group. Furthermore, they also mentioned that being obese causing someone to have problems with ventilation, can increase airway obstructions, and causing critical pressure, which leads to daytime hypercapnia. All of these can lead to sleep disturbances and cause daytime sleepiness. Hence that is why individu with higher BMI range are more prone to have daytime sleepiness [82].

2.3.3 Sleep quality

In a study conducted by Zailinawati et al. in 2009 on the Daytime Sleepiness and Sleep Quality Among Malaysian Medical Students, they found out that daytime sleepiness occurred in 35.5%, 16.1% reported bad sleep quality. Furthermore, daytime sleepiness was significantly more common among the clinical students, those with self-reported bad sleep quality [35].

In other population study by Glauber S. B et al. in 2018 on the association of sleep quality with excessive daytime sleepiness and quality of life of elderlies of the community, the result of their study showed that from 131 elderlies with poor sleep quality, 40(30.5%) had excessive daytime sleepiness which were assessed by ESS [39].

In a study done by El Hangouche AJ et al. in 2018 on 600 medical university students that were randomly recruited from the Faculty of Medicine and Pharmacy of Rabat in Morocco, they found out that out of 600 students, 58.2% reported bad sleep quality that were assessed by PSQI (score greater than 5) and 36.3% of students had excessive daytime sleepiness assessed by ESS [40].

Rishav Dey et al. conducted a study on sleep quality and daytime sleepiness among the clinicians working in a tertiary care center in Sikkim, India. They found out that there is a significant relation between sleep quality and excessive daytime sleepiness. Among 100 participants, 45% of the junior residents and 27.3% of the senior residents were reported having a poor sleep quality assessed by PSQI score. Daytime sleepiness was significantly more common among the junior residents as compared to senior residents with 20% of the junior residents reported mild excessive daytime sleepiness and 15% reported moderate excessive daytime sleepiness. Rishav Dey et al. reported a prevalence of 18% of poor sleepers reported mild excessive daytime sleepiness and equal percentage 17.9% reported moderate excessive daytime sleepiness. Higher normal daytime sleepiness was reported by 46.4% of the participants having poor sleep [41].

Snoring is a form of the sleep disorders breathing that is usually associated with obstructive sleep apnoea (OSA), a more serious form of sleep-disordered breathing. Not all snorers have OSA but people who snore are at greater risk for OSA. Snoring is not just noisy and annoying, it also disrupts healthy, sound, restorative sleep. Furthermore, snoring also leads to increased risks for other health problems such as heart disease and stroke, accidental injury, depression and anxiety and also can diminish sexual satisfaction. Snoring also can affect our bed partner as their sleep will be disturb by our snoring [74].

According to Michael J. Breus, 2017, snoring can diminish our sleep quality. This is because snoring causes an individual to wake more often throughout the night, waking up in the morning with a dry mouth or sore or irritated throat, feeling fatigue the next day, having signs of exhaustion, moodiness, and lack of concentration during the day and having headaches. Sometimes a snorer can wake themselves up and not even realize it. This can happen many times throughout the night, causing a high number of micro-awakenings. This can hinder your ability to get more REM sleep, the physically and mentally restorative stages of rest. He furthermore stated in his article that if you snore, it will likely affect your sleep score [75].

2.4 Materials and Methods

2.4.1 Study design and subjects

A cross sectional study was performed using online questionnaires distributed among medical students at the Faculty of Medicine and Health Sciences, Universiti Putra Malaysia. Questionnaires will be distributed to a total number of 505 medical students comprising 114 Year 1 students, 113 Year 2 students, 99 Year 3 students, 98 Year 4 students and 81 Year 5 students.. Distribution of questionnaires and data collection will be conducted from 17 - 24th August 2020, and will not coincide with any major examinations.

2.4.2 Questionnaires

2.4.2.1 Consent Form

This segment was used to briefly introduce our research to the respondents and to obtain their consent.

2.4.2.2 Biodata

The segment was used to collect respondent's gender, height and weight.

2.4.2.3 Berlin Questionnaire

The questionnaire focused on evaluating the prevalence of snoring among all medical students in UPM. This questionnaire consists of questions assorted in 3 categories. Respondents were also asked to provide information on age, weight, height, sex, neck circumference, and ethnicity. Obesity was quantified by calculating body mass index from self-reported weight and height. The detailed description of this questionnaire can be found in "Chapter 3 : Data Collection" of this research proposal.

2.4.2.4 Epworth Sleepiness Scale (ESS)

The questionnaire was used to assess the frequency of individuals dozing off. Respondents were required to rate their sleepiness scale in 8 specific situations commonly met in daily life. The detailed description of this questionnaire was included in " "Chapter 3 : Data Collection" of this research proposal.

2.4.2.5 The Pittsburgh Sleep Quality Index (PSQI)

The questionnaire focused on evaluating the sleep quality of our respondents. Factors such as sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction over the last month were assessed and were used to calculate the global PSQI score . The detailed description of this questionnaire was included in " "Chapter 3 : Data Collection" of this research proposal.

2.5 Conceptual Framework

Figure 1.0 shows the prevalence of snoring and excessive daytime sleepiness among the medical students at Faculty on Medicine and Health Sciences, Universiti Putra Malaysia in year 2020. Based on the literature review, we have categorised several factors that is the sociodemographic factors (gender, BMI) and lifestyle factor (sleep quality) to be the possible factors affecting the snoring and excessive daylight sleepiness among the medical students in Faculty on Medicine and Health Sciences, Universiti Putra Malaysia in year 2020.

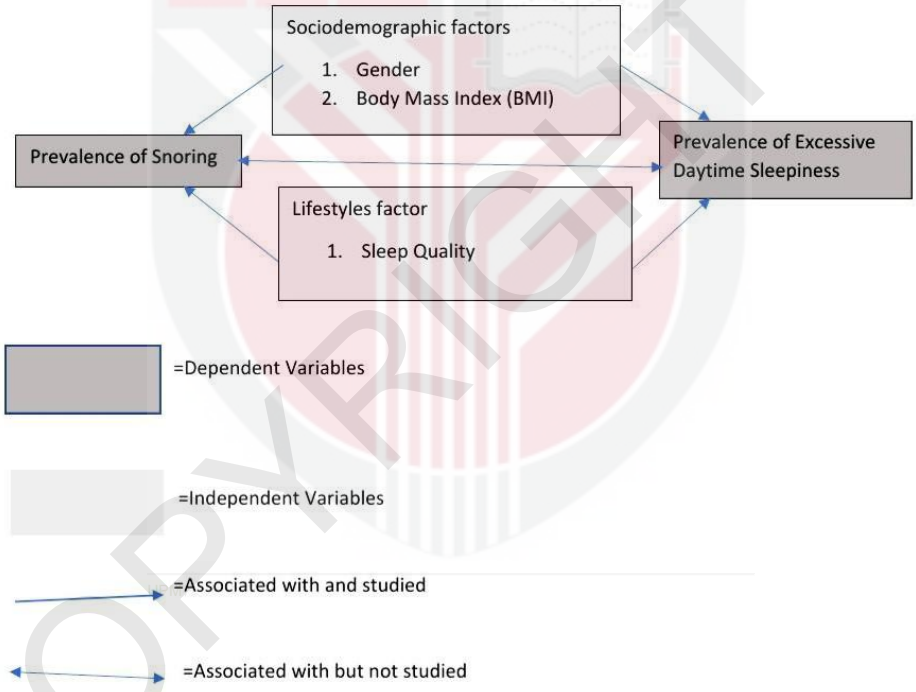


Figure 1: The conceptual framework of factors that are associated with the prevalence of snoring and excessive daylight sleepiness respectively.

CHAPTER 3: METHODOLOGY

3.1 Study Location

The research was held at the Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, Serdang, Selangor in 2020.

3.2.Study Design

A cross-sectional study was used for this research. The data for this research was collected through online questionnaires which was given to all medical students of Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, Serdang, Selangor.

3.3 Study duration

The study duration for this research was four months, which commences from May 2020 until September 2020.

3.4 Study Population

All medical students of Faculty of Medicine and Health Sciences of Universiti Putra Malaysia comprising 505 medical students - 114 year one students; 113 year two students; 99 year three students; 98 year four students; 81 year five students participated in this research.

3.5 Sampling

Universal sampling was used in data collection and data distribution.

3.5.1 Selection Criteria

The selection criteria was categorised into inclusion criteria and exclusion criteria.

3.5.1.1 Inclusion Criteria

1. All medical students that were studying at Faculty of Medicine and Health Sciences of Universiti Putra Malaysia, Serdang, Selangor in 2020 at the time of when the research is being conducted.

3.5.1.2 Exclusion Criteria

1. Medical students that have snoring due to medications (benzodiazepines, barbiturates, and antihistamines.) or any diseases (OSA)
2. Medical students that have excessive daytime sleepiness due to medications (narcotics, antianxiety, antidepressants and antihistamines) or any diseases (OSA)
3. Non-medical students.

3.5.2 Sampling Frame

The complete list of medical students of Faculty of Medicine and Health Sciences of Universiti Putra Malaysia, Serdang, Selangor.

3.5.3 Sampling Unit

Preclinical and clinical medical students of Faculty of Medicine and Health Sciences of Universiti Putra Malaysia, Serdang, Selangor that fulfill the inclusion criteria and were willing to participate in the research.

3.5.4 Sample Size Estimation

Various sample sizes were calculated based on our specific objectives (all calculations attached in appendices-Table 2). Out of all the sample sizes calculated, the biggest sample size obtained was chosen as our final sample size. The final sample size chosen is based on our specific objective which is to determine the prevalence of snoring among medical students in UPM. Based on previous study, the prevalence of is 25.2% (Eva Lindberg et al., 2006). The sample size for this study was calculated using sample size calculation to estimate a proportion as shown below:

Formula (Daniel, 1999) as follows:

$$n = \frac{Z^2 P(1-P)}{d^2}$$

- n = sample size
- Z = Z statistic for a level of confidence (95% confidence interval = 1.96)
- P = prevalence of snoring (Eva Lindberg et al., 2006) = 25.2%
- d = precision (appropriate to have a precision of 5% if the prevalence of the disease is between 10% and 90%).

Calculation:

$n = (1.96)^2(0.25)(1-0.25) / (0.05)^2$

$n = 288$

We estimated 10% for non-response rate, the final sample size is calculated using formula as shown below:

$$n_{final} = \frac{n\ calculated}{1 - non\ response\ rate}$$

Calculation :

n = 288 / (1-0.1)

n = 320

After adjusting and adding the non response rate, our final sample size was 320 respondents. All the calculations done for sample size estimation was attached at the "Appendices" section of this report.

3.5.5 Sampling Method

Randomized sampling method was used for getting the responses of medical students of the Faculty of Medicine and Health Sciences, Universiti Putra Malaysia. After getting approval from JKEUPM, a list of names of medical students who were studying at the Faculty of Medicine and Health Sciences was collected.

3.6 Data Collection

3.6.1 Materials

1. Consent Form
2. Biodata

3. Berlin Questionnaire

4. Epworth Sleepiness Scale (ESS)

5. The Pittsburgh Sleep Quality Index (PSQI)

3.6.2 Instruments

3.6.2.1 Consent Form

This segment was used to briefly introduce the main objective of our research to the respondents. The consent of respondents was collected with choices given : "Yes, I give my consent." or "No, I do not give my consent."

3.6.2.2 Biodata

This segment was used to collect respondent's gender, height and weight. Gender was used to determine the association between gender and the prevalence of snoring, and association between gender and excessive daytime sleepiness separately among all medical students in UPM. Height and weight was used to calculate the body mass index of respondents to determine the association between body mass index and snoring and body mass index and excessive daytime sleepiness among all medical students in UPM. Body mass index was later on categorized into 4 categories : Underweight (less than 18.5), Normal (18.5 - 24.9), Overweight (25.0 - 29.9) and Obese (30.0 or more) [65].

3.6.2.3 The Berlin Questionnaire

The Berlin Questionnaire was an outcome of the Conference on Sleep in Primary Care, which involved 120 U.S. and German pulmonary and primary care physicians and was held in April 1996 in Berlin, Germany [67]. This questionnaire was introduced to determine the risk

of sleep apnoea in respondents. According to Netzer et.al (1999), the Berlin Questionnaire consists of one introductory question and four follow-up questions concerning snoring (category 1); three questions addressing daytime sleepiness, with a subquestion about sleepiness while driving (category 2); one question concerning history of high blood pressure and obesity (category 3). Respondents were asked to provide information on age, weight, height, sex, neck circumference, and ethnicity. Obesity was quantified by calculating body mass index from self-reported weight and height [67]. Scores from the first and second categories were positive if the responses indicated frequent symptoms (.3–4 times/week), whereas the score from the third category was positive if there was a history of hypertension or a BMI .30 kg/m2. Patients were scored as being at high risk for OSA if they had a positive score on 2 or more categories, while those who did not were scored as being at low risk [67].

3.6.2.4 Epworth Sleepiness Scale (ESS)

The Epworth Sleepiness Scale (ESS) was founded by Johns (1991) based on the evaluation of 180 patients is a 8-question self-evaluation questionnaire [55].This questionnaire solely focuses on assessing the frequency of individuals dozing off, it does not measure individual's feeling of drowsiness or sleeping hours. Respondents are required to rate their sleepiness scale in specific situations commonly met in daily life. The scale ranges from 0 = would never doze; 1 = slight chance of dozing; 2 = moderate chance of dozing ; and 3 = high chance of dozing). The ESS score is the score sum of the eight questions and can range from 0 to 24 (Johns, 2002). According to Johns (1991), scores 0-5 indicated Lower Normal Daytime Sleepiness; scores of 6-10 indicated Higher Normal Daytime Sleepiness; scores 11-12 indicated Mild Excessive Daytime Sleepiness; scores 13-15 indicated Moderate Excessive Daytime Sleepiness; while scores 16-24 indicated Severe Excessive Daytime Sleepiness [55].

3.6.2.5 The Pittsburgh Sleep Quality Index (PSQI)

The Pittsburgh Sleep Quality Index (PSQI) was founded by Buysse et.al in 1989 was used to measure the quality and patterns of sleep in adults. According to Buysse, their study subjects found the questionnaire easy to be understood, therefore making it an efficient self-evaluated questionnaire [68]. The questionnaire assesses poor and good sleep quality by measuring seven domains: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction over the previous month. There are 9 questions that are required to be answered. Questions 1-4 are fill-in questions such as “What time have you usually gone to bed?” , “How long (in minutes) has it taken you to fall asleep each night?” , “What time have you usually gotten up in the morning?” ,and “How many hours of actual sleep do you get at night?”. Questions 5-9 will be answered according to a 0 to 3 scale, whereby “0” indicates not during the past month; “1” indicates less than once a week; “2” indicates once or twice a week; and “3” indicates three or more times a week [69]. The global PSQI score will be calculated using 7 components : Score for component 1 will be calculated by using the score for question 9; score for component 2 will be calculated by using the score for question 2 (≤15min=0; 16-30 min=1; 31-60 min=2, >60 min=3) added with score for question 5a Score (if sum is equal 0=0; 1-2=1; 3-4=2; 5-6=3) ; score for component 3 will be calculated by using the score for question 4 (>7=0; 6-7=1; 5-6=2; <5=3); score for component 4 will be calculated by using the formula : (total # of hours asleep) / (total # of hours in bed) x 100 , where results >85%=0, 75%-84%=1, 65%-74%=2, <65%=3; score for component 5 will be calculated by using the sum of score for questions 5b to 5j where (0=0; 1-9=1; 10-18=2; 19-27=3); score for component 6 will be calculated by using the score for question 6; and lastly score for component 7 will be calculated by using the sum of score for questions 7 and 8 where (0=0; 1-2=1; 3-4=2; 5-6=3) [69]. The use of this

questionnaire had been granted permission to be reproduced, posted, downloaded, and/or distributed for not-for-profit educational purposes only provided that The Hartford Institute for Geriatric Nursing, New York University, College of Nursing is cited as the source [69]. If the final PSQI score ends up as (PSQI>5), the respondent is identified to have poor sleep quality [76].

3.6.3 Data Collection Technique

The questionnaire was generated using the official Google Forms prior to the date to data distribution. During the data collection period (17th August 2020 - 24th August 2020), the questionnaire was distributed to each respondents on several social platforms such as Whatsapp, Telegram or Instagram. Completion and submission of the questionnaire by each respondent was completed before the submission of data analysis. Data analysing was commenced soon after data collection. No physical or laboratory examination was required in our study as our questionnaire was a self-evaluation questionnaire.

3.7 Quality Control

3.7.1 Berlin Questionnaire

3.7.1.1 Validity and Reliability

The test-retest reliability Kappa value for Berlin questionnaire showed a good range between 0.864 - 1.000. The Berlin questionnaire also had a high level of internal consistency as measured by Cronbach's alpha (0.68 - 0.98).

3.7.1.2 Sensitivity and Specificity

The sensitivity and specificity of the Berlin Questionnaire were 92% and 17% respectively. The Berlin Questionnaire showed high sensitivity (92%) but low specificity (17%). Therefore, Berlin Questionnaire is useful as a screening tool but it is not a confirmatory diagnostic tool for obstructive sleep apnoea.

3.7.2 Epworth Sleepiness Scale (ESS)

3.7.2.1 Validity and reliability

A study was conducted by M. W. Johns on the Reliability and Factor Analysis of the Epworth Sleepiness Scale. The results indicate, first, that the ESS questionnaire is reasonably reliable in the test-retest sense. In the study, comparisons between the ESS responses of 87 students on two separate occasions, 5 months apart, enabled an estimate to be made of the test-retest reliability of the questionnaire. On the first occasion their mean ESS score was 7.4 ± 3.9 (SD) and on the second occasion was 7.6 ± 3.8 (SD). The mean difference between these paired scores was 0.20 ± 2.3 (SD), which was not statistically significant ($t = 0.79$, $df = 86$, $p = 0.43$). The paired scores differed by no more than 1 in 51.7% of students, by no more than 2 in 81.6% and by no more than 4 in 96.6%. The Pearson correlation coefficient between the 87 paired scores was 0.822 ($p < 0.001$). The ESS questionnaire also had a high level of internal consistency as measured by Cronbach's alpha (0.88)[55] .

3.7.3 The Pittsburgh Sleep Quality Index (PSQI)

3.7.3.1 Validity and reliability

A study was done by Backhaus, J. et al. on test–retest reliability and validity of the Pittsburgh Sleep Quality Index in primary insomnia. The study sample consisted of 80 patients with primary insomnia. The length of the test-retest interval was either 2 days or several weeks. Validity analyses were calculated for PSQI data and data from sleep diaries, as well as polysomnography. To evaluate the specificity of the PSQI, insomnia patients were compared with a control group of 45 healthy subjects. The results show that in primary insomnia patients, the overall PSQI global score correlation coefficient for test-retest reliability was 0.87. Validity analyses showed high correlations between PSQI and sleep log data and lower correlations with polysomnography data. A PSQI global score > 5 resulted in a sensitivity of 98.7 and specificity of 84.4 as a marker for sleep disturbances in insomnia patients versus controls. The PSQI has a high test-retest reliability and a good validity for patients with primary insomnia. The PSQI has internal consistency and a reliability coefficient (Cronbach's alpha) of 0.83 for its seven components[72].

3.8 Variables

3.8.1 Dependent Variable

The dependent variables for this study are snoring and excessive daytime sleepiness.

3.8.2 Independent Variable

The independent variables for this study are gender, body mass index and sleep quality.

3.9 Operational Definition

3.9.1 Dependent Variable

Variable	Definition
Snoring	Sound produced when an individual breathes during sleep due to the turbulence of air passing through the partially obstructed airway. [57] In our study, we assess the prevalence of snoring by having told that the respondent does snores.
Excessive Daytime Sleepiness (EDS)	Having a high chance to fall asleep during typical wake hours or daytime. [58] According to the Epworth Sleepiness Scale, a person who scores 11 or higher represents excessive daytime sleepiness.

3.9.2 Independent Variable

Sleep Quality	Sleep quality is defined as one's satisfaction of the sleep experience, integrating aspects of sleep initiation, sleep maintenance, sleep quantity, and refreshment upon awakening.[61]

Gender	Either of the two sexes, it is typically referring to the difference in terms of social and cultural rather than biological [62]. In our study, gender is represented by male and female.
BMI	A person's weight in kilograms divided by the square of height in meters [64]. According to Ministry of Health, the BMI classifications are: Underweight (<18.5), Normal (18.5 - 24.9), Overweight (25 - 29.9), and Obese (≥ 30.0).

3.10 Data Analysis

Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS), version 22. Continuous data was described as mean and standard deviation if the distribution is normal. If the data is a skewed distribution, median, minimum and maximum value was used to describe the data. The evaluation association between categorical variables was analyzed by using Chi-square test. Fisher-exact test was only used if the expected number of sample size obtained is less than 5. Diagnostic proportions was given along with their 95% confidence intervals (CI). P values < 0.05 was considered to indicate statistical significance.

3.11 Ethical Approval

In order to start conducting the research, a copy of the completed research proposal was submitted to the Ethics Committee for Research Involving Human Subjects (JKEUPM), Universiti Putra Malaysia. The research proposal was analyzed by the committee before approval was given to us to start doing the study. Information of our research was attached to

our questionnaire to obtain consent from the respondents. The respondents were assured that the information obtained through the questionnaire was kept confidential.

3.12 Budget Planning

No.	Items	Estimated Cost
1.	Hard cover and binding of thesis	RM 200.00
2.	Printing	RM 20.00
Total		RM 220.00

4.1 Response rate

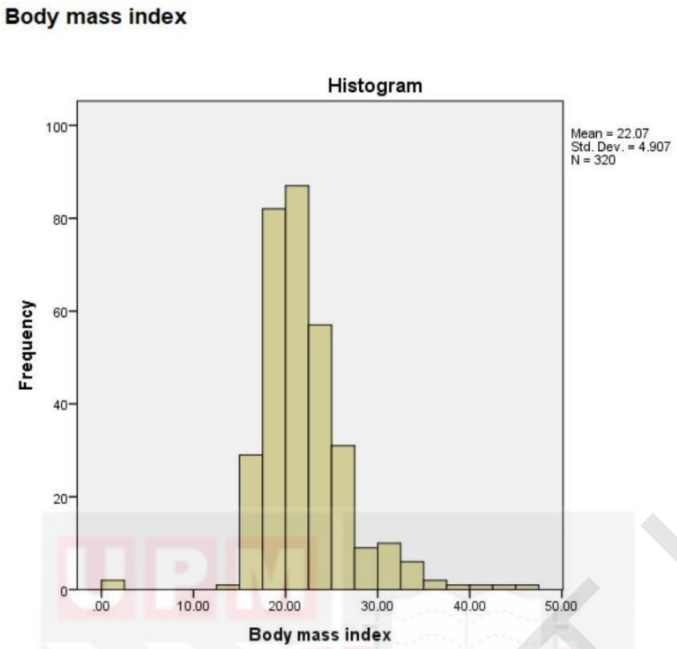
A total of 331 respondents had completed the questionnaire. These 331 responses were inclusive of double responses and non-consented responses. The optimum estimated sample size (320 respondents) has been 50% achieved in the data collection session (17th August 2020 – 25th August 2020). To dramatically improve the response rates, follow ups which involved sending reminders through phone numbers were carried out nearing the end of the data collection period.

4.2 Normality Test

4.2.1 Normality Test for Body Mass index

	Kolmogorov Smirnov		
	Statistic	**df**	**Sig.**
Body Mass Index	**0.107**	**320**	**< 0.001***

Table 4.2.1 showed the normality test for body mass index by using Kolmogorov-Smirnov test. From the test, p-value of ($p<0.001$) was obtained.The p-value was less than 0.05, thus statistically significant. Therefore, we assumed that the distribution for the body mass index was not normally distributed with a confidence Interval of 95%.



Picture 4.2.1 (The histogram showed a positively-skewed body mass index distribution.)

4.3 Distribution of Associated Factors among Medical Students in UPM

4.3.1 Distribution of Gender among Medical Students in UPM

Variable	Number of respondent(s)	Percentage (%)
Gender (n=320)		
Male	97	30.3%
Female	223	69.7%

Table 4.3.1 Distribution of Socio-demographic characteristic (Gender) among respondents **(N=320).** Majority were females (69.7%)

4.3.2 Distribution of BMI among Medical Students in UPM

Variable	Number of respondent(s)	Percentage (%)
Body Mass Index (n=320)		
Underweight	54	16.9%
Normal	204	63.7%
Overweight	40	12.5%
Obese	22	6.9%

Table 4.3.2 Distribution of BMI among respondents **(N=320).** Majority were normal (63.7%)

4.3.3 Distribution of Prevalence of Snoring among Medical Students in UPM

Variable	Number of respondent(s)	Percentage (%)
Prevalence of Snoring (n=320)		
Snorer	66	20.6%
Non-snorer	254	79.4%

Table 4.3.3 Distribution of prevalence of snoring among respondents **(N=320).** Majority were non-snorer (79.4%)

4.3.4 Distribution of Epworth Sleepiness Score among Medical Students in UPM

Variable	Number of respondent(s)	Percentage (%)
Prevalence of Epworth Sleepiness Score (n=320)		
Lower Normal Daytime Sleepiness	64	20.0%
Higher Normal Daytime Sleepiness	155	48.4%
Mild Excessive Daytime Sleepiness	37	11.6%
Moderate Excessive Daytime Sleepiness	44	13.8%
Severe Excessive Daytime Sleepiness	20	6.3%

Table 4.3.4 Distribution of Epworth Sleepiness Score among respondents **(N=320).** Majority were having higher normal daytime sleepiness (48.4%)

4.3.5 Distribution of Pittsburgh Sleep Quality Index score among Medical Students in UPM

Variable	Number of respondent(s)	Percentage (%)
Sleep Quality (n=320)		
Good Sleep Quality	163	50.9%
Poor Sleep Quality	157	49.1%

Table 4.3.5 Distribution of Pittsburgh Sleep Quality Index score among respondents **(N=320).** Majority were having good sleep quality.

4.4 The Prevalence of Snoring among Medical Students in UPM

Table 4.4 The prevalence of snoring among medical students(N=320)

Snoring	**Frequency (n)**	**Percentage (%)**
Positive	66	20.6
Negative	254	79.4

Table 4.4 shows the prevalence of snoring among medical students in UPM. In this study, the respondents were divided into two categories in which respondents with snoring were categorized as “positive snoring”, meanwhile, respondents without snoring were categorized

as “negative snoring”. There were 66 respondents with snoring hence they were categorized into “positive snoring”. The prevalence of medical students in UPM with snoring was 20.6%.

4.5 The Prevalence of Excessive Daytime Sleepiness among Medical Students in UPM

Table 4.5 The prevalence of excessive daytime sleepiness among medical students(N=320)

Excessive Daytime Sleepiness (EDS)	Frequency (n)	Percentage (%)
Positive	134	41.9
Negative	186	58.1

Table 4.5 shows the prevalence of excessive daytime sleepiness among medical students in UPM. In this study, the respondents were divided into two categories in which respondents with excessive daytime sleepiness were categorized as “positive EDS”, meanwhile, respondents without excessive daytime sleepiness were categorized as “negative EDS”. There were 134 respondents with EDS hence they were categorized into “positive EDS”. The prevalence of medical students in UPM with EDS was 41.9%.

4.6 Association between Snoring or Excessive Daytime Sleepiness with its Associated Factors

Table 4.6.1 Association between Gender and Snoring Among Medical Students in UPM.

Factor	Prevalence of Snoring		$\chi 2$	p-value
	Snorer	Non-snorer		
Gender				
Male	22 (22.7%)	75 (77.3%)	0.359	0.549
Female	44 (19.7%)	179 (80.3%)		

Table 4.6.1 shows the association between gender and snoring among medical students in UPM. . According to Chi Square test, there is no statistically significant association between gender and snoring among medical students in UPM. The p-value obtained from the Chi Square test that is greater than 0.05 which is 0.549.

4.6.2 Association Body Mass Index and Snoring among Medical Students in UPM.

Factor	**Prevalence of snoring**		$\chi 2$	**p-value**
	Snorer	Non-snorer		
BMI Classification				
Underweight	9 (16.7 %)	45 (83.3%)		
Normal	38 (18.6%)	166 (81.4%)	5.053	0.168
Overweight	13 (32.5%)	27 (67.5%)		
Obese	6 (27.3%)	16 (72.7%)		

Table 4.6.2 shows the association between Body Mass Index and snoring among medical students in UPM.According to the Chi Square test, there is no statistically significant association between between Body Mass Index and snoring among medical students in UPM.The p-value obtained from the Chi Square test is greater than 0.05 which is 0.168.

4.6.3 Association between Sleep Quality and Snoring among medical Students in UPM

Factor	Prevalence of Snoring		$\chi 2$	p-value
	Snorer	Non-snorer		
Sleep Quality				
Good	22 (13.5%)	141(86.5%)	10.311	0.01
Poor	60 (90.9%)	238 (93.7%)		

Table 4.6.3 shows the association between sleep quality and snoring among medical students in UPM. According to the Chi Square test, there is a statistically significant association between sleep quality and snoring among medical students in UPM.The p-value obtained from the Chi Square test is lesser than 0.05 which is 0.01.

4.6.3 Association between Gender and Excessive Daytime Sleepiness among Medical Students in UPM

Factor	Prevalence of Excessive Daytime Sleepiness(EDS)		$\chi 2$	p-value
	EDS	Non-EDS		
Gender				
Male	31 (32.0%)	66 (68.0%)	0.010	0.920
Female	70 (31.4%)	153 (68.6%)		

Table 4.6.4 shows the association between gender and excessive daytime sleepiness among medical students in UPM. According to the Chi Square test, there is no statistically significant association between gender and excessive daytime sleepiness among medical students in UPM.The p-value obtained from the Chi Square test is greater than 0.05 which is 0.920

4.6.4 Association between Body Mass Index and Excessive Daytime Sleepiness among Medical Students in UPM

Factor	Prevalence of Excessive Daytime Sleepiness		$\chi 2$	p-value
	EDS	Non-EDS		
BMI Classification				
Underweight	26 (48.1%)	28 (51.9%)		
Normal	54 (24.5%)	150 (73.5%)	10.261	0.016
Overweight	12 (30.0%)	28(70.0%)		
Obese	9 (40.9%)	13 (59.1%)		

Table 4.6.5 shows the association between sleep quality and excessive daytime sleepiness among medical students in UPM. According to the Chi Square test, there is a statistically significant association between body mass index and excessive daytime sleepiness among medical students in UPM.The p-value obtained from the Chi Square test is lesser than 0.05 which is 0.016

4.6.5 Association between Sleep Quality and Excessive Daytime Sleepiness among Medical Students in UPM

Factor	**Prevalence of Excessive Daytime Sleepiness (EDS)**		$\chi 2$	**p-value**
	EDS	Non-EDS		
Sleep Quality				
Good	44 (27.0%)	119 (73.0%)	3.210	0.073
Poor	57 (36.3%)	100 (63.7%)		

Table 4.6.6 shows the association between sleep quality and excessive daytime sleepiness among medical students in UPM. According to the Chi Square test, there is no statistically significant association between sleep quality and excessive daytime sleepiness among medical students in UPM. The p-value obtained from the Chi Square test is greater than 0.05 which is 0.073.

CHAPTER 5 : DISCUSSION

5.1 Introduction

The aim of this study was to assess snoring and excessive daytime sleepiness and its associated factors among medical students in UPM. We done the study on medical students out of other courses because we want to know the prevalence of snoring and excessive daytime sleepiness so the intervention can be done early. This is because both snoring and excessive daytime sleepiness are primary symptoms of obstructive sleep apnoea can lead to serious health problems such as cardiovascular disease, stroke, hypertension and can also cause vehicle accidents. Furthermore, snoring and excessive daytime sleepiness can also interfere students' quality of life and also affect their academic performance. Hence, through this study we hope to create awareness about this issue among medical students in UPM by doing early detection. Our findings showed that 20.6% out of 320 medical students in UPM present with snoring and 41.9% present with excessive daytime sleepiness. In our study, we found that there is no statistically significant association between snoring and excessive daytime sleepiness ($p>0.05$), that is, 0.805.

Snoring is defined as breathing during sleep with hoarse or harsh sounds as caused by the vibration of the soft palate through the open mouth and the nose when asleep. Snoring can be harmless or harmful, high intensity of snoring can lead to some serious diseases. It was found that about one-half of people who snore loudly have obstructive sleep apnea. Furthermore, habitual snoring (snoring on more than 3 nights of week) has been said to be the best predictor of obstructive sleep apnea (OSA). Excessive daytime sleepiness is characterized by persistent sleepiness and often a general lack of energy, even during the day after apparently adequate or even prolonged nighttime sleep. Several studies have been conducted and it is found that persons with excessive daytime sleepiness are at risk of motor vehicle and work-related incidents, and have poorer health than comparable adults [3]. Thomas Roth, 2015 stated in his article on Effects of Excessive Daytime Sleepiness and Fatigue on Overall Health and

Cognitive Function that excessive daytime sleepiness (EDS) can cause negative behavioral, physiologic, and cognitive effects, which limit patients' function and quality of life.

5.1 Distribution of Gender, Body Mass Index, Sleep Quality, Prevalence of Snoring and Prevalence of Excessive Daytime Sleepiness among Medical Students in UPM

The study involved 320 UPM medical students from year 1 until year 5 that were randomly selected between 17th August 2020 – 25th August 2020.

Majority of the respondents were female with a big difference between both genders (223 female, 97 male). For body mass index, we categorised our respondent into 4 category according to Malaysia guideline for BMI, which are underweight (<18.5 kg/m^2), normal (18.5 - 24.9 kg/m^2), overweight (25 - 29.9 kg/m^2) and obese (≥ 30.0 kg/m^2). The distribution of BMI of our respondents are 16.9%, 63.7%, 12.5% and 6.9% respectively. Majority of our respondents' BMI fall within normal range, 204 out of 320 respondents (63.7%). Body mass index is one of the factors of snoring and excessive daytime sleepiness and their association were proven in previous studies.

Sleep is an essential component for physical and mental health. Previous study showed that snoring can affect our sleep quality. Poor sleep quality can lead to daytime sleepiness. Good sleep is important for optimal neurocognitive and psychomotor performance. Indeed, several studies have shown correlation between sleep quality and snoring and also with excessive daytime sleepiness. Previous study showed that snoring can disturb our sleep quality and poor sleep quality leads to daytime somnolence [77]. In our study, we found that 50.9% of 320 UPM medical students had good sleep quality and 49.1% had poor sleep quality.

Snoring is one of the most common clinical symptoms of obstructive sleep apnea-hypopnea syndrome. Several studies were done worldwide on the prevalence of snoring among university students; 30% of participants of Californian college students reported having snoring [16]; Hui et. al (1999) found out that the prevalence of snoring among 1910 year 1 students in the chinese University of Hong Kong was 25.7% [17]; Ficker et. al (1999) stated in his research that out of 201 medical students, 43.9% were occasional snorers and 11.9% were frequent snorers [18]. However, data and research done in Malaysia is scarce compared to other countries, a research done in University Malaysia Sarawak (UNIMAS) showed that the percentage of snoring for all years, first year and final year medical students are 7.2, 9.9, and 3.6 respectively. In our study we found that out of 320 UPM medical students, 20.6% reported snoring which were assessed by the Berlin questionnaire.

Excessive daytime sleepiness is particularly frequent in university students, with a prevalence ranging between 24% and 39%. In our study, the overall prevalence of excessive daytime sleepiness which was assessed by the Epworth Sleepiness Scale (ESS) was 41.9% (ESS score > 10). Our study showed a very slightly higher prevalence of excessive daytime sleepiness with those of other studies conducted in Morocco (36.3%) [77], Pakistan (39.5%) [78] and Saudi Arabia (37.8%) [79] but much lower than the prevalence of excessive daytime sleepiness shown in the medical students in Brazil (63%) [80].

5.3 Frequency Distribution of Questionnaires Scores

5.3.1 Frequency Distribution of Berlin Questionnaire Score

To assess for snoring, we use the Berlin questionnaire which consists of questions assorted in 3 categories. Patients were asked whether they snore or not and to describe their snoring. Scores from the first and second categories were positive if the responses indicated frequent symptoms (.3–4 times/week), whereas the score from the third category was positive if there was a history of hypertension or a BMI >30 kg/m2. Patients were scored as being at high risk of OSA if they had a positive score on 2 or more categories, while those who did not were scored as being at low risk. From our studies, we found that 79.4% were categorised as low risk and 20.6% were categorised as high risk. Hence, the majority of medical students in UPM are at low risk of OSA.

5.3.2 Frequency Distribution of Epworth Sleepiness Scale Score

Epworth Sleepiness Scale (ESS) was used to assess excessive daytime sleepiness. This questionnaire consists of 8 self evaluated questionnaires. The ESS score was obtained by summing up the eight questions and the score can range from 0 to 24 (Johns, 2002). According to Johns (1991), scores 0-5 indicated Lower Normal Daytime Sleepiness; scores of 6-10 indicated Higher Normal Daytime Sleepiness; scores 11-12 indicated Mild Excessive Daytime Sleepiness; scores 13-15 indicated Moderate Excessive Daytime Sleepiness; while scores 16-24 indicated Severe Excessive Daytime Sleepiness [55]. In our study, 20% having lower normal daytime sleepiness, 48.4% higher normal daytime sleepiness, 11.6% mild excessive daytime sleepiness, 13.8% moderate excessive daytime sleepiness and 6.3% having severe excessive daytime sleepiness. Hence, the majority of medical students in UPM present with higher normal daytime sleepiness.

5.3.3 Frequency Distribution of The Pittsburgh Sleep Quality Index Score

We use the Pittsburgh Sleep Quality Index (PSQI)to assess sleep quality. This questionnaire assesses poor and good sleep quality by measuring seven domains: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction over the previous month. There are 9 questions to be answered. The global PSQI score will be calculated using 7 components : Score for component 1 will be calculated by using the score for question 9; score for component 2 will be calculated by using the score for question 2 (≤15min=0; 16-30 min=1; 31-60 min=2, >60 min=3) added with score for question 5a Score (if sum is equal 0=0; 1-2=1; 3-4=2; 5-6=3) ; score for component 3 will be calculated by using the score for question 4 (>7=0; 6-7=1; 5-6=2; <5=3); score for component 4 will be calculated by using the formula : (total # of hours asleep) / (total # of hours in bed) x 100 , where results >85%=0, 75%-84%=1, 65%-74%=2, <65%=3; score for component 5 will be calculated by using the sum of score for questions 5b to 5j where (0=0; 1-9=1; 10-18=2; 19-27=3); score for component 6 will be calculated by using the score for question 6; and lastly score for component 7 will be calculated by using the sum of score for questions 7 and 8 where (0=0; 1-2=1; 3-4=2; 5-6=3) [69]. The final PSQI score is obtained by summing up all the 7 components and if the final PSQI score ends up as (PSQI>5), the respondent is identified to have poor sleep quality [76]. In our study, we found that 50.9% had good sleep quality and 49.1% had poor sleep quality. Majority were having good sleep quality with just a small difference in gap between the two categories.

5.4 Association between Snoring or Excessive Daytime Sleepiness with their Respective Associated Factors

5.4.1 Association between Gender and Snoring Among Medical Students in UPM

In our study, a Chi square test revealed no significant difference in gender and snoring with a p- value of >0.05, that is, 0.549. We fail to reject the null hypothesis. Thus, there is no association between gender and snoring. However, there are several studies conducted which revealed such as Paul L. et al.(n.d) stated that males were more likely to report snoring with a prevalence of 33% (males) vs. 19% (females) [81] ; Adewole, O. O. et al. in 2008 on the prevalence and correlates of snoring among adults in Nigeria. They found out that in 31% (n=370) of all the respondents, there was a reported history of snoring in 36% of males and 27% of females [44].The result is different from the outcome of our study because we had twice the amount of female snorer (n=44)(66.7%) than male snorer (n=22)(33.3%)

5.4.2 Association Body Mass Index and Snoring among Medical Students in UPM

In our study, a Chi square test revealed no significant difference in Body Mass Index (BMI) and snoring with a p- value of >0.05, that is, 0.168. We fail to reject the null hypothesis. Thus, there is no association between BMI and snoring. However, there are several studies conducted which revealed such as prevalence of snoring is higher in those who are overweight than in normal BMI (Ma Y. et al. 2017) [46]; a significant association between BMI and snoring (Patel M et al. 2008) [16]; Yue Ma et al., 2017 stated that there is a relation between overweight and snoring [49]. The result is different from the outcome of our study because most of the snorers were having a normal BMI.

5.4.3 Association between Sleep Quality and Snoring among Medical Students in UPM

In our study, a Chi square test revealed a statistically significant association between sleep quality and snoring with a p-value of < 0.05, which is 0.01. We fail to reject the null hypothesis, hence we accept it. There were not many studies conducted on association between

sleep quality and snoring but according to Michael J. Breus, 2017, snoring can diminish our sleep quality [75]. This is because snoring causes an individual to wake more often throughout the night. Furthermore, snoring also affects our sleep partner especially those who snore loudly which can wake up their sleep partner and disturb their sleep time.

5.4.4 Association between Gender and Excessive Daytime Sleepiness among Medical Students in UPM

Prevalence of excessive daytime sleepiness shows varied results between male and female. Several studies showed that excessive daytime sleepiness was found to be higher in female than male with a prevalence of 53.7% of men and 55.2% of women[49]. In another study conducted on high school students in South Korea, the prevalence of excessive daytime sleepiness was also higher in female students (20.4%) than males (15.4%) [38]. Furthermore, a study was conducted on medical students in Morocco and they found out that EDS is more frequent in the female students (43%) than male students (20.1%) [77]. However in our study, the result was different from the previous study which showed that the prevalence of EDS slightly higher in male (32%) than in female (31.4%), and there is no statistically significant association between gender and excessive daytime sleepiness which was measured by chi square test with p-value of >0,05, that is, 0.920. This may be due to the big difference between the number of male and female students in our respondents.

5.4.5 Association between Body Mass Index and Excessive Daytime Sleepiness among Medical Students in UPM

In our study, a Chi square test revealed a significant difference in Body Mass Index (BMI) and excessive daytime sleepiness (EDS) with a p- value of >0.05, that is, 0.016. We reject the null hypothesis. Thus, there is an association between BMI and EDS. There is a study

conducted which revealed the similar results as ours , that is, Ursavaş, Ahmet et al., n.d conducted a study on the association between snoring, daytime sleepiness and obesity in professional wrestlers [48]. It showed a significant association between BMI and EDS ; Somayyeh M. et, al., found out that prevalence of sleepiness was 29 (52.7%) in cases (obese patients) and 17 (30.9%) in the control (normal BMI) [82].

5.4.6 Association between Sleep Quality and Excessive Daytime Sleepiness among Medical Students in UPM

In our study, a Chi square test revealed no significant difference in sleep quality and excessive daytime sleepiness (EDS) with a p- value of >0.05, that is, 0.073. We fail to reject the null hypothesis. Thus, there is no association between sleep quality and EDS . However, there are several studies conducted which revealed such as Glauber S. B et al. in 2018 their result of their study showed that from 131 elderlies with poor sleep quality, 40(30.5%) had excessive daytime sleepiness[39]; El Hangouche AJ et al. in 2018 found out that out of 600 students, 58.2% reported bad sleep quality and 36.3% of students had excessive daytime sleepiness [40] ; The results is slightly different from the outcome of our study because most of our participants are non-EDS even though there was more poor sleep quality (36.3%) than good sleep quality (27%) in EDS. So the unequal distribution of EDS and non-EDS affected our results.

CHAPTER 6 : CONCLUSION

6.1 Strength

This study is done among medical students who are still taking the Medical Degree in Universiti Putra Malaysia during the research period. Medical students are mostly prone to be being worn out physically and emotionally due to their busy schedules and vast knowledge to grasp, not to mention the stress they have to face during the exam periods. At some point, individual sleep qualities, sociodemographic factors and body mass index may induce early obstructive sleep apnea symptoms such as snoring and excessive daytime sleepiness that may affect their focus in studies or ability to carry out their daily routines. This study assessed the association of snoring and excessive daytime sleepiness respectively with their associated factors. Therefore it is important that this study is done so that early awareness and early detection of obstructive sleep apnea can be raised among all medical students in Universiti Putra Malaysia.

6.2 Limitations

This study only targeted medical students in Universiti Putra Malaysia, therefore it is not representative of the whole population of medical students in Malaysia. More accurate results of association between snoring or excessive daytime sleepiness with their associated factors can be obtained if more medical students across Malaysia are involved. Unfortunately, we could not involve more medical students from more universities as we were given a one-week limited period of time for data collection.

Moreover, this study was unable to include all the medical students in UPM during the data collection period. This is because we face some difficulties to reach all medical students due to limited time for data collection process as some of the respondents are clinical students, they are very busy with their schedule and spend most of their time in the hospital. They may not be available during our data collection or they are too busy to participate in our study.

In this study, we were also unable to set a limit for gender in our respondents due to the large sample size needed within the short time given for data collection. Due to no limitation in gender, our results for association with gender were affected as women respondents outnumbered male respondents by three times larger.

Furthermore, as our study was conducted fully online, we are unable to make sure whether our respondents are honest during answering our questionnaire regarding their weight and height, so there may be false information given by our respondents regarding their weight and height which also lead to false information about their body mass index and finally this will affect our results on the association with body mass index.

6.3 Bias

As the instrument used to collect data is a self-reported questionnaire, there is a possibility of respondent bias such as acquiescence bias, habituation and recall bias. The answers of the questionnaire may also be affected by multiple factors such as the time of day, mood, memory, personality and knowledge of the respondents which might affect data analysis.

6.4 Conclusion

To the best of everyone's knowledge, this is the researchers first try on research as well as to thoroughly understand the prevalence and associated factors of snoring and excessive daytime sleepiness among medical students in UPM. From this research, the researchers can conclude that the majority of medical students do not have snoring and excessive daytime sleepiness, body mass index do have association with excessive daytime sleepiness and sleep quality have an association with snoring among medical students in UPM. While gender does not have any association with both snoring and excessive daytime sleepiness, body mass index does not have association with snoring and sleep quality does not have any association with excessive daytime sleepiness. Although there were limitations in this study, the researchers managed to gain new experience and a better understanding of the prevalence and factors associated with snoring and excessive daytime sleepiness among medical students in UPM. The researchers suggest that screening of snoring and excessive daytime sleepiness should be done so that early detection and interventions can be done. Hereby, expectantly the medical students are more aware about the factors that can cause snoring and excessive daytime sleepiness and their effects to their health if left untreated. Most people still have the thought that snoring is normal when you are very tired without knowing that if they snore badly they may have the symptoms of obstructive sleep apnoea that later can lead to serious health problems such as cardiovascular diseases.

6.5 Recommendation

It would be better if this study can be conducted in a bigger population in addition to other medical students in Malaysia. Doing the study in different populations might give different results on the prevalence and factors associated with snoring and excessive daytime sleepiness among medical students. Hence we hope this study can be improvised and be done by other researchers to study the prevalence and factors associated with snoring and excessive daytime sleepiness among medical students. This is to enhance the quality of life and to raise awareness among the medical students about the factors associated with snoring and excessive daytime sleepiness and also the risk of having obstructive sleep apnea due to prolonged snoring and excessive daytime sleepiness as well as adequate treatment for it. Furthermore, future researchers can further classify medical students into clinical and non-clinical years to see whether both have different prevalence of snoring and excessive daytime sleepiness as their lifestyles and burden of study is a bit different.

Other than that, we recommend future researchers to set limits for gender, so that they can get an equal number of male and female respondents. By having equal numbers within both genders among respondents, researchers can clearly see whether gender is the factor that is associated with snoring and excessive daytime sleepiness or not. We also recommend that researchers can ask respondents individually when collecting data on body mass index so that the respondents will not give false information about their BMI as this also can affect the study results.

In our study, we exclude those who snore and have excessive daytime sleepiness due to medication or other diseases and we did not specifically ask about what type of medication and diseases they are having. So, we would like to recommend the future researcher to include those who take medication or have other diseases and ask about their specific disease and name of medication taken. By doing this, we can discuss more on why the disease and medication taken can cause snoring or excessive daytime sleepiness and also intervention can be made so that their snoring or excessive daytime sleepiness will not get worse or prolonged which later can lead to obstructive sleep apnoea (OSA).

Lastly, a longer period for data collection should be considered for future researchers so that larger sample size can be collected.

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Appendices

1. Gantt Chart

Months	A	M				J				J				A				S			
Weeks	1	2	3	4	5	6	7	8	9	1	1	1	1	1	1	1	1	1	1	2	2
										0	1	2	3	4	5	6	7	8	9	0	1
Proposal preparation																					
Proposal submission and proposal presentation preparation																					
Proposal presentation																					

Ethical approval preparation																				
Data collection, data analysis and																				
presentation preparation																				
Analysed data presentation																				
Report writing																				
Poster competition																				
Final presentation																				

Log book submission																				

2. Sample Size Estimation for Each Specific Objectives

OBJECTIVE	FORMULA	SAMPLE SIZE (n)
1) To determine the prevalence of snoring among medical students in UPM.	Formula (Daniel, 1999) as follows: $$n = \frac{Z^2 P(1-P)}{d^2}$$ ● n = sample size ● Z = Z statistic for a level of confidence (95% confidence interval = 1.96) ● P = prevalence of snoring (Eva Lindberg et al., 2006) = 25.2% ● d = precision (appropriate to have a precision of 5% if the prevalence of the disease is between 10% and 90%).	n = 288

2) To determine the prevalence of excessive daytime sleepiness among medical students in UPM.	Formula (Daniel, 1999) as follows : $$n = \frac{Z^2 P(1-P)}{d^2}$$ • n = sample size • Z = Z statistic for a level of confidence (95% confidence al = 1.96) • P =prevalence of EDS (Eva Lindberg et al., 2006) = 12.9% • d = precision (appropriate to have a precision of 5% if the prevalence of the disease is between 10% and 90%).	n=173
4) To determine the association between gender and excessive daytime sleepiness among medical students in UPM.	$$n = \frac{\left\{z_{1-\alpha/2}\sqrt{2\bar{P}(1-\bar{P})} + z_{1-\beta}\sqrt{P_1(1-P_1)+P_2(1-P_2)}\right\}^2}{(P_1-P_2)^2}$$ Where: • n = sample size estimate • z(1-α/2)= standard error associated with 95% confidence interval = 1.96 • z(1-β) = standard error associated with 80% power =0.84 • P_1 = prevalence of EDS in male (20.1%) • P_2 =prevalence of EDS in female (43%) • P=(P_1+ P_2) ÷ 2	n= 61 2n=122

5) To determine the association between body mass index and snoring among medical students in UPM.	$$n = \frac{\left\{z_{1-\alpha/2}\sqrt{2\bar{P}(1-\bar{P})} + z_{1-\beta}\sqrt{P_1(1-P_1)+P_2(1-P_2)}\right\}^2}{(P_1-P_2)^2}$$ Where: ● n = sample size estimate ● z(1-α/2)= standard error associated with 95% confidence interval = 1.96 ● z(1-β) = standard error associated with 80% power =0.84 ● P_1 = prevalence of snoring in obese (20%) ● P_2 =prevalence of snoring in non-obese (3.3%) ● P=(P_1+ P_2) ÷ 2	n = 55 2n = 110
6) To determine the association between sleep quality and excessive daytime sleepiness	$$n = \frac{\left\{z_{1-\alpha/2}\sqrt{2\bar{P}(1-\bar{P})} + z_{1-\beta}\sqrt{P_1(1-P_1)+P_2(1-P_2)}\right\}^2}{(P_1-P_2)^2}$$ Where: ● n = sample size estimate ● z(1-α/2)= standard error associated with 95% confidence interval = 1.96 ● z(1-β) = standard error associated with 80% power =0.84 ● P_1 = prevalence of poor sleep quality with EDS (58.2%) ● P_2 =prevalence of good sleep quality (36.6%) ● P=(P_1+ P_2) ÷ 2	n= 80 2n= 160

3. Consent Form

I hereby voluntarily agree to take part in the research stated above. I understand that I have the right to withdraw from this research at any time with a reasonable reason. I also understand that this study is confidential and all information provided with regard to my identity will remain private and confidential. *

- ◯ Yes, I give my consent
- ◯ No, I do not give my consent

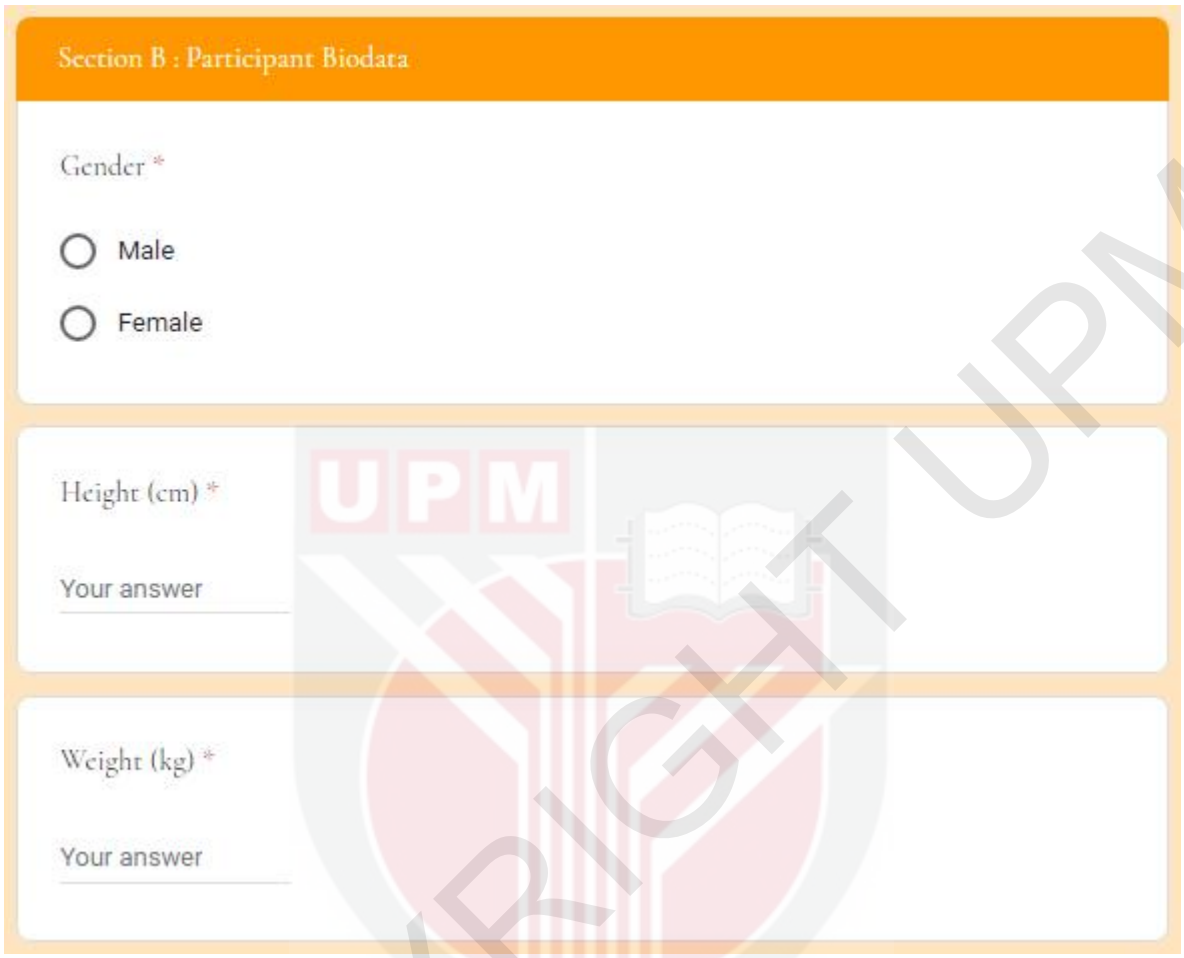
Contact number *

Your answer

Name *

Your answer

4. Biodata questionnaire



5. Berlin Questionnaire

Section C : Berlin Questionnaire

The Berlin Questionnaire is used to determine the risk of sleep apnoea among respondents.

You are required to answer 10 questions.

1. Do you snore? *

- ◯ Yes. (If YES, please continue with question 2)
- ◯ No. (If NO, please proceed to question 3)

2. Describe your snoring

- ◯ Slightly louder than breathing
- ◯ As loud as talking
- ◯ Louder than talking

3. How often do you snore? *

- ○ Almost every day
- ○ 3-4 times per week
- ○ 1-2 times per week
- ○ Rarely or never
- ○ Other:

4. Has your snoring ever bothered other people? *

- ○ Yes
- ○ No
- ○ Don't know

5. Has anyone noticed that you stop breathing during your sleep? *

- ○ Almost every day
- ○ 3-4 times per week
- ○ 1-2 times per week
- ○ 1-2 times per month
- ○ Rarely or never

6. How often do you feel tired or fatigued after your sleep? *

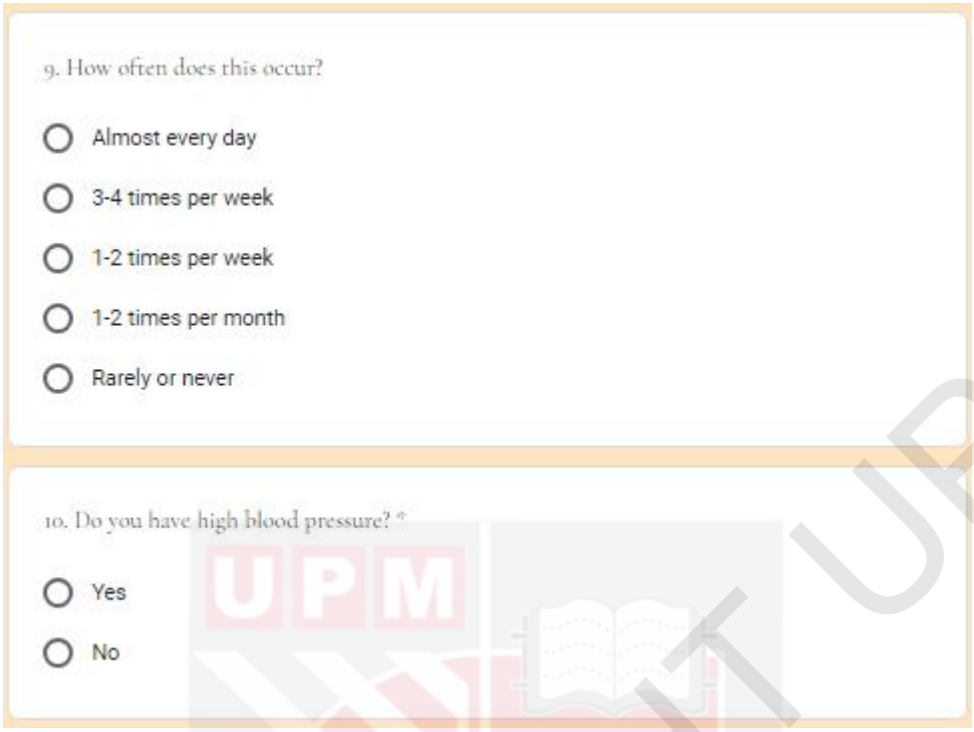
- ○ Almost every day
- ○ 3-4 times per week
- ○ 1-2 times per week
- ○ 1-2 times per month
- ○ Rarely or never

7. During your waking time, do you feel tired, fatigued or not up to par? *

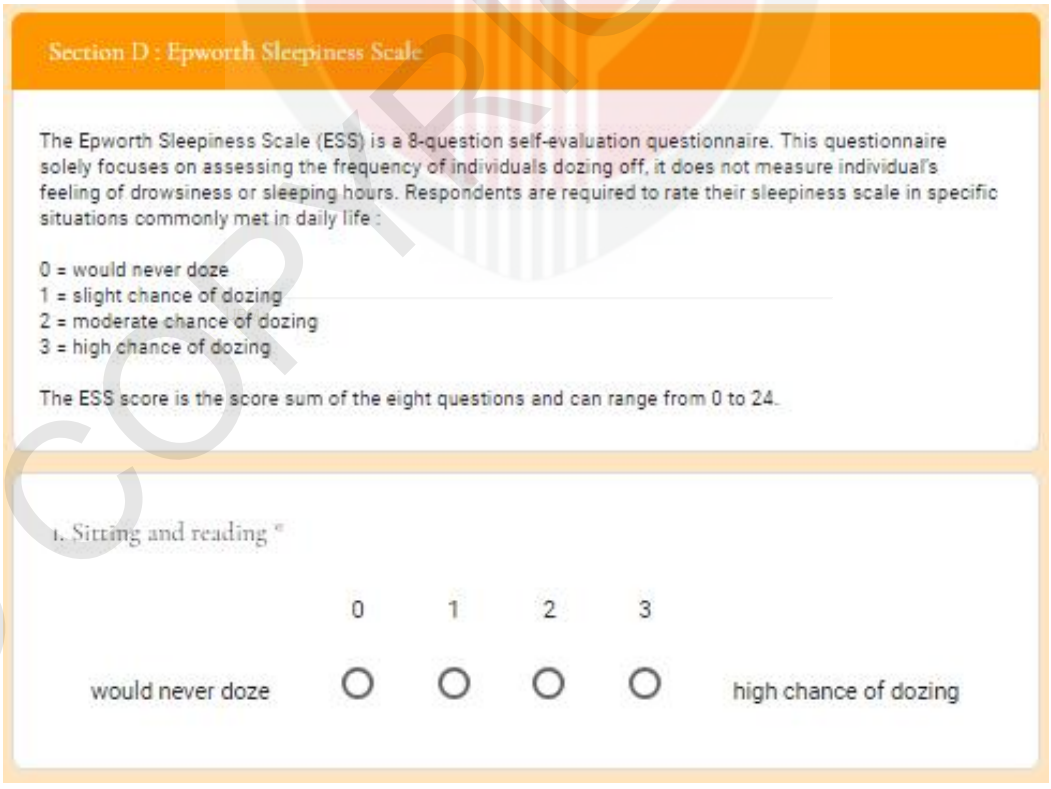
- ○ Almost every day
- ○ 3-4 times per week
- ○ 1-2 times per week
- ○ 1-2 times per month
- ○ Rarely or never

8. Have you ever nodded off or fallen asleep while driving a vehicle? *

- ○ Yes. (If YES, please continue with question 9)
- ○ No. (If NO, please proceed to question 10)



2. Epworth Sleep Scale



2. Watching TV *

	0	1	2	3	
would never doze	○	○	○	○	high chance of dozing

3. Sitting, inactive in a public place (e.g. a meeting or a theatre) *

	0	1	2	3	
would never doze	○	○	○	○	high chance of dozing

4. As a passenger in a car for an hour without a break *

	0	1	2	3	
would never doze	○	○	○	○	high chance of dozing

5. Lying down to rest in the afternoon when circumstances permit *

	0	1	2	3	
would never doze	○	○	○	○	high chance of dozing

6. Sitting and talking to someone *

	0	1	2	3	
would never doze	○	○	○	○	high chance of dozing

7. Sitting quietly after a lunch without alcohol *

	0	1	2	3	
would never doze	○	○	○	○	high chance of dozing

8. In a car, while stopped for a few minutes in the traffic *

	0	1	2	3	
would never doze	○	○	○	○	high chance of dozing

3. The Pittsburgh Sleep Quality Index

Section E : The Pittsburgh Sleep Quality Index (PSQI)

The Pittsburgh Sleep Quality Index (PSQI) is an efficient self-evaluated questionnaire used to measure the quality and patterns of sleep in adults. The questionnaire assesses poor and good sleep quality by measuring seven domains: sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction over the previous month.

You are required to answer 9 questions.

1) During the past month, what time have you usually gone to bed? In 24 hours format (eg: 2200 hrs) *

Time

__ : __

2) During the past month, how long (in minutes) has it taken you to fall asleep each night? *

Your answer

3) What time have you usually gotten up in the morning? In 24 hours format (Eg : 2200 hours) *

Time

__ : __

4) During the past month, how many hours of actual sleep do you get at night? (Hours of sleep per night) (This may be different than the number of hours you spend in bed) *

Your answer

5) During the past month how often have you had trouble sleeping because you...
Not during the past month (0)
Less than once a week (1)
Once or twice a week (2)
Three or more times a week (3)

*

	0	1	2	3
1. Cannot get to sleep within 30 minutes	○	○	○	○
2. Wake up in the middle of the night or early morning	○	○	○	○
3. Have to get up to use the bathroom	○	○	○	○
4. Cannot breathe comfortably	○	○	○	○
5. Cough or snore loudly	○	○	○	○
6. Feel too cold	○	○	○	○
7. Feel too hot	○	○	○	○
8. Have bad dreams	○	○	○	○
9. Have pain	○	○	○	○

Other reason(s), please describe, including how often you have had trouble sleeping because of this reason(s) :

Your answer

6) During the past month, how often have you take medicine (prescribed or "over the counter") to help you sleep? *

- ○ Not during the past month
- ○ Less than once a week
- ○ Once or twice a week
- ○ Three or more times a week

7) During the past month, how often have you had trouble staying awake while driving, eating meals or engaging in social activities? *

- ○ Not during the past month
- ○ Less than once a week
- ○ Once or twice a week
- ○ Three or more times a week

8) During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done? *

- ○ Not during the past month
- ○ Less than once a week
- ○ Once or twice a week
- ○ Three or more times a week

9) During the past month, how would you rate your sleep quality overall? *

- ○ Very good
- ○ Fairly good
- ○ Fairly bad
- ○ Very bad

ETHICS COMMITTEE FOR RESEARCH INVOLVING HUMAN SUBJECTS
(JKEUPM)
UNIVERSITI PUTRA MALAYSIA

Research title	:	**Prevalence and Associated Factors of Snoring and Excessive Daytime Sleepiness Among Medical Students in Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, Serdang, Selangor 2020.**
Study Site	:	**Faculty of Medicine and Health Sciences, Universiti Putra Malaysia.**
JKEUPM Ref No.	:	**JKEUPM-2020-227**
Researcher	:	**Fatennajwa Aizam, Malini P. Kanapathy, Alycia Tan Ee Syann.**
Supervisor	:	**Dr. Nurfarissa Hussin**

Documents received and reviewed with reference to the above study:

1. Ethics Application Form, Version 1 dated 26/6/2020
2. Respondent Information Sheet & Consent (English), Version 1 dated 26/6/2020
3. Proposal (English), Version 1 dated 26/6/2020
4. Questionnaires/ Interviews (English), Version 1 dated 26/6/2020
5. Curriculum Vitae of:
    a. Dr. Nurfarissa Hussin
    b. Dr. Khadijah Mohd Nor

The University Research Ethics Committee, Universiti Putra Malaysia (JKEUPM) operates in accordance to the ICH-GCP Guidelines.

Decision by JKEUPM:

[X] Approved

[X] **Permission MUST BE OBTAINED from the respective hospitals/ institutions before conducting the research**

[ ] Disapproved

Please note that the approval is **VALID UNTIL 4 AUGUST 2021**

Researchers should comply with the following:

I. Complete a Study Final Report upon study completion (Form 3.2).

II. Ethical approval is required in the case of amendments/ changes to the study documents/ study sites/ study team.