QUALITY OF SLEEP AND BURNOUT AMONG UNDERGRADUATE MEDICAL STUDENTS AT THE UNIVERSITY OF NAIROBI

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A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTERS IN MEDICINE, PSYCHIATRY DEGREE, UNIVERSITY OF NAIROBI

2019

DECLARATION

I declare that this project is my original work and it has not been submitted to any other institution or higher leaning for award of a degree or for any other purpose(s) except where due reference have been made in the text.

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DEDICATION

This project has been dedicated to medical students who silently battle with mental illness. It's also dedicated to those we lost during our medical training journey.

ACKNOWLEDGEMENT

I would like to acknowledge everyone who has been a part of my training for all the support rendered.

Dr. Winnie Nyamute for being a constant pillar of encouragement and source of strength.

To all my colleagues, friends and the rest of my family for the never-ending support.

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Finally, to the Department of Psychiatry, To the School of Medicine, To the ethics board and to all the participants for making this project possible.

LIST OF ABBREVIATIONS AND ACRONYMS

CBT	Cognitive Behaviour Therapy
CNS	Central Nervous System
DSM	Diagnostic Statistical Manual (5^{th} Edition)
EEG	Electroencephalogram
ICD	International Classification of Diseases (10^{th} Edition)
MBI	Maslach's Burnout Inventory
NREM	Non-Rapid Eye Movement (sleep)
OLBI	Oldenburg Burnout Inventory
PSQI	Pittsburgh Sleep Quality Index
RAS	Reticular Activating System
REM	Rapid Eye Movement (sleep)
SES	Socio-economic Status
UON	University of Nairobi
WHO	World Health Organization

OPERATIONAL DEFINITIONS

Burnout: This is a state of chronic stress that leads to; cynicism and detachment, physical and emotional exhaustion and feelings of ineffectiveness and lack of accomplishment. (Freudenberger, 1974).

Sleep quality: This is determined by sleeping more time while in bed (at least 85 percent of the total time); Falling asleep in 30 minutes or less; waking up no more than once per night and being awake for 20 minutes or less after initially falling asleep. (Oyahon et al, 2017).

Sleep deprivation: A state in which one lacks sufficient restorative sleep. This can be from both quantity (recommended number of hours) and quality of sleep (National sleep foundation, 2015).

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STRUCTURED ABSTRACT

In a pressure prevailing environment, medical students find themselves in a vicious cycle of cutting down on sleep in attempts to cope and adjust to increasing workloads. Students with poor sleep quality have been found to perform worse in their board exam and have strained social engagements. Ultimately this chronic sleep deprivation may lead to burnout which may cause diminished sense of accomplishment and impaired professional conduct, that may be carried on to the career as a physician. The main objective of this study was to determine whether the quality of sleep is associated with burnout among undergraduate medical students at the University of Nairobi. The sample size obtained was 384 and participants were selected by a mixed sampling method. Data collection was through self-administered questionnaires. Ethical considerations were adhered to. Data entry and analysis was by SPSS v23. Data from 336 questionnaires was deemed fit for analysis. With a response rate of 87.5%, the prevalence of poor sleep quality and burnout were 69.9% and 74.7% respectively. There was a positive association between poor sleep quality and female gender, clinical year of study, living with family, a poorly perceived SES and poor subjective academic performance. In addition, being female, younger, in the pre-clinical year, living independently off campus and a poor subjective academic performance were associated with higher levels of burnout. Burnout was positively correlated with poor sleep quality and having poor sleep increased the risk of having burnout by 2.8times. Peer support groups and peer led mentorship programs are recommended within this population to help deal with expectations, challenges and difficulties encountered within the course of medical education, in addition to preparing for the early future careers.

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

Sleep and other states of consciousness are fundamental in human physiology for sustainability of homeostasis. Sleep has been defined as a regularly recurring; rapidly reversible neurobehavioral state characterized by quiescence, postural recumbence and reduced awareness of the environment (Carskadon & Dement; 2005). According to the National Sleep Foundation, recommended hours of sleep for an adult is seven hours, and an individual who has had good sleep is one who has had restorative sleep (Hirshkowitz, 2015). The Foundation continues to note that restorative sleep is influenced by not only the quantity but also the quality of sleep. Quality of sleep was further described to be determined by sleeping more time while in bed (at least 85 percent of the total time); waking up no more than once per night; falling asleep in 30 minutes or less and being awake for 20 minutes or less after initially falling asleep (Oyahon et al, 2017). Factors that can affect sleep are but not limited to age, gender, medical and psychiatric illness, medication that primarily work on the central nervous system, environment and psychosocial factors (Hirshkowitz, 2015). According to Chokroverty (2010), non-restorative sleep can lead to physical exhaustion and precipitate medical illnesses and increase incidences of road traffic accidents. It may also be a precipitating factor to development of depressive symptoms though this cause-effect relationship cannot be established as changes in sleep patterns are biological symptoms seen in depressive illness. It may also lead to mental exhaustion and cause high stress and burnout levels.

Maslach and Jackson (1981) defined burnout as a syndrome comprising of diminished sense of accomplishment, emotional exhaustion and depersonalization caused by psychological stress. Sociodemographic factors that have been identified with burnout are female gender, younger age,

negative marital stress, high job demands with reduced satisfaction of work (Amoafo, Hanbali, Patel & Singh, 2014). Burnout is common among doctors (Imo, 2017), critical care givers, (Bhatt, Lizano , Carlese, Kvetan & Gershengorn, 2017), nurses (Gómez-Urquiza et al, 2017), teachers (Russel, Altmaier & Van, 1987) and policemen (Martinussen, Richardsen, & Burke, 2007). The association between burnout and sleep has been studied among healthcare professions and medical students. Pagnin et al (2014) notes that sleep disorders and burnout do have a relevant bidirectional effect on medical students especially in the early phase of medical school. According to a study by Vela-Bueno et al (2008), high levels of burnout among physicians had a positive correlation with high prevalence of insomnia and poor sleep quality. Emotional exhaustion has been correlated with daytime sleepiness. Poor sleep quality and burnout can lead to reduced job satisfaction, work engagement, self-accomplishment and can compound as a predisposing factor to development of depressive and other mood symptoms (Iacovides, Fountoulakis, Kaprinis &Kaprinis, 2003).

The University of Nairobi medical school admits on average 300-400 students per year for the medical degree. The fulltime program consists of a curriculum combining lectures, fieldwork and clinical work running for about 9 hours per day on weekdays, year-round for 6 years. With the highly demanding curriculum, one may be denied the opportunity to explore interpersonal relationships and at times fall victim to the unrealistic societal demands and expectations, denying one the opportunity to have quality sleep and engage in healthy coping mechanisms. This study aimed to identify the quality of sleep among medical students and its association to student burnout.

1.2 RESEARCH PROBLEM

In a global literature review, it was stipulated that not only were medical students prone to poor sleep quality but it was significantly higher than that of other students (Azad et al, 2015). Little is known about burnout among undergraduate medical students in our region as it has not been widely researched. In a meta-analysis, a median of 27.2% was established as level of burnout among medical students (Erschens et al, 2018). High burnout rates have also been reported among physicians with a range of 0-85% from a systematic review (Rotenstein et al, 2015). We are not sure if the high burnout among the practicing doctors started when they were in medical school. There is paucity of literature exploring quality of sleep and on burnout among Kenyan medical undergraduate students. There are currently no encountered articles on peer reviewed journals addressing sleep quality or burnout among medical students in Kenya. In addition, in Africa the number of studies done are also very few with the researcher encountering only 3 partially similar studies done among medical students in Nigeria which showed a prevalence of 32.5% of poor sleep quality (James et al, 2011) in Morocco prevalence of 58.2% for poor sleep quality (Hangouche, 2018) and in Cameroon assessing burnout among medical students (Njim et al, 2019). As seen from vast studies, there are many factors that can make a medical student particularly more vulnerable than the general population to adopting poor sleep patterns and thus having poor sleep quality and being at risk of developing burnout. The magnitude of this problem in our study population however remains unknown. This study seeks to fill this knowledge gap.

1.3 JUSTIFICATION

Sleep has been largely implicated in the learning and memory consolidation process through dependent brain plasticity. Despite its significance in this cognitive performance, it has been well

documented that college students find themselves cutting down on sleep, in attempts to cope and adjust to increasing workloads (Buboltz, Brown, &Soper, B. (2001). Poor sleep has been associated with excessive daytime sleepiness. Students with poor sleep quality have been found to perform worse in their board exams and thereafter get into a vicious cycle of cutting down sleep trying to achieve better grades (Ahrberg, Dresler, Niedermaier, Steiger, &Genzel, 2012). Ultimately this chronic sleep deprivation may lead to burnout. Sleep deprivation has been identified as a main risk factor to development of burnout more so in situations where one is preoccupied with school work during leisure time and increasing work demands (Söderström, Jeding, Ekstedt, Perski, &Åkerstedt, 2012). In addition to poor sleep, other factors that have been implicated in development of burnout among these students are socio-economic pressures, tests and papers to which they are constantly exposed, professional future careers concerns, teacher and peer relationship; significant ongoing variables during their training and therefore constitute a risk population to be studied (Schaufeli, Martinez, Pinto, Salanova, & Bakker, 2002).

It is therefore important for medical students to develop healthy sleeping habits as job demands upon graduation into a physician are still significantly high as they grow within the career. It could be that some of these habits built during the medical training are carried on, giving a picture of similar burnout rates among medical students and physicians. Poor sleep and burnout can lead to reduced job satisfaction, work engagement, self-accomplishment and can compound as a predisposing factor to development of depressive and other mood symptoms (Iacovides, Fountoulakis, Kaprinis &Kaprinis, 2003). Burnout has been stipulated to also increase suicidal ideation among students (Drybye et al, 2008). Suicides among medical professionals has been determined to be significantly higher than that of the general population and suicidal gaps during medical school have also been linked with physician suicides (Schernhammer, &Colditz 2004).

Extreme exhaustion in a work setup may lead to low productivity, wrong diagnosis, mismanagement of patients among those dealing with patients (Mata et al, 2015) and even impaired patterns of professional conduct similar to those seen with substance abuse among students (Brown, Goske, &Johnson, 2009). This points out that identifying, managing and preventing poor sleep and burnout is not only beneficial to the medical student and future professional but also in the practice as it may dictate patient care.

1.4 RESEARCH QUESTIONS AND OBJECTIVES

This section covers the research question and the objectives of the study.

1.4.1 RESEARCH QUESTIONS

The research questions for this study were;

1. What is the quality of sleep among undergraduate medical students?

2. What is the prevalence of burnout among undergraduate medical students?

3. Do sociodemographic variables have significant association with quality of sleep?

4. Do sociodemographic variables have significant association with burnout?

5. Is there an association between quality of sleep and burnout?

1.4.2 BROAD OBJECTIVE

The broad objective of this study was to determine whether the quality of sleep is associated with burnout among undergraduate medical students at the university of Nairobi.

1.4.3 SPECIFIC OBJECTIVES

The specific objectives in this study were;

1. To establish the quality of sleep among undergraduate medical students.
2. To determine the prevalence of burnout among undergraduate medical students
3. To determine the relation between socio-demographic variables and quality of sleep.
4. To determine the relation between socio-demographic variables and burnout.
5. To determine the association between sleep quality and burnout.

1.5 SIGNIFICANCE OF THE STUDY

This study aimed to highlight the quality of sleep and professional medical student burnout. The results of this study will be used as base for other researches that may surround the above topics within the study population. By providing evidence of the magnitude of the problem in this study, the researcher will be able to help stake-holders gain more insight in developing or enhancing existing programs to help students deal with the issues discussed in this research.

This study also highlights the need for self-help groups, support groups, awareness and prevention programs in the school to deal with stress, managing huge workloads and burnout during the undergraduate medical training.

CHAPTER 2: LITERATURE REVIEW

2.0 INTRODUCTION

Studies have reported that medical students have partial sleep deprivation, delayed sleep onset and poor sleep quality. This has also been associated with reduced sleep times during the week and extended durations of sleep during the weekend more in scenarios that included an early schedule of classes (Lima, Medeiros, &Araujo, 2002). Assessing this phenomenon allows researchers and other stakeholders to better grasp the relationship between sleep quality and personal achievement, academic performance, social relationships and predisposition to psychological problems such as burnout among medical students. This section shall cover the empirical studies, theoretical review and the conceptual framework.

2.1 EMPIRICAL STUDIES

2.1.1 PREVALENCE OF POOR SLEEP QUALITY AND BURNOUT

Globally, studies done among medical students have found significantly high levels of poor sleep quality and burnout as outlined in this study. Various studies done have showed a prevalence of 40% in Lithuania (Preišegolavičiūtė, Leskauskas, &Adomaitienė, 2010), 24% in Mexico (Tafoya, Jurado, Yepez, Fouilloux, &Lara, 2013), 30% in Korea (Ban &Lee, 2001) and 49% in Taiwan (Tsai &Li, 2004). In Africa, a study focusing on Nigerian undergraduate medical students identified that 50% of the respondents had poor sleep quality, 24.4% had associated psychological distress and up to 5.7% of them used medication to aid them to sleep at least once or twice a week (James et al, 2011). In Morocco prevalence of poor sleep quality (58.2%) was associated with psychological distress (Hangouche, 2019**)**. Prevalence of poor sleep quality does not seem to differ

very significantly also among economic states around the globe with 27.8% in Mongolia a LIC (Wang et al, 2016), 30% in Saudi Arabia a HIC (Alsaggaf, Wali, Merdad, &Merdad, 2016) and 38.9% in Brazil a MIC (Medeiros, Mendes, Lima, &Araujo, 2001). Prevalence of burnout among medical students has been reported in a meta-analytic study to range between 7-75% (Erschens et al, 2018).

2.1.2 SOCIODEMOGRAPHIC PROFILE OF SLEEP QUALITY AND BURNOUT

A study done in Iran by Ghoreishi and Aghajani (2008) among medical students identified significant sociodemographic variables associated with poor sleep quality. Out of the total prevalence 40.6%, 38% were identified as females and 44.8% males. Male predominance was also recorded in a Palestinian study where the total prevalence of poor sleep quality was 74.2% and males contributed to 64.4% versus 35.6% that were females (Siddiqui, 2016). However, none of these were found to be statistically significant. From the same Palestinian study, other variables tested were age, marital status and level of study of which, those who were older than 22 years of age, not married and in clinical years were found to be more than the counter groups. In this study these variables were not significant. Contrary to the Palestinian study the study by Ghoreishi and Aghajani (2008) in Iran identified positive marital status as having a significant association with poor sleep quality with 64.9% of married students having poor sleep versus 35.8% of those who were single. Other significant sociodemographic variables with positive correlation in this study were residential status, with higher levels among those living with a spouse 61.5% in comparison to 44.6%, 35.6% and 20.8% of those living in their private homes, in dormitories and with their parents respectively. In addition, financial status was also implicated in the same study with 57.9%,

46.9%, and 33.9% of those from low, moderate and high economic classes, respectively, being sleep deprived.

Students in the senior years are thought to be affected more by sleep problems compared to those in the junior years (Hazama, Inoue, Kojima, Ueta &Nakagome, 2008). Other factors that have been associated with poor sleep quality among medical students are presence of a chronic illness, irregular sleep schedule and adverse childhood experiences (James et al, 2011). In a cross-sectional study in India focusing on both sleep quality and burnout, exhaustion and disengagement which are components of burnout, correlated with poor sleep scores. Among medical students, reported prevalence rate of burnout ranged from 7% to 75.2% in a meta-analytic study by Erschens et al (2018). Higher rates have been recorded among the female students, those in preclinical years and in the final year of study (Abdulghani, AlKanhal, Mahmoud, Ponnamperuma &Alfaris, 2011). Higher rates have also been recorded during exam period and other busy schedules (Kulsoom & Afsar, 2015).

2.1.3 EFFECTS OF POOR SLEEP QUALITY AND BURN OUT

Medical education is characterized by intense psychological changes among the young adults joining university. The environment in most medical schools, provides a rigid and authoritarian system leading to an all-prevailing pressure atmosphere that may encourage competition rather than mutual cooperation between its learners (Rao &Reddy, 2013). It is not just undergraduate study period, which brings the stress, but it may continue later in internship, during postgraduate and residency training, proceeding to a physicians' practical life later on and it may progress to burnout (Arora, Asha, Chinnappa &Diwan, 2013). Sleep disturbance is a common presentation

among psychiatric conditions. In Thailand where the prevalence of the poor quality was 42.3%, there was a positive association with occurrence of mood and anxiety symptomatology (Pensuksan et al, 2016). Reduced regularity in sleep schedules has been associated with strained social engagements in addition to higher levels of anxiety, depression, and stress (Carney, Edinger, Meyer, Lindman &Istre, 2006). A study done among Chinese medical students also demonstrated a significant correlation between sleep quality and depression or anxiety (Feng, Chen &Yang, 2005).

Cognitive competences including memory consolidation and encoding are very crucial in higher education learning, and especially for medical education, because the students are expected to retain a substantial amount of complex factual knowledge in limited period of time (Ahrberg et al, 2012). Students with later sleep phase and poorer sleep quality have been identified to be at a higher risk of impaired or poor academic performance (Yeung, Chung, &Chan, 2008). While it is evident that disruption of sleep should be minimized for any person trying to optimize their learning potential, there are effects of sleep deprivation that would be necessary to put into consideration among medical students. The time in medical training is a period in which lifelong professional attitudes and habits are formed. However, deprivation of sleep has been noted to have significant negative outcomes on emotional intelligence, including the ability to demonstrate patient empathy (Killgore et al, 2008). In an American study, burnout among medical students has been associated with less desirable professional behaviours. The same study also concluded that students with burnout have a negative view towards the profession and this may impact on what they learn. There was also an association with reduced empathy which in turn influences their working environment humanitarian attitudes and their relationships with other healthcare workers (Brazeau, Schroeder, Rovi, &Boyd, 2010).

There has been an identified association between burnout and increased suicidal ideation among medical students (Dyrbye et al, 2008). Of the 49.6% that screened positive for burnout in this study, 11.1% also had suicidal ideation in the past one year. On follow up, those who recovered from burnout also reported reduction in suicidal ideation affirming the suggestion that decreased burnout levels decreased suicidal risk.

Locally, poor sleep habits among university students have been positively correlated with poor academic performance and factors associated with these are, but not limited to, family problems, inadequate pocket money and broken relationships. (Gikunda, Abura, Kiriungi &Muchiri, 2014). There have been no local studies in research databases in regards to burnout among medical students in Kenya.

2.2 RESTORATIVE THRORY OF SLEEP

Oswald's restorative theory of sleep states that sleep is necessary in revitalizing and restoring physiological processes. The non-rapid eye movement (NREM) stage of sleep helps reinstate normal physiological functions while the rapid eye movement (REM) sleep vital in maintain normal mental functions. It has also been supported that after periods of sleep deprivation there are longer REM sleep cycles versus NREM indicating the body's need for normal mental functioning in day to day activity. During these sleep states there is cell division and protein synthesis that occur as well as regulation of neurotransmitters and neurohormones such as cortisol. During the day the body has higher levels of cortisol and catecholamines while at night these are reduced and there are higher levels of growth hormone necessary in brain protein synthesis. This theory also points out the role of sleep on neuroprotection as potentially neurotoxic wastes that accumulate during the day are eliminated during these periods (Oswald, 2011). The neurobiology

of burnout has been associated with low levels of Brain derived neurotrophic factor (BDNF) which is produced through protein synthesis (Sertöz, Bınbay, &Mete, 2008). In addition, exhaustion has been positively correlated with serotonin and dopamine while negatively correlated with catecholamine- noradrenaline and acetylcholine more so in the hippocampus where learning and memory consolidation happens (Yao et al, 2018).

This theory points out the role of sleep in maintaining normal physiological processes and mental functioning such as learning, memory, motivation and other cognitive processes that are controlled by neurotransmitters produced by different brain circuits which can be altered in sleep deprived and or burnout states.

2.3 CONCEPTUAL FRAMEWORK

This section covers the variables in this study, the null hypotheses and the conceptual model.

2.3.1 VARIABLES

Independent variables: The independent variables in this study were the select sociodemographic characteristics among the medical students. These were age, sex, year of study, perceived socioeconomic status, marital status and residence type. These have been found to vary among different studies globally focusing on medical student burnout and sleep quality.

Dependent variable: The dependent variables being tested in this research are both sleep quality and burnout. Poor sleep quality has been linked to burnout as outlined in the studies above and burnout has also been associated with disturbance in the quality of sleep. While testing the prevalence, there will also be a correlation test to determine whether there is an association between the two variables. This will be through Hypothesis testing.

2.3.2 HYPOTHESES

Null hypothesis:

1. H01: There is no significant association between sociodemographic variables and sleep quality among undergraduate medical students.
2. H02: There is no significant association between sociodemographic variables and burnout among undergraduate medical students.
3. H03: There is no significant association between poor sleep quality and burnout among undergraduate medical students.

2.3.3 CONCEPTUAL MODEL

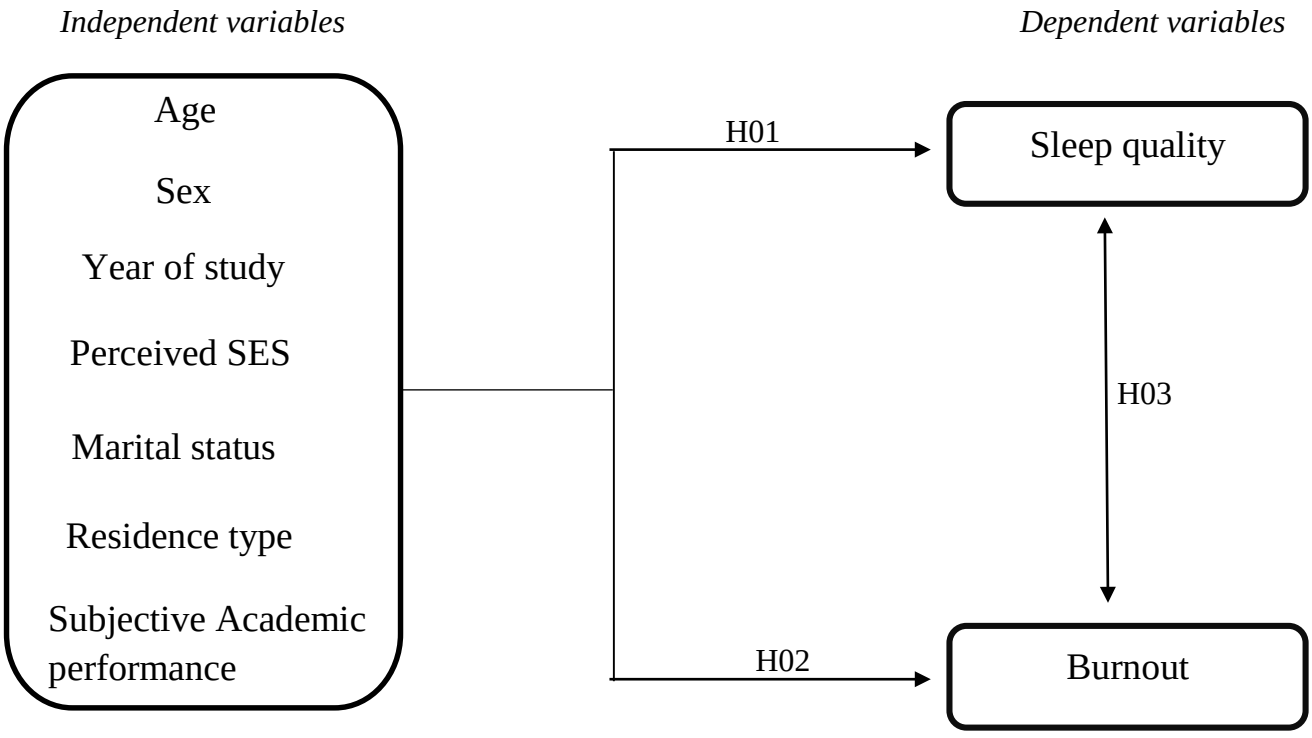


Figure 2.1: Conceptual model

CHAPTER 3: RESEARCH METHODOLOGY

3.1 RESEARCH DESIGN

The study adopted a cross-sectional, quantitative, analytical study design.

3.1.1 STUDY AREA

University of Nairobi medical school is situated in Nairobi adjacent to Kenyatta National Teaching and Referral Hospital. Students taking health courses attend clinics and ward rounds at the hospital as part of their learning curriculum.

3.2 STUDY POPULATION

Kenya currently has 9 board approved medical schools training undergraduate students; University of Nairobi, Moi University, Kenyatta University, Uzima university, Egerton University, Kenya Methodist University, Maseno University, Jomo Kenyatta University of Science and Technology and Mount Kenya University.

University of Nairobi as it is the founder of medical education in the country and enrols the highest number of the medical students. Medical training began in 1968 in the University of Nairobi and to date has 14 departments handling both undergraduate and postgraduate studies. Population comprised of currently enrolled undergraduate medical students in all years of study at the University of Nairobi. The School of Medicine has an estimated 2,700 undergraduate students distributed throughout the six academic years, with an average of about 350 students per class. With a double intake that ensued for 3 years, there are currently eight separate classes enrolled in the school. Of the eight classes, only six are in session at a given time.

3.2.1 POPULATION CHARACTERISTICS

The sample population comprised mostly of young adults who join university within a year after completion of their high school studies, most of whom are at least 18years of age. The students are usually chosen on merit basis from final national exams, for secondary/high schools, to enrol to the program thus, there is a wide representation in ethnicity, religion and socioeconomic backgrounds.

3.2.2 INCLUSION AND EXCLUSION CRITERIA

Inclusion Criteria: Only participants who met the following conditions were allowed to participate in the study;

1. An undergraduate medical student currently enrolled in the school.
2. A student who gave his/her full informed consent to be a subject in the study.

Exclusion criteria

1. Lack of consent to be in the study
2. Absence from school during day of study.
3. Enrolled students on vacation who were in session.

3.3 SAMPLE AND SAMPLING

The students were clustered in their respective years of study. The sample size was distributed on ratio basis with regards to the number of students for each level represented. From each level, the individuals were chosen using convenience-sampling method.

3.3.1 SAMPLE SIZE

The sample size is calculated using the Cochran's formula below. It was calculated with a margin error of 5%, confidence interval of 95%, population proportion of 50%, for the population size of 2430. The sample size obtained was 384. Questionnaires were distributed on ratio basis depending on the number of students per class. The population proportion was calculated using a partially similar study in Africa, Nigeria by James et al, 2011, where prevalence of poor sleep quality was at 50%. There was a 10% mark-up to account for possibility of spoilt questionnaires.

$$\text{Sample size} = \frac{Z^2 \times P(1-P)}{E^2}$$

Z= is the z score

E= is the margin error

P= is the population proportion

$$\text{Sample size} = \frac{1.96^2 \times 0.5(0.5)}{0.05^2} = 384$$

10% mark-up = 38.4+384=422.4

Total rounded up to 423 questionnaires required for the sample size of 384.

3.3.2 SAMPLING PROCEDURE

A mixed sampling method was employed. Using stratified sampling, the students were clustered in their respective years of study. Then the sample size was then distributed as follows.

Table 3.1: Questionnaire distribution according to level of study

Year of study	Registered students	% Proportion	Sample size
I	450	18.5	**71**
II	389	16.0	**61**
III	350	14.4	**55**
IV	650	26.8	**103**
V	302	12.4	**48**
VI	289	11.9	**46**
TOTAL	**2430**	**100**	**384**

The stratified groups based on year of study were further clustered into their existing class rotation/practical groups. Convenience sampling method was to be adopted to choose one group based on their availability and meeting times as some groups have field work out of the study site. In the selected group, all participants willing to take part in the study were to be given questionnaires after a brief introduction on the study. Should the number of respondents been fewer than the expected number, then the process was to be repeated with a different group till the expected sample size was achieved for each cluster. Should the number have been higher than the expected size, questionnaires would still have been distributed to all the willing participants in that cluster. This was to be distributed before class or immediately after depending on the initial

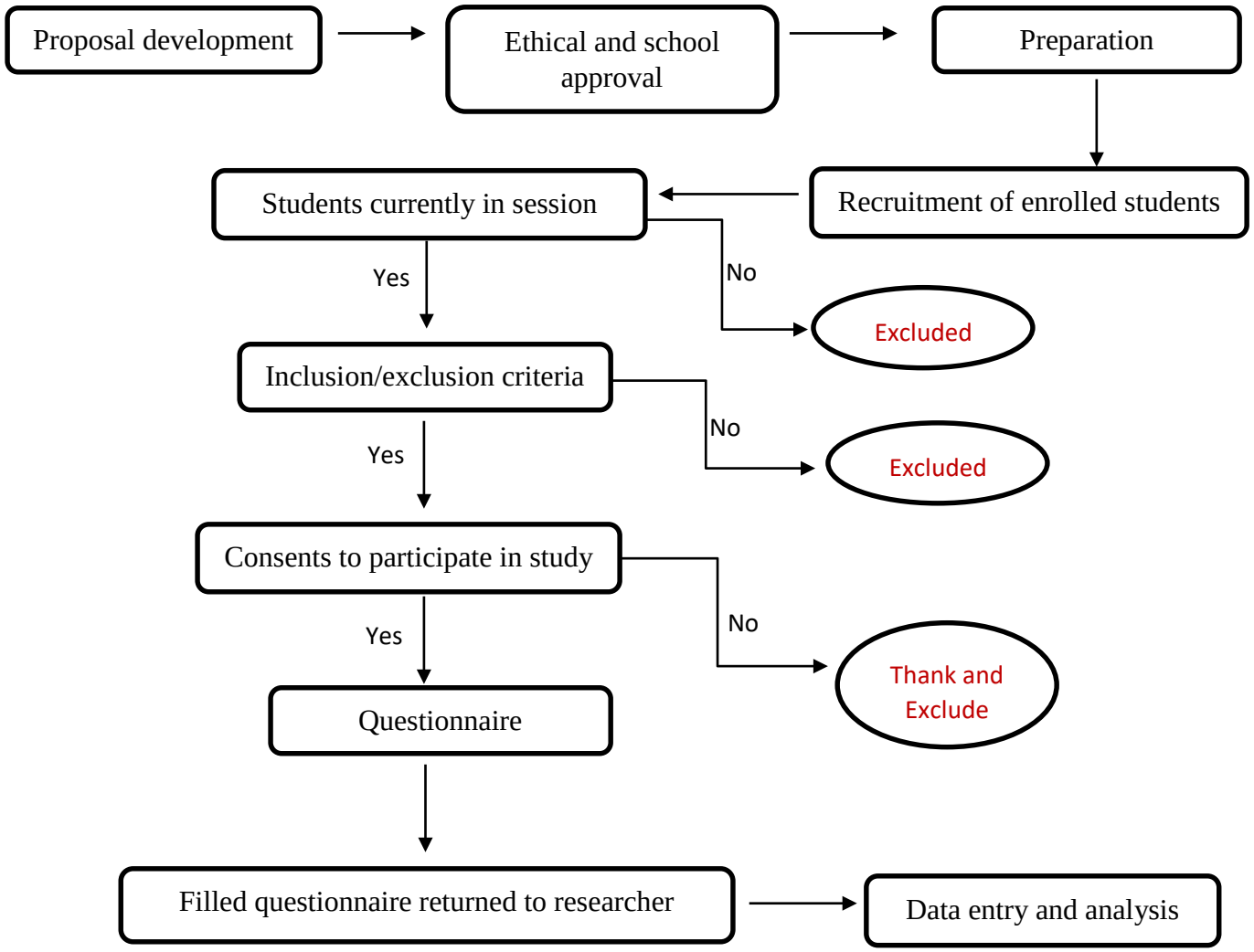
agreement with the class representative for the particular cluster. However, random sampling within the cluster years was used as two levels (year 5 and 6) didn't not have allocated groups because they had completed their rotations as per the curriculum but instead had common classes as the end of year exams were almost due. Questionnaires were then distributed during the common classes in all the levels (year 1-6) as this was more representative. In addition, some rotations were perceived to be more demanding than others and would skew the results.

3.3.3 RECRUITMENT AND CONSENTING

After clearance from the ethical board, the researcher proceeded to recruit study participants. The overview, aim and objectives of the study were clearly explained to the participants before questionnaire distribution. The data collection procedure was outlined before the questionnaires were distributed. The participants who were then willing to take part in the study were handed the questionnaire that included two parts; the consent information and the questionnaire itself. The information included a consent document with a brief outline of the study and a consent form that was signed willingly. They then filled in the questionnaire and returned it to the researcher. The researcher then collected the questionnaires once they are filled.

3.4 STUDY FLOW

Figure 3.1 Study flow diagram



3.5 DATA COLLECTION

Data collection was by use of questionnaire which should have taken about 7-15minutes to complete.

The questionnaire included

i. Sociodemographic profile

ii. Pittsburgh Sleep Quality Index

iii. Oldenburg Burnout Inventory

3.5.1 COLLECTION INSTRUMENTS

Sociodemographic questionnaire:

This included the sociodemographic profile and some researcher developed questions.

Sociodemographic questions included the participant's age, sex, year of study, perceived socioeconomic status, academic financing, marital status, subjective academic performance, state of living and any current medications.

Pittsburgh Sleep Quality Index

The PSQI is a self-rated questionnaire that helps assess sleep quality and sleep disturbances over a 1-month time interval. There are 19 individual items that generate seven "component" scores: sleep latency, subjective sleep quality, sleep disturbances, habitual sleep efficiency, use of sleeping medication, sleep duration and daytime dysfunction. The scores are summoned to yield one global score. Scoring is done based on the 7 components with each component scoring from a scale of 0

to 3. Scores above usually 5 indicate poor sleep patterns. PSQI has been used in several studies across the globe and is currently available in 56 languages. The tool has a diagnostic specificity of 86.5% and a sensitivity of 89.6%. It also has an internal consistency and a reliability coefficient (Cronbach's alpha) of 0.83. This tool has been used in similar studies.

Table 3.2: Similar research done using the PSQI tool

Country &year	**Author(s)**	**Topic**
Nigeria 2011	James et al	Prevalence and correlates of poor sleep quality among medical students at a Nigerian university
Pakistan 2015	Surani et al	Sleep quality among medical students of Karachi, Pakistan
Sudan 2015	Mirghani, Mohammed, Almurtadha, & Ahmed	Good sleep quality is associated with better academic performance among Sudanese medical students
German 2013	Genzel et al	Sleep timing is more important than sleep length or quality for medical school performance.

Oldenburg Burnout Inventory

The OLBI was initially developed by Demerouti, Bakker, Nachreiner, &Schaufeli 2001, then modified by Halbesleben & Demerouti, 2005. OLBI is a 16-item survey with positively and negatively framed items that covers 2 areas: exhaustion (physical, cognitive, and affective aspects) and disengagement from work (negative attitudes toward work objects, work content, or work in general). There are multiple questions for each of these subscales and responses are in the form of a 4 point Likert scale from strongly agree (1) to strongly disagree (4). Exhaustion has been defined as a consequence of intensive physical, affective, and cognitive strain, which corresponds to other definitions of exhaustion (Lee & Ashforth, 1993; Shirom, 1989). Unlike exhaustion as operationalised in the widely used Maslach's Burnout Inventory, the OLBI covers not only

affective aspects of exhaustion, but also physical and cognitive aspects. Disengagement in the OLBI refers to distancing oneself from one's work and experiencing negative attitudes toward the work object, the work content, or one's work in general. A student version has been developed to incorporate study instead of work terms. Reliability of the exhaustion subscale (Cronbach's alpha) has been found to range between 0.74 to 0.85 and for the disengagement scale between 0.73 to 0.85. This tool has been used is several global studies.

Table 3.3: Similar research done using the OLBI tool

Country &year	**Author(s)**	**Topic**
Sweden 2007	Dahlin & Runeson	Burnout and psychiatric morbidity among medical students entering clinical training: a three-year prospective questionnaire and interview-based study
Slovenia 2014	Kogoj, Travnik, & Kragelj	Role of Stress in Burnout among Students of Medicine and Dentistry
US and Brazil 2018	Lucchetti et al	Cross-cultural differences in mental health, quality of life, empathy, and burnout between US and Brazilian medical students
India 2015	Shad, Thawani, & Goel	Burnout and sleep quality: a cross-sectional questionnaire-based study of medical and non-medical students in India

3.5.2 COLLECTION PROCEDURES

The objectives and aims of the study were explained to the participants by the researcher. The participants were informed that the information they provided was anonymous and only the researcher will have access to the information given in the questionnaires. The participants were also informed that there were no monetary gifts, benefits or favours granted upon taking part in

the study. They were provided with information sheets regarding sleep quality and burnout prevention and management strategies. They were also informed that there shall be no direct harm or injury anticipated while taking part in this study. However, some participants may develop overwhelming emotional reaction to questions and they had the option to stop or proceed to complete the questionnaire. The questionnaires were handed over to the participants. They were required to fill the consent form (compulsory) before proceeding to fill in the questionnaire. Participants were directed to return the questionnaires to the researcher who was stationed outside their lecture halls. The primary researcher had the questionnaires stored under lock and key in a safety box before they were transported and stored awaiting data entry.

3.5.3 QUALITY ASSURANCE

Research ethics were adhered to during the study process. The primary researcher was responsible for providing the information about the study including aims and objectives, the collection procedure and risks and benefits. The researcher was also responsible for handing questionnaires to the participants. Participants will be required to sign the consent form for data provided to be considered valid for research. Though the questionnaires were numbered to aid in data entry, they did not contain personal details of the participant to ensure anonymity and participant confidentiality. The filled questionnaires were stored under lock and key before, during and after data management. During and after data entry and analysis, there was and still is encrypted code to protect the data on the software.

3.6 ETHICAL CONSIDERATION

This study commenced once research and ethical approval was obtained from KNH-UON Ethics and research committee. Participant confidentiality was maintained throughout the study.

Anonymity of respondents' sociodemographic details was provided by avoiding personal information. Questionnaires were numbered for data entry and not in any way linked to a particular respondent. Data collected was password-protected and its access was limited to the primary researcher. Before, during and after data entry, questionnaires were stored in a private box under lock and key that was only be accessible to the researcher. During data entry information was stored in a private computer and encrypted with a password to prevent access by unauthorized persons. Filled Questionnaires were not distributed to unauthorized personnel before, during and even after data entry. They shall be stored for a period of 6 months under lock and key after study closure and discarded thereafter. There were no known direct risks or benefits on the respondents linked to this study. At times participants develop overwhelming emotional reaction to some questions and had the option to choose to proceed or terminate the process and this was not in any way going to affect their position in the institution. However, during the data collection procedure, there were no affected participants. Additional questions in regards to the study topic that were raised by the participants were addressed. There was no monetary compensation but respondents were encouraged to take part in the study that helped to highlight a need for self-help groups, support groups, awareness and prevention programs in the school to deal with stress, managing huge workloads and burnout during the undergraduate medical training.

3.7 DATA ENTRY AND ANALYSIS

Data cleaning and coding was done prior to data entry.

Data entry and analysis was by the use of Statistical Package for Social Sciences computer program (SPSS) version 23 software.

Discrete variables were summarized using frequencies and percentages. Measures of central tendencies (mean, median, minimum, maximum) were used to summarize continuous variables.

Tests of differences and statistical significance were analysed using the student t-test and Chi-square respectively. Relationship between discrete and continuous variable were done using analysis of variance methods (ANOVA) and Spearman correlation coefficient. Association between quality of sleep and burnout was carried out using the Chi Square test.

Hypothesis testing was also done where a level of 0.05 or less was considered significant to reject the null hypothesis.

3.8 DATA PRESENTATION

Presentation of the interpreted data from the analysis was by the use of tables, graphs and charts where applicable**.**

3.9 STUDY TIMELINE

The study timeline after approval from the ethics board was as outlined in table 3.4.

Table 3.4: Study timeline

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
Preparation							
		Data collection					
				Data analysis and write-up			
							Data presentation

3.10 STUDY LIMITATIONS

The anticipated limitations prior to conducting the study were;

Financial constraints: Of which proper budgeting was done to minimize out of pocket costs for the research as there were no funding agencies for this study.

Respondent bias based on current surrounding environment. Such as before or after an exam or assessment.

However, the limitations faced during the data collection and analysis have been outlined in the discussion segment.

3.11 STUDY CLOSURE PLAN

The results of the study are to be made available at the University school library for future reference.

Upon completion now, this study is to be published in a peer-reviewed journal.

CHAPTER 4: RESULTS AND DATA ANALYSIS

4.1 INTRODUCTION

This chapter contains description of data collected in regard to the variables of the study, analysis of data, presentation of results in form of tables and charts as well as summary and interpretation of study findings.

4.1.1 RESPONSE RATE

A sample size of 384 was obtained and a total of 423 questionnaires were issued which included a 10% mark-up to cater for spoilt questionnaires. The researcher was able to get a total of 339 questionnaires filled and returned. However, 3 questionnaires were deemed to be unfit for data analysis due to incompleteness. 336 questionnaires were therefore used for analysis which represented a response rate of 87.5% as Table 4.1 outlines in detail. Therefore, in this study N=336. According to Mugenda and Mugenda (2013) a response rate of over 80% was considered excellent for data analysis.

Table 4.1: Response rate per year of study.

Year of Study	Expected Sample Size	Actual sample size	Response Rate (%)
I	71	68	95.8%
II	61	58	95.1%
III	55	50	90.9%
IV	103	77	74.8%
V	48	49	102.1%
VI	46	34	73.9%
TOTAL	**384**	**336**	**87.5%**

4.2 DESCRIPTIVE STATISTICS

In this section we shall describe the data collected in form of socio demographic variables of Age, Sex, Perceived SES, Marital Status, and Residence Type. Sleep Quality will also be described on subjective sleep quality, sleep Latency, Sleep Duration, sleep efficiency, Sleep Disturbance, and Daytime Function and the overall sleep quality. Burn out will be described in form of disengagement as well as exhaustion on the students. The variables will be described for every year of study of the students.

4.2.1 POPULATION SOCIO-DEMOGRAPHIC VARIABLES

In this study the socio-demographic variables of interest were age, sex, year of study, marital status, residence type, perceived socio-economic status and subjective academic performance.

Sex: From the results it is noted that there were more female respondents in general 55 % (N=184) than the males 45% (N=152). However, in year I and III there were slightly more males 57% and 68% respectively.

Age: There was a fairly normal age distribution with a mean of 22.3 and a SD of 2.7 for our population. The youngest respondent was 18years with the oldest at 40 years. The mean age in the respective years from I to VI was 19.9, 20.5, 21.7, 22.9, 25 and 25.3. The ages were clustered for purpose of analysis into 3; below 20years, 21-25 years and 26 years and above. The sample from the groups were 94, 211 and 31 respectively.

Marital status: Most of the respondents were single with only 7 out of the 336 being married. This was only 2% of the total sample population.

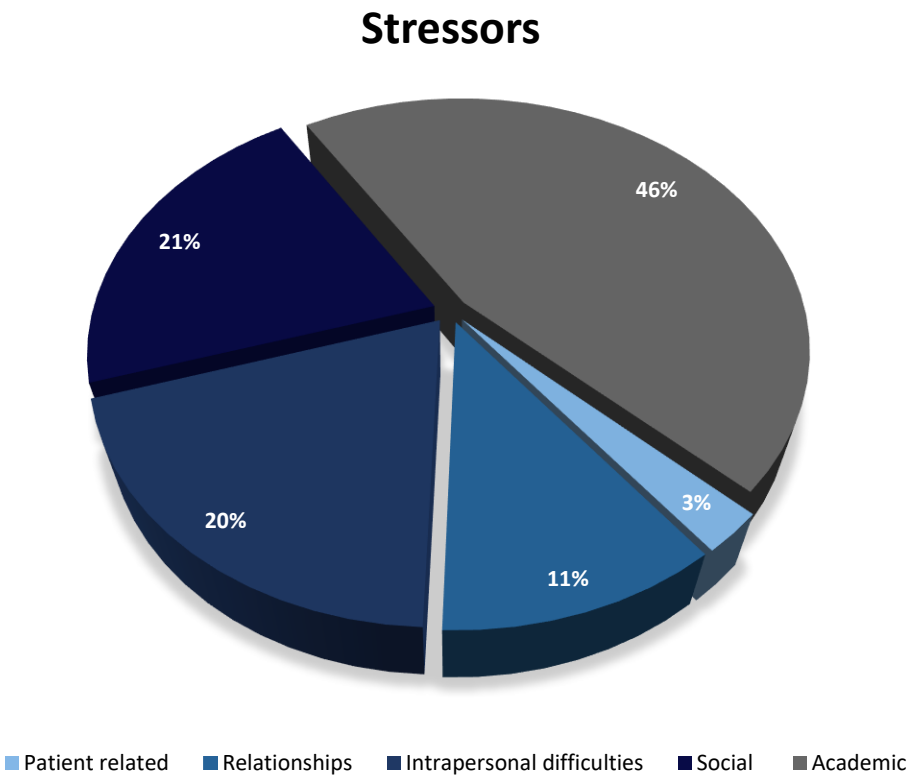
Socio-economic status: Our study sample population comprised of students who predominantly perceived their socio-economic status as satisfactory which we equated to middle income 64%. Those who perceived their SES to be good or high were 19% and bad or low at 17%.

Residence type: In our sample, 36% of the respondents lived alone off campus, 41% resided within the campus premises and only 23% lived with their family.

Subjective Academic performance: When asked about subjective overall performance in relation to the rest of their classmates, students in year II and VI had an equal response rate between those that felt they were performing well and those who were underperforming. Year III had a large proportion of students (64%) who felt like they were underperforming. The other classes I, IV and V had more students reporting subjectively good performance at 51%, 71% and 55% respectively. These results have been summarized in table 4.2 in appendices.

Stressors: Out of interest to understand the population better, the researcher formulated questions included one on the main stressors encountered. As this was an open-ended question and the responses were grouped into 5 categories namely; Patient related, Academics, Psychosocial, Current relationships and Intrapersonal stressors. The most repeated category was the Academic related stressors (46%) that included responses ranging from increased workload, exams and inadequate support and mentorship within the program. Psychosocial stressors (21%) included; limited free time to relax, isolation and rejection from the peers and difficulty making and sustaining friendships. Intrapersonal stressors accounted for 20% and included uncertainty about the future, career planning and financial difficulties. Current relationships including discord within the family, intimate and other partnerships accounted for 11%. Only 3% of current stressors included patient related problems such as facing a patient with bad news and death of a patient.

Figure 4.1: Stressors among medical students.



4.2.2 PITTSBURGH SLEEP QUALITY INDEX (PSQI)

The PSQI consists of 19 items which are summarized into 7 components summed up to the total Global PSQI. The seven components are subjective sleep quality, sleep Latency, Sleep Duration, sleep efficiency, Sleep Disturbance, Use of sleep medication and Daytime Function. The responses consisted of time stated in hours or minutes for questions 1 to 4 and Likert point scale for question 5 to 9 of the index. Total for the subscales were calculated as per the interpretation guideline and the means were obtained as per the table. The overall score termed as the Global PSQI is the mean of the seven components. The Global PSQI score for our study sample was 6.87 with a SD of 3.712. The means of the 7 subscales was as shown in table 4.3.

A cut off score of 5 is used to classify respondents as having good or poor sleep quality. Where 5 and above are poor sleepers and below 5 good sleepers. From our study sample, the prevalence of poor quality of sleep was 69.9% with only 30.1% of the participants meeting the criteria for good sleep quality.

Table 4.3: Mean for the subscales and global score of PSQI.

Sleep quality	Mean score	SD	Good sleepers N (%)	Poor sleepers N (%)
Subscales				
Subjective sleep quality	1.05	.794		
Sleep latency	1.06	.954		
Sleep duration	1.15	.963		
Sleep efficiency	0.58	.849		
Sleep disturbances	0.97	.526		
Use of sleep medication	0.19	.565		
Daytime function	1.19	.964		
Global PSQI	6.87	3.712	101 (30.1%)	235 (69.9%)

The frequencies within each of the subscales were also determined as shown below.

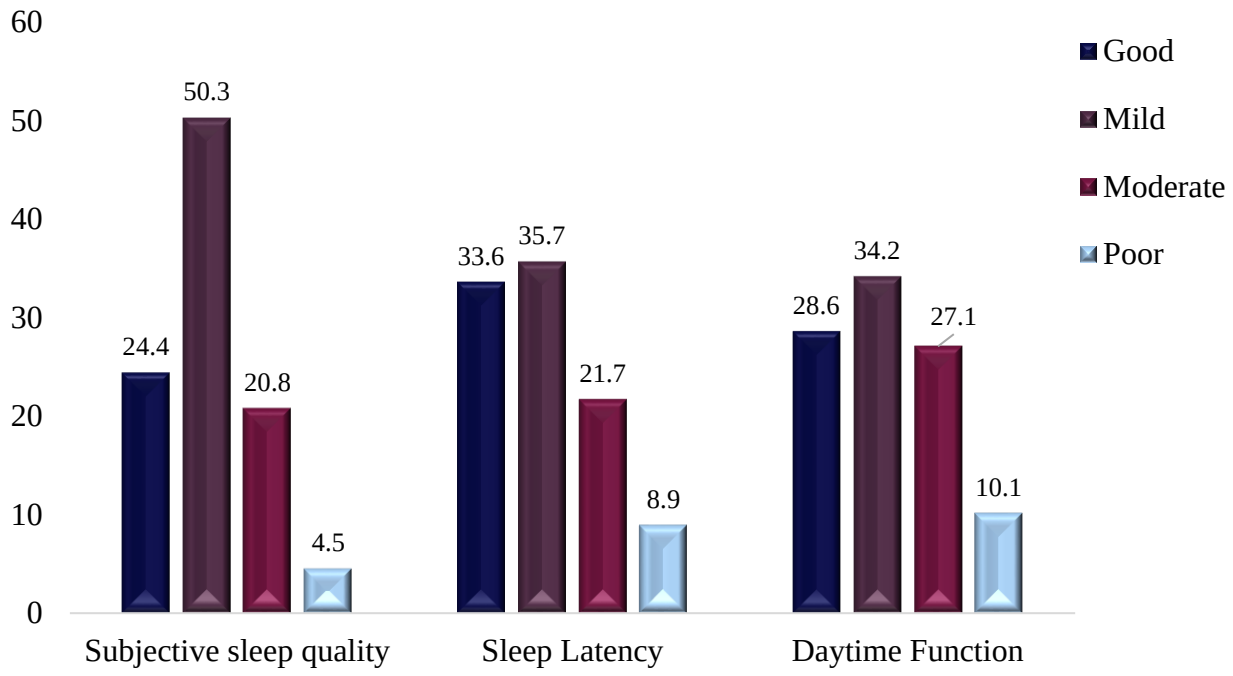
For **subjective sleep quality**, only 24% rated themselves as having good quality of sleep with mild and moderate at 50.3% and 20.8% respectively. 4.5% stated having poor sleep quality.

For **sleep latency** 33.6% of the respondents belonged to the group that had a short period of time before initiation of sleep with 35.7% and 21.7% having mild to moderate disturbance with sleep latency. 8.9% reported to have long latency period of more than 60 minutes.

For **daytime functioning**, 28.6% reported to have good function while 34.2% and 27.1%reported mild and moderate functioning respectively. 10.1% reported poor function during the day.

The frequencies for these 3 subscales have been summarized in figure 4.2

Figure 4.2: Subjective sleep quality (%), Sleep latency (%) & Daytime function (%)

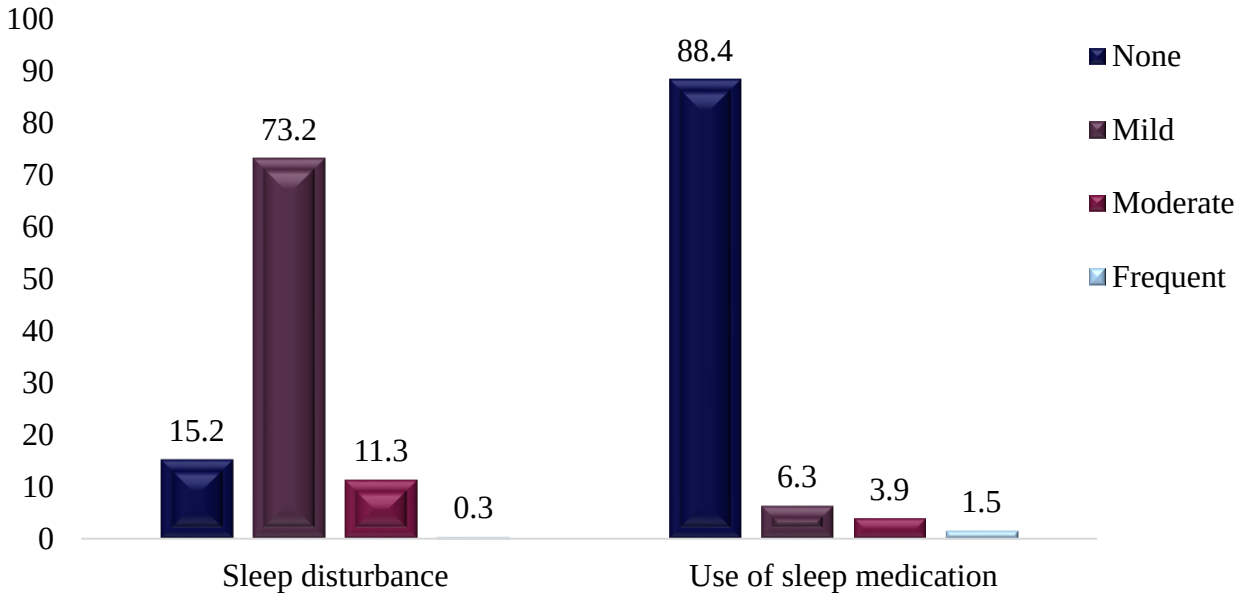


Sleep disturbance was calculated on a Likert scale of summing up 9 items (5b-5j) with the lowest possible scores being 0 and the highest 3. Highest overall possible score is 27 which is then divided by total number of items to get a score ranging between 0 and 3. From our sample, majority 73.2% reported mild disturbance in sleep with 11.3% reporting moderate disturbance. only 0.3% reported frequent disturbance and 15.2% no sleep disturbance.

Use of **sleep medication** was also reported with majority 88.4% stating no use of prescribed or over the counter medications to aid them in sleeping. Only 1.5% reported frequent use of the same, with 6.3% and 3.9% having mild to moderate use of sleep medication.

The frequencies for the 2 subscales have been summarized in figure 4.3

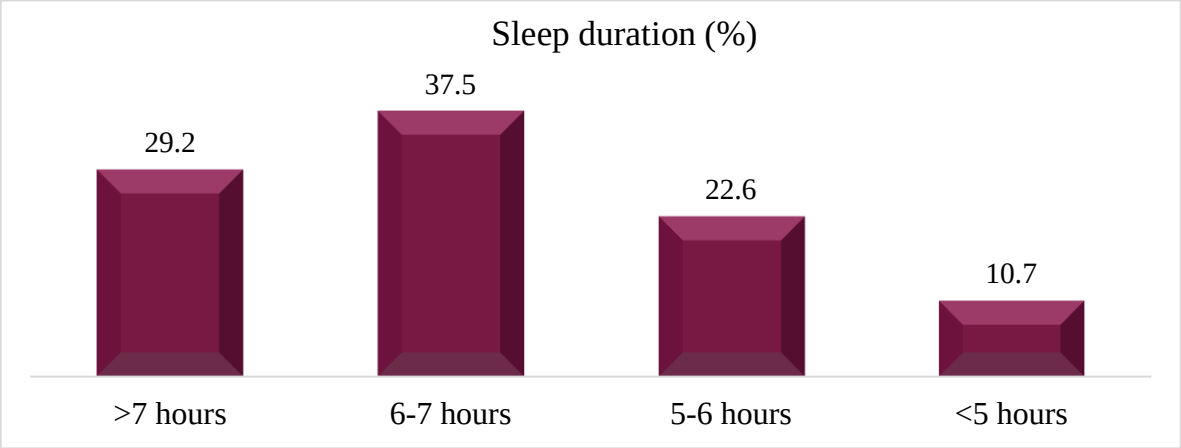
Figure 4.3: Frequencies of Sleep disturbance (%) and Use of Sleep Medication (%)



Sleep duration was calculated from the sleep and wake up times provided by the respondents. 29.2% of the respondents had 7 or more hours of sleep, majority (37.5%) had between 6 and 7 hours, 22.6 with 5-6 hours and the least10.7% had the lowest duration of sleep which is less than 5 hours. Majority of the students slept between 10pm and Midnight, while a small proportion (2.4%) slept between 2am and 4am. Those who slept between 8pm and 10pm were only 5.7% and those between 12am and 2am were 33.3%. On waking up times, majority of the students reported to wake up between 6am and 8am (53%) with 37.2% waking up between 4am and 6am, 5.1% waking before 4am and 4.8% after 8am.

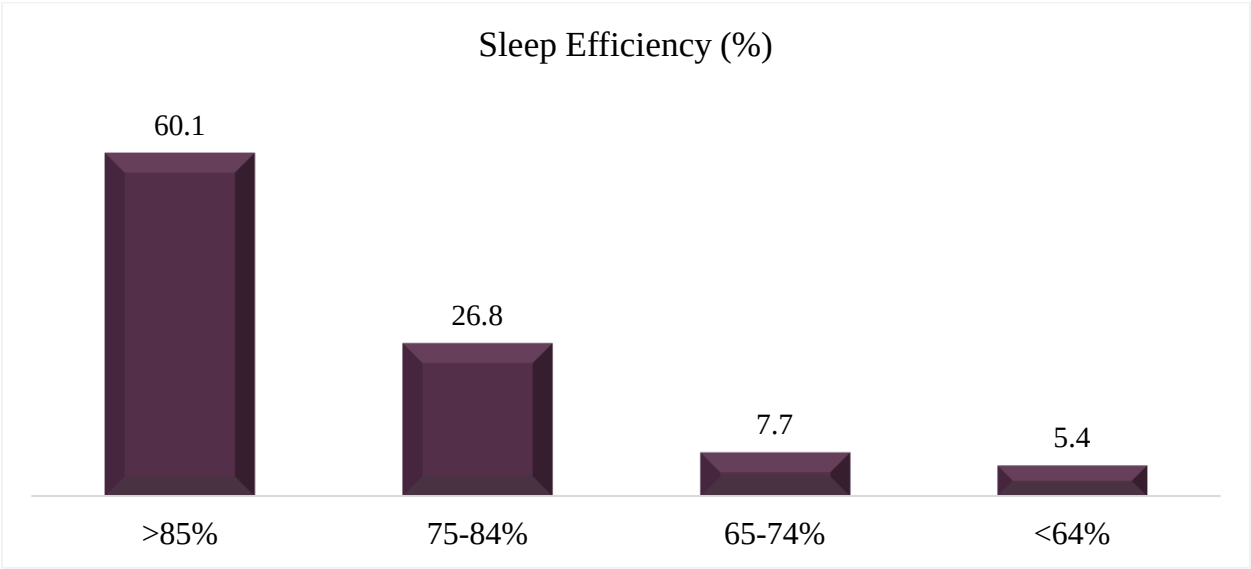
The above has been summarized in the figures 4.4, 4.5 (in the appendices) and figure 4.6.

Figure 4.6: Sleep duration in hours expressed as percentages



Sleep efficiency was calculated from the total hours asleep against the total hours spent in bed multiplied by 100 to give a percentage score. Majority 60.1% had above 85% with the least 5.4% having below 64%. 26.8% and 7.7% of the respondents had between 75-84% and 65-74% respectively. Summarized in figure 4.7.

Figure 4.7: Sleep efficiency frequencies expressed as percentages



4.2.3 OLDENBURG BURNOUT INVENTORY (OLBI)

The OLBI tool was used to assess burnout within the study sample. The tool comprises of 16 positively and negatively framed items that are coded normally or reversely to bring about a cumulative score for the two components, exhaustion and disengagement. Each item is scored on a Likert scale from 1 to 4. Highest possible score for either component is 4. The cut-off scores for exhaustion and disengagement used were 2.25 and 2.1 respectively. However, there are no severity scores for this scale. The mean scores for exhaustion and disengagement were 2.82 and 2.42 respectively. 86.9% of the respondents had a score above the cut-off for exhaustion and 81.8% for disengagement.

From the mean of the 16 items, item number 2 ‘There are days I feel tired before school’ had the highest mean of 3.38 (SD=.694). Item 1 ‘I always find new and interesting aspects of my school work’ had the lowest mean, 2.04 (SD=.732).

Table 4.4 Frequencies of exhaustion and disengagement.

Burnout	Cut off	Mean	SD	Below cut-off point		Above cut-off point	
Exhaustion	2.25	2.82	0.45	44	(13.1%)	292	(86.9%)
Disengagement	2.1	2.42	0.40	61	(18.2%)	275	(81.8%)

The data was further explored to determine the number of students that met or did not meet either criteria.

Table 4.5 Criteria for burnout components and overall burnout

Burnout component	Prevalence	N	(%)
Did not meet criteria for either disengagement and exhaustion		20	(6.0%)
Meets criteria for Disengagement but not exhaustion		24	(7.1%)
Meets criteria for Exhaustion but not Disengagement		41	(12.2%)
Met criteria for both Disengagement and exhaustion		251	(74.7%)

A Pearson's correlation test was done to determine the association between the two components; disengagement and exhaustion. There was a significant correlation between the variables, disengagement and exhaustion. [$r=0.514$, $n=336$, $p<0.01$].

4.3 INFERENTIAL STATISTICS

In this section we looked at the correlations between the independent and dependent variables. We explored the association between the select socio-demographic variables and sleep quality and burnout as separate components. We also explored the relationship between the two dependent variables sleep quality and burnout. Using the correlation tests, a hypothesis testing was done. The null hypotheses that were tested in this study were:

1. $H0_1$ There is no significant association between socio-demographic variables and sleep quality among undergraduate medical students.
2. $H0_2$ There is no significant association between socio-demographic variables and burnout among undergraduate medical students.
3. $H0_3$ There is no significant association between poor sleep quality and burnout among undergraduate medical students.

4.3.1 POPULATION DEMOGRAPHICS AND SLEEP QUALITY

The selected socio-demographic variables within the study were; age, sex, year of study, perceived SES, residency type, marital status and subjective academic performance.

Therefore, the hypotheses tested in this section were:

$H0_{1A}$: Age has no association with sleep quality

$H0_{1B}$: Sex has no association with sleep quality

$H0_{1C}$: Year of study has no association with sleep quality

$H0_{1D}$: Perceived SES has no association with sleep quality

$H0_{1E}$: Residency type has no association with sleep quality

$H0_{1F}$: Marital status has no association with sleep quality

$H0_{1G}$: Subjective academic performance has no association with sleep quality

As the above variables were categorical data, a Spearman's correlation test was used to determine the association with the mean global PSQI score. A one-way ANOVA was also carried out to test the difference between the subgroups of the sociodemographic variables (SDV).

Age: For purpose of analysis, age was clustered into 3 subsets; those 20 years and below, 21-25years and those above 25years. From the analysis it was determined that from our sample, the subset with the highest number of respondents with good sleep quality was that of below 20years (34%), though the difference was small, 28% &32% for 21-25years &26years and above respectively. The 21-25year old group had highest proportion with poor sleep quality (72%). The correlation between age and sleep quality was not significant from our Spearman rank coefficient tests and it is thought that any association would only arise by chance [r_s=0.083, p=0.127].

Therefore, we fail to reject the null hypotheses ($H01_A$).

Sex: The comparison between males and females identified that there were more females who had poor sleep quality in comparison to their male counterparts 74% and 65% respectively. A one-way ANOVA test done [F=5.582, p=0.019] showed there was a difference in the means that was statistically significant. Based on the results of the study, there was a significant association between the variable and sleep quality thus, the observed results could not be merely be out of chance [r_s=0.130, p=0.017].

Therefore, we reject the null hypotheses ($H01_B$).

Level of study: Respondents were clustered into Pre-clinical and clinical years for this analysis N=176 and N=160 respectively. From the results it was concluded that the proportion of students was similar among the good and poor sleepers between the two groups. Using the Spearman Correlation Coefficient, there was no association between the level of study and sleep quality [r_s=0.070, p=0.198].

Therefore, we fail to reject the null hypotheses ($H01_C$).

Perceived SES: Students were asked to subjectively rate their socioeconomic state on a 3-point scale comprising of good, satisfactory or bad/poor. Students who subjectively felt their socio-economic status was good had a higher number of good sleepers (41%) than those who felt theirs were satisfactory or bad (27% and 28% respectively). Highest number of poor sleepers are those who perceived their SES as bad or satisfactory 72 and 73% compared to 59% of those who perceived a good SES. A one-way ANOVA conducted determined that there was a significant

difference in the means of the three groups. [F=3.232, p<0.05]. From the study results, perceived SES was positively correlated with sleep quality. [r_s=0.134, p<0.05].

Therefore, we reject the null hypotheses ($H01_D$).

Residency type: An analysis between the sleep quality and residency type of the respondents determined that the group that had the highest proportion of poor sleepers are those that stayed at home with family (79%). Students who stayed within the campus and those who lived independently off campus premises also had higher proportions of respondents, 62% and 74% respectively, having poor sleep quality. A one-way ANOVA conducted on the means of the 3 different clusters showed there was a significant difference [F=5.911, p<0.05]. The Spearman Correlation Coefficient determined a positive association between residency type and sleep quality [r_s=0.184, p<0.01].

Therefore, we reject the null hypotheses ($H01_E$).

Marital status: From the results, more respondents (98%) were single and only 2% married. Out of the above proportions, their distribution in sleep quality was largely the same. 70% of those who were not married and 71% of the married had poor sleep quality. From the Correlation Coefficient, there was no association between marital status and sleep quality [r_s=0.028, p=0.609].

Therefore, we fail to reject the null hypotheses ($H01_F$).

Subjective Academic performance: Subjective Academic performance was classified as either performing well or underperforming. From the respondents that felt that they were underperforming, 79% also had poor quality of sleep. Of those who felt their academic

performance was good or satisfactory, 62% still had poor sleep quality. A one-way ANOVA was conducted on the sample means and there was a significant difference between the two groups [$F=18.377$, $p<0.01$]. Based on the results of the study, there was a correlation between performance and sleep quality that was statistically significant [$r_s=0.233$, $p<0.01$].

Therefore, we reject the null hypotheses ($H01_G$).

The above results were summarized in the table 4.6 (in the appendices)

In summary, sex, residency type, perceived SES and subjective academic performance all had positively significant correlations with sleep quality. In addition, those who had a subjectively underperforming perception (79%) about themselves had a significantly higher association with poor sleep quality in relation to those who were performing well (62%). Those that lived with family, those who perceived their SES as bad and the female sample also had significantly higher proportion of poor sleepers in comparison to those in other categories. There was no correlation between age, study level and marital status with sleep quality from our study.

4.3.2 POPULATION DEMOGRAPHICS AND BURNOUT

The selected socio-demographic variables within the study were; age, sex, year of study, perceived SES, residency type, marital status and subjective academic performance.

The hypotheses tested in this section were:

$H0_{2A}$: Age has no association with a component of burnout

$H0_{2B}$: Sex has no association with a component of burnout

$H0_{2C}$: Year of study has no association with a component of burnout

$H0_{2D}$: Perceived SES has no association with a component of burnout

$H0_{2E}$: Residency type has no association with a component of burnout

$H0_{2F}$: Marital status has no association with a component of burnout

$H0_{2G}$: Subjective academic performance has no association with a component of burnout

The independent variables were correlated between both components of burnout.

As the above variables were categorical data, a Spearman's correlation test was used to determine the association with exhaustion and disengagement. The results were summarized in the tables 4.7 and 4.8 respectively (in the appendices) and discussed below.

Age: From the analysis it was determined that from our sample, the subset with the highest number of respondents (84%) with disengagement was that of below 20years. 21-25year olds had highest proportion (90%) with exhaustion out of the three subsets. A one-way ANOVA was done to test the difference in means between the subsets on exhaustion, which was statistically significant [$F=5.766$, $p<0.01$]. On disengagement there was no significant differences between the means [$F=1.961$, $p=0.142$]. Despite the association between disengagement and age not being significant

[r_s=0.071, p=0.195], the correlation between age and exhaustion was significant from our Spearman rank coefficient tests [r_s=0.142, p<0.01].

Therefore, we reject the null hypotheses ($H02_A$).

Sex: The comparison between males and females identified that females had higher proportion of respondents with exhaustion (89%) and disengagement (84%) in comparison to their male counterparts who had 84% and 80% respectively. There was a difference in the means that is statistically significant on the exhaustion component [F=5.036, p<0.05] but none on disengagement component [F=0.240, p=0.624]. Based on the results of the study, there was no correlation between sex and disengagement [r_s=0.042, p=0.444] however, females ranked higher in exhaustion and the correlation was statistically significant [r_s=0.107, p<0.05].

Therefore, we reject the null hypotheses ($H02_B$).

Level of study: Respondents were clustered into Pre-clinical and clinical years for this analysis. From the results it could be concluded that the proportion of students was similar with exhaustion between the two groups (86% and 87% respectively). Disengagement was higher among the preclinical years 85% in comparison to the clinical years with 79%. A one-way ANOVA was conducted between the 2 groups and the difference in mean was significant for both exhaustion [F=3.891, p<0.01] and disengagement [F=3.342, p<0.01]. Based on the results of the study using the Spearman Correlation Coefficient, there was a significant positive association between the level of study and exhaustion [r_s=0.175, p<0.01] as well as disengagement [r_s=0.164, p<0.01].

Therefore, we reject the null hypotheses ($H02_C$).

Perceived SES: Students who subjectively felt their socio-economic status as good had a lower proportion of those exhausted (78%) than those who felt theirs were satisfactory or bad (88% and 91% respectively). However, scores on disengagement were relatively similar between the three groups with bad at 82%, satisfactory at 81% and good at 84% on proportion of those that were disengaged. There was a significant difference in the means of the three groups on the component of exhaustion [$F=4.07$, $p<0.05$] and none on the component of disengagement [$F=0.391$, $p=0.677$]. Based on the results of the study, SES did not have a correlation with disengagement [$r_s=0.088$, $p=0.490$], but did have a correlation with exhaustion [$r_s=0.190$, $p<0.01$].

Therefore, we reject the null hypotheses ($H02_D$).

Residency type: An analysis between exhaustion and residency type of the respondents determine that the group that had the highest proportion of those with exhaustion are those that stayed independently off campus (93%) versus 83% and 84% for those that stayed on campus and with family respectively. There were similar proportions of respondents with disengagement between the three groups. Between the different clusters showed there was a significant difference within the exhaustion component [$F=5.807$, $p<0.01$] but none with the disengagement component [$F=0.750$, $p=0.473$]. Based on the results of the study using the Spearman Correlation Coefficient, there was an association between residency type and exhaustion [$r_s=0.126$, $p<0.05$] though no association between residency type and disengagement [$r_s=0.083$, $p=0.336$].

Therefore, we reject the null hypotheses ($H02_E$).

Marital status: From the results, more respondents (98%) were single and only 2% married. Out of the above proportions, their distribution in within the exhaustion and disengagement scores were

relatively similar. 87% of those who were not married and 86% of the married had exhaustion while 82% of those who were not married and 86% of the married had disengagement. There was no significant difference in means between the two groups on the exhaustion [F=0.042, p=0.839] and disengagement components [F=0.005, p=0.943]. There was also no association between marital status and exhaustion [r_s=0.022, p=0.694] or disengagement [r_s=0.004, p=0.939].

Therefore, we fail to reject the null hypotheses ($H02_F$).

Subjective Academic performance: Subjective Academic performance was classified as either performing well or underperforming. From the respondents that felt that they were underperforming, 92% also had exhaustion and 88% had disengagement. Of those who felt their academic performance was good or satisfactory, 82% still had exhaustion and 76% reported disengagement. There was also a significant difference between the two groups on both components exhaustion [F=19.7, p<0.01] and disengagement [F=12.273, p<0.01]. There was a significant correlation between both the exhaustion [r_s=0.245, p<0.01] and disengagement scores [r_s=0.198, p<0.01].

Therefore, we reject the null hypotheses ($H02_G$).

In summary age, sex, level of study, residency type, subjective academic performance and perceived SES all had significant correlations with exhaustion below the set 95% confidence interval. Disengagement had a significant correlation with the year of study and subjective academic performance. Marital status did not have a correlation with either disengagement or exhaustion and any association would be arising merely by chance.

4.3.3 SLEEP QUALITY AND BURNOUT

This section shall cover the association between sleep quality and burnout as well as their subscales respectively. As these were categorical (ordinal) data, Spearman Rank Correlation test was used to determine the association between the subscales of the two scales (PSQI and OLBI).

The results were summarized in the table 4.9 (in appendices)

Based on the results, **subjective sleep quality** was positively associated with exhaustion [r_s=0.381, p<0.01] and with disengagement [r_s=0.173, p<0.01]. With the overall burnout criteria there was a positive association as well with subjective sleep quality at the significant level [r_s=0.302, p<0.01].

Sleep latency had a positive association with exhaustion [r_s=0.248, p<0.01] and disengagement [r_s=0.125, p<0.05]. With the overall burnout criteria there was also an association with sleep latency at the significant level [r_s=0.157, p<0.01].

Sleep duration had an association with exhaustion [r_s=0.114, p<0.05] and no association with disengagement [r_s=0.035, p=0.518]. With the overall burnout criteria there was also no association with sleep duration [r_s=0.034, p=0.540].

Sleep efficiency had no association with exhaustion [r_s=0.023, p=0.677] and no association with disengagement [r_s=0.001, p=0.985]. With the overall burnout criteria there was no association with sleep efficiency [r_s=0.015, p=0.781].

Sleep disturbance had an association with exhaustion [r_s=0.229, p<0.01] and disengagement [r_s=0.157, p<0.01]. With the overall burnout criteria there was also an association with sleep disturbance at the significant level [r_s=0.181, p<0.01].

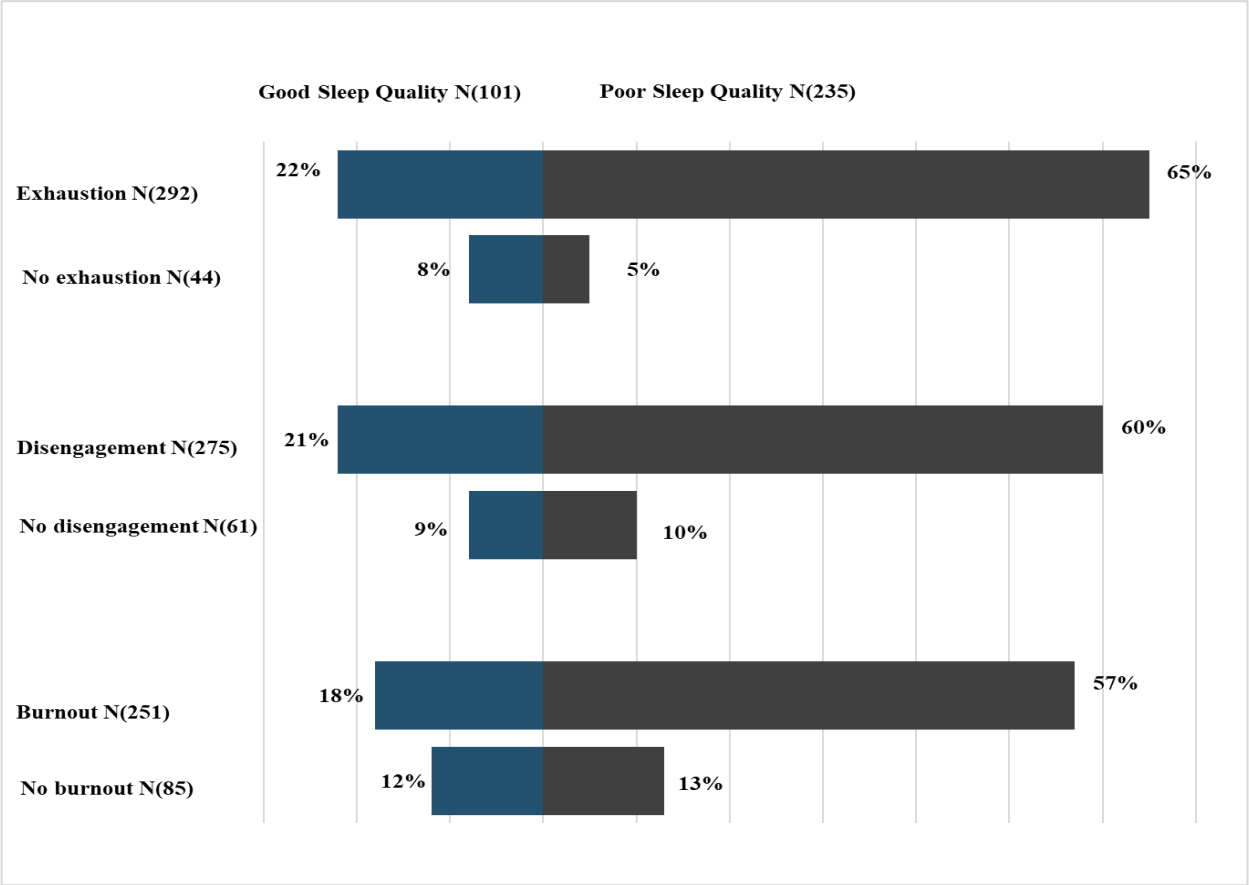
Use of sleep medication had a positive association with exhaustion [r_s=0.168, p<0.01] and no association with disengagement [r_s=0.107, p=0.051]. With the overall burnout criteria there was an association with use of sleep medication [r_s=0.109, p<0.05].

Daytime function had an association with exhaustion [r_s=0.347, p<0.01] and disengagement [r_s=0.266, p<0.01]. there was also an association with overall burnout [r_s=0.289, p<0.01].

In summary, exhaustion had a positive correlation with all the seven components except sleep efficiency. Disengagement did not correlate with sleep efficiency either in addition to sleep duration.

Global sleep quality: Distribution of the binary burnout components against the binary sleep quality output. From this we could conclude that 65% of the total participants had both poor sleep quality and exhaustion. While only 8% had good sleep quality and were not exhausted either. 60% had poor sleep quality and disengagement while only 9% had good sleep quality and no disengagement. 57% of our respondents had both poor sleep quality and overall burnout, while only 12% were good sleepers with no burnout. 18% had good sleep even though they had burnout while 13% had poor sleep without burnout. This was summarized in the figure 4.8

Figure 4.8: Overlap between the dependent variables.



Chi square tests were also carried on the above association to determine whether the association was statistically significant. A p value of <0.05 was considered significant to reject or fail to reject the null hypothesis.

Global sleep quality and disengagement: Global sleep quality and disengagement were categorized into binary variables (poor and good sleep quality; disengaged and not disengaged). The Chi-square test was significant [χ^2 (1, N=336) =7.15, p<0.01].

Global sleep quality and Exhaustion: Global sleep quality and exhaustion were categorized into binary variables (poor and good sleep quality; exhausted and not exhausted). The Chi-square test was significant [χ^2 (1, N=336) =20.3, p<0.01].

Global sleep quality and burnout: Global sleep quality and overall burnout were categorized into binary variables (poor and good sleep quality; burnout and no burnout). The Chi-square test was significant [χ^2 (1, N=336) =15.6, p<0.01].

The above result therefore *rejects the null hypotheses (H0$_3$)* and states that indeed, there is an association between poor sleep quality and burnout within our population.

4.3.4 RISK RATIO

The following relative risks on poor sleep quality were tabulated using a 95% confidence interval. Students who were exhausted were 4.18 times more likely to have poor sleep quality. Those with disengagement had a 2.16 relative risk of having poor sleep quality. Students who met the overall criteria for burnout were 2.77 times more likely to have poor sleep quality. Summarized in table 4.10.

Table 4.10: Relative risk of poor sleep quality on burnout.

Poor Sleep Quality		95% Confidence Interval	
	Relative risk	Lower	Upper
Exhaustion	4.18	2.17	8.05
Disengagement	2.16	1.22	3.82
Burnout	2.77	1.66	4.63

4.4 RELIABILITY TESTING

Reliability testing was done on each of the two scales using the Cronbach's alpha and the scores recorded.

4.4.1 PITTSBURGH SLEEP QUALITY INDEX

The PSQI consists of 19 items. The mean obtained was 24.24 (SD=7.4).

A reliability analysis was carried out on the perceived task values scale comprising 19 items. Cronbach's alpha showed the scale to reach acceptable reliability, $\alpha = 0.776$. Most items appeared to be worthy of retention, resulting in a decrease in the alpha if deleted.

4.4.2 OLDENBURG BURNOUT INVENTORY

A reliability analysis was carried out on the perceived task values scale comprising 8 items. Cronbach's alpha showed the questionnaire to reach acceptable reliability, $\alpha = 0.74$. Most items appeared to be worthy of retention, resulting in a decrease in the alpha if deleted. The one exception to this was item 6, which would increase the alpha slightly to $\alpha = 0.76$. As such, removal of this item could be considered.

Table 4.11 Reliability testing for the PSQI and OLBI scales.

Scale	**Scale statistics**			**Reliability statistics**	
	Mean	Variance	Std. deviation	No of items	Cronbach's Alpha
PSQI	24.24	55.014	7.417	19	0.776
OLBI	41.90	35.305	5.942	16	0.741

CHAPTER 5: DISCUSSION

In this chapter we shall focus on addressing the research question and study objectives. This chapter will also address the recommendations and study limitations.

The specific objectives of this research were: -

1. To establish the quality of sleep among undergraduate medical students.
2. To determine the prevalence of burnout among undergraduate medical students
3. To determine the relation between socio-demographic variables and quality of sleep.
4. To determine the relation between socio-demographic variables and burnout.
5. To determine the association between sleep quality and burnout.

5.1 SLEEP QUALITY

This section covers objectives 1 and 3 focusing on the prevalence of sleep and its association to the select socio-demographic variables.

5.1.1 PREVALENCE OF SLEEP QUALITY

Based on the study results the prevalence of poor sleep quality was 69.9%. This was relatively higher than prevalence rates done in most parts of the globe. In comparison, prevalence of poor sleep quality was 40% in Lithuania (Preišegolavičiūtė, 2010), 38.9% in Brazil (Medeiros, 2001) and 49% in Taiwan (Tsai &Li, 2004) The prevalence was however higher (74.2%) in Palestine (Siddiqui, 2016). In Africa a study done in Nigeria identified 32.5% of the students as having poor quality of sleep (James, 2011) and in Morocco a rate of 58.2% was reported (Hangouche, 2018).

The National Sleep Foundation, has a number of factors recommended for good restorative sleep. It does recommend seven hours of sleep for an adult, and also states that an individual who has

had good sleep is one who has had restorative sleep (Hirshkowitz, 2015). According to our study results, only 29% of the students reported to sleep for 7 or more hours and about 11% had less than 5 hours of sleep on average. This may conclude that 71% of our population did not meet the criteria for restorative sleep on the basis of quantity. The foundation went on further to describe that restorative sleep is not only quantitative but also qualitative. This can be determined from a good subjective sleep quality, short sleep latency period, good sleep efficiency and minimal to no sleep disturbance. The subjective sleep quality mean from our sample was 1.05 and 50% of the respondents would rate their overall sleep quality as fairly good with only 24% reporting very good. It has also recommended that one should fall asleep within 30minutes of lying in bed and a long latency period correlates with non-restorative sleep. From our results, most of the students (91.1%) had good initiation of sleep on most days of the week and only 8.9% reported long periods of more than 60 minutes to fall asleep. It has been additionally recommended that one should be asleep for at least 85% of the total time spent in bed. A majority of our student sample (60.1%) had efficient sleep. However only 5.4%, spent 64% of the time in bed sleeping. It was also noted from our study that some students who did not meet the criteria for the recommended adequate sleep duration (7Hours) would meet this criterion, as they would be in bed for shorter periods of time (<7 hours) but spent more than 85% of that time asleep. Students who would be in bed for 5 hours and spend 5 hours asleep would score 100% on this component of the scale. Minimal sleep disturbance has been characterized as waking up no more than once per night to attend to interruptions and thereafter being awake for no more than 20 minutes (Oyahon et al, 2017). Sleep interruptions on this scale included spontaneous untriggered wakening, use of bathroom, difficulties breathing, coughing or snoring loudly, experiencing bad dreams, extreme temperatures sensation and pain sensation. Based on this study, only 15.2% reported that they had good sleep

maintenance with 73.2% of the students reporting that they would have minimal sleep disturbance at least once a week. Of the sample, 11.6% had more than once a week disturbance and did not meet this criterion. It has been additionally reported that daytime sleepiness has been associated with reduced daytime function (Oyahon et al, 2017). This is manipulated by increased sleepiness during the day and enthusiasm to achieve daily activities. From our study, only 28.6% of our sample had good daytime functioning, which is thought to impact significantly on their learning, academic and professional performance. The overall mean for daytime function was the highest among the seven components constituting the sleep quality scale at 1.19 (SD=0.964). Meaning that, among our participants this was the most affected component of the scale. Of the total sample, 10.1% were recorded to have poor daytime functioning.

Although this scale had not been used locally among the population of interest, all the items showed high covariances and the alpha Cronbach coefficient at 0.776 concluding that the PSQI measured the same underlying construct of sleep quality.

5.1.2 SOCIODEMOGRAPHIC VARIABLES AND SLEEP QUALITY

Factors that can affect sleep are but not limited to age, gender, medical and psychiatric illness, medication that primarily work on the central nervous system, environment and psychosocial factors (Hirshkowitz, 2015). The socio-demographic variables included in our study were age, sex, level of study, perceived SES, marital status, residency type and subjective academic performance.

Studies done on correlation of sleep quality and sex have revealed varying results. There has been more male predominance reported in Iran 44.8% (Ghoreishi, 2008) and Palestine 64.4% (Siddiqui, 2016). However, none of these were found to be statistically significant. In our study, females ranked significantly higher in poor quality of sleep with 74% versus 65% for the males ($F=5.582$, $p<0.05$). However, in our study the correlation between females and sleep quality was found to be

statistically significant. This finding could be attributed to the increase in societal expectations for the females in previously male dominated fields.

Age marital status and level of study have also been studied in various parts of the globe. In Palestine, students who were older than 22 years of age, not married and in clinical years were found to have higher ranking in poor quality of sleep than the counter groups (Siddiqui, 2016). Contrary to this study, married students in Iran were identified as having a significant association with poor sleep quality and of the married students, 64.9% had poor sleep quality versus 35.8% of those who were single (Ghoreishi, 2008). Corresponding to the Palestine study, students in the senior years are thought to be affected more by sleep problems compared to those in the junior years (Hazama, 2008). Based on our study, there were no significant differences between the different age groups, and marital status. There were relatively similar rates between the groups in regards to the two socio-demographic variables. There was also no correlation between the two variables and sleep quality. However, the level of study replicated similar findings to those above and showed a difference in means [$F=3.600$, $p<0.01$] with the clinical years having a slightly higher score than the pre-clinical years (71% and 69% respectively). Despite the slight difference between the two groups, clinical years of study were correlated with poor sleep quality. This could be attributed to increasing demands of the student slowly budding into a professional and increased responsibility for the same. Since there are more courses in the clinical years, it could be assumed that the assessments would also be significantly higher. As students aim for good academic grades, some cut-down on sleep in attempts to achieve this goal. This in turn leads to a vicious cycle as sleep is necessary for learning and memory potentiation.

In Palestine, residential status was positively correlated with higher levels among those living with a spouse 61.5% in comparison to 44.6%, 35.6% and 20.8% of those living in their private homes,

in dormitories and with their parents respectively (Siddiqui, 2016). From our study results, there was a recorded difference between the groups [$F=3.600$, $p<0.01$] that however colluded with the Palestine study. Those living with their family had higher poor quality of sleep (79%) compared to those residing alone in private homes just outside school (74%) and those staying within the campus premises or school dormitories (62%). This relationship was also statistically significant and could be related to commuting difficulties. Students staying within school grounds are assumed to spend a significantly lower amount of time travelling between their premises and the lecture halls, laboratories and wards in comparison to the other groups. This could contribute to extra time in achieving daily activities, goals and ultimately sleep duration.

Financial status has also been implicated in the global quality of sleep with 57.9%, 46.9%, and 33.9% of those from low, moderate and high economic classes, respectively, being sleep deprived (Ghoreishi and Aghajani (2008) Our study replicated similar findings on the perceived financial state. Those who felt their financial state was good had 59% of the respondents reporting significantly poor sleep quality against 73% and 72% of those that reported satisfactory and bad respectively. A low/poor financial state can be assumed to be a stressor that may interfere with subjective and over sleep quality.

Poor quality of sleep and excessive daytime sleepiness affect cognitive ability and have a negative impact on the academic performance of medical students. Being a poor sleeper has been associated with poor academic performance. Students with later sleep phase and poorer sleep quality are at a higher risk of impaired academic performance (Yeung, 2008). Despite its significance in cognitive performance, it has been documented that college students find themselves cutting down on sleep, in attempts to cope and adjust to increasing workloads (Buboltz, 2001). A local study done on sleep quality and academic performance among university students identified a positive correlation

with poor academic performance (Gikunda, 2014). According to our study, participants subjectively classified themselves as performing well or underperforming. As it was expected, poor sleep quality was significantly higher among the underperformers, 79% compared to those who subjectively felt they performed well (62%).

5.2 BURNOUT

This section covers objectives 2 and 4 focusing on prevalence of burnout and its relation to the select socio-demographic variables.

5.2.1 PREVALENCE OF BURNOUT

Burnout has been described as a syndrome comprising of diminished sense of accomplishment, emotional exhaustion and depersonalization caused by psychological stress. The scale used in this study (Oldenburg Burnout Inventory) aimed to address two major components of burnout; exhaustion and disengagement. The exhaustion component covering not only affective aspects of burnout, but also physical and cognitive aspects and the disengagement component involving the distancing of oneself from one's academic work and experiencing negative attitudes towards school, the academic content, or one's academic course in general.

The prevalence of medical student burnout differs significantly around the globe. In a meta-analysis, a median of 27.2% was established with a range of 7%-75.2% as level of burnout among medical students (Erschens, 2018). The prevalence within our population was within the same range though on the upper limit at 74.7% in which, the students met the criteria for both disengagement and exhaustion.

With a cut off of 2.25 for exhaustion and 2.1 for disengagement, the average scores for the two burnout subscales were (mean =2.82, sd= 0.45) for exhaustion items and (mean = 2.42, sd = 0.40) for disengagement. A study done in India (Shad, 2015), had relatively similar rates with the average score for exhaustion (mean = 2.43, sd = 0.57) and (mean = 2.32, sd = 0.53) for disengagement being slightly lower than that in our sample. While those who met the criteria for both disengagement and exhaustion was 74.7%, there were bigger proportions that met each criterion 86.9% for exhaustion and 81.8% for disengagement. Meaning that a significant number of students would have been physically and cognitively tired but not mentally disconnected from their academic work and vice versa.

Although this tool has been formulated to access student burnout, it has not been tested in our study population. However, a reliability test determined that all the items showed high covariances and the alpha Cronbach coefficient was 0.741. Meaning that, the OLBI scale measured the same underlying construct of burnout amongst our participants.

5.2.2 SOCIODEMOGRAPHIC VARIABLES AND BURNOUT

Factors that have been associated with burnout are female gender, younger age, negative marital stress, high job demands with reduced satisfaction of work (Amoafo, 2014). Among medical students, female gender, those in the preclinical years and in the final year of study have been found to have higher rates of burnout (Abdulghani, 2011). Higher rates have also been recorded during exam period and other busy schedules (Kulsoom & Afsar, 2015).

Based on our results, sex, perceived financial status and residency type all had significant differences among the different groups on scoring for exhaustion item but not the disengagement score. Females had higher levels of exhaustion 89% versus 84% of males [$F=5.036$, $p<0.05$]. This

could be attributed to the same stressors as those for sleep quality. Surprisingly, those who lived independently but off campus grounds also had higher (93%) levels of exhaustion compared to those who lied with family (84%) and those living on campus (83%) [$F=5.807$, $p<0.05$]. This could be accounted for by the increased level of independence and responsibility when living alone compared to the other two components. Those who perceived their socioeconomic status to be good had the lowest rate of exhaustion (78%) compared to those who perceived it as satisfactory (88%) and bad (91%) [$F=4.07$, $p<0.05$]. This could be attributed to less worry about financial difficulties and engagement with their studies. Those who had lower socio-economic state may find themselves in situations where they have businesses or jobs to keep up with increasing financial demands. Among these four variables however, there was no difference in means between the groups on the disengagement item.

Based on our study, age and marital status did not have a correlation with either component of burnout. There was a significant difference of means between the age groups [$F=5.766$, $p<0.01$] with those ranking between 21-25 years of age having higher scores of exhaustion, 90%, compared to those who were 20 years and below at 82% and above 25 years of age at 81%. However, the correlation between this variable and exhaustion was not statistically significant. There was no difference between the groups and disengagement scores. This could be contributed to the fact that there are different age groups represented within the different levels of study. A cohort of people with one similar age could be distributed among different levels of study, facing different stressors that could contribute to exhaustion. Marital status had no difference in means between the groups for either exhaustion or disengagement. This could be contributed to by the very small representation of married people from our study sample (N=7).

The level of study and subjective academic performance were significantly correlated to both components of burnout. Level of study showed differences in means between the clinical and preclinical groups. There was little difference in the proportions between the clinical 86% and pre-clinical 87% though the difference in means was statistically significant [$F=3.891$, $p<0.01$] for exhaustion. For disengagement, the difference in groups was also significant [$F=3.342$, $p<0.01$] with disengagement being higher in the preclinical group (85%) as compared to the clinical group (79%). This finding is replicated in a similar study stating higher levels in the pre-clinical years (Abdulghani, 2011). It could be that a majority of students in the pre-clinical years were dealing with more personal stressors such as adjusting into the highly demanding career, transitioning significantly from late adolescent to young adult, making and sustaining new friendships and social circles. These could be assumed to be better developed or tolerated among the students in the clinical years. Subjective academic performance revealed a significant difference in means between the performers and underperformers with both the engagement item [$F=19.7$, $p<0.01$] and the disengagement item [$F=12.273$, $p<0.01$]. As expected, the underperformers had significantly higher levels of exhaustion 92% and disengagement 88% compared to those who were performing relatively well 82% and 76% respectively. This could again be explained by the increasing workload that could lead to reduced productivity. In turn there are affective and cognitive changes progressing to detachment from academic work and ultimately poor performance.

5.3 SLEEP QUALITY AND BURNOUT

It has been noted that burnout and poor sleep quality can have bidirectional effects on each other. Chokroverty (2010), notes that poor sleep quality may lead to mental exhaustion and cause high stress and burnout levels. This study supports this finding as it was determined that there was a

significant association between sleep quality and burnout [$\chi 2$ (1, N=336) =15.6, p<0.01]. Exhaustion and disengagement have aslo been identified to correlate positively with poor sleep scores. (Shad, Thawani, & Goel, 2015). As evident in this study there was a higher correlation with exhaustion and poor sleep quality as compared to disengagement. This could be due to the fact that exhaustion correlates more with the components within the sleep assessment scale.

Emotional exhaustion and daytime sleepiness showed an important mutual influence (Pagnin, 2014). From our study there was a positive significant correlation between exhaustion and daytime function [r_s=0.347, p<0.01]. Other subscales of sleep that showed positive correlation with exhaustion were subjective sleep quality [r_s=0.381, p<0.01], sleep latency [r_s=0.248, p<0.01], sleep disturbance [r_s=229, p<0.01] and the global score [r_s=0.389, p<0.01]. It is evident that being exhausted interferes with various components of sleep. Disengagement item showed positive correlations with only daytime function from the subscale [r_s=0.266, p<0.01]. Sleep efficiency did not have any correlation with the two components of burnout.

Sleep deprivation has been identified as a main risk factor to development of burnout more so in situations where one is preoccupied with school work during leisure time and increasing work demands (Söderström et al, 2012). In this study, poor sleep quality increased the risk of having burnout (OR 2.8, 95% CI: 1.7-4.6, p<0.01). There was also an increased risk of having exhaustion (OR 4.2, 95% CI: 2.2-8.1, p<0.01) and disengagement (OR 2.2, 95% CI: 1.2-3.8, p<0.01) as individual components. Therefore, having good sleep quality was deemed as a protective factor to developing burnout among undergraduate medical students.

Socio-economic pressures, tests and papers to which they are constantly exposed, concerns about their professional future, relationships with peers and teachers have been identified as stressors

contributing to sleep deprivation and burnout (Schaufeli et al, 2002). From our study, academic related, psychosocial and intrapersonal difficulties accounted for most of the stressors within our sample that could be contributing significantly to the high levels of poor sleep quality and burnout. Pointing out that there is a possibility of shared stressors within medical schools in different regions.

5.4 CONCLUSION

The prevalence of poor sleep quality and burnout was at 69.9% and 74.7% respectively within our study population. Poor sleep quality was positively associated with female gender, clinical year of study, living with family, bad perceived SES and poor subjective academic performance. In addition, being female, younger, in the pre-clinical year, living independently off campus and a poor subjective academic performance were associated with higher levels of burnout. Burnout was positively correlated with poor sleep quality and reduced daytime functioning. Moreover, having poor sleep increased the risk of having burnout (OR=2.77).

It is therefore important to identify harmful sleep patterns, habits and other factors that could predispose medical students to having poor sleep quality and or burnout, address them early or prevent them all together.

5.5 STRENGTHS AND LIMITATIONS

As this was a cross-sectional study, there was a heavy reliance on self-reported questionnaires that may have limited the ability to objectively test for sleep quality and burnout. Temporal associations and causality may not be confirmed. As data collection was by the use of questionnaires data was

subject to recall bias. Since the validity of PSQI and OLBI have not been tested within the Kenyan setting, use of a Kenyan inventory may have been desirable.

However, this is the first study to assess sleep quality and burnout among undergraduate medical students in Kenya, which may pave way in understanding and addressing these issues in the studied population. In addition, the Cronbach's alpha Coefficient obtained for the OLBI and PSQI scales confirmed that this tool is reliable for assessing the specified constructs within this population.

5.6 RECOMMENDATION

Further studies could be done on the same population to determine the short- and long-term effects of poor sleep quality and burnout.

Evidence based strategies that could also aid medical students prevent burnout and adopt good sleep habits given the workload and competitive environment in medical schools such as peer led support groups, monthly talks or activities aimed at sleep and burnout. These talks could be started in the pre-clinical years addressing issues such as academic expectations, transitioning to adulthood and academic-social balance.

Increased mentorship and support from the faculty would be of significant benefit. However, given the staff to student ratio a peer-led hierarchical mentorship program would be ideal as new students are easily integrated into an existing group upon enrolment to the program. This may help to create a sense of belonging, security and reduce isolation especially among the younger group in this population.

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APPENDICES

APPENDIX I: TABLES

TABLE 4.2: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF STUDY PARTICIPANTS

YEAR OF STUDY		**I**	**II**	**III**	**IV**	**V**	**VI**	**TOTAL**	
								N	%
GENDER	Female (%)	43	78	38	60	53	56	**185**	55%
	Male (%)	57	22	68	40	47	44	**151**	45%
AGE	Mean	19.9	20.5	21.7	22.9	25	25.3	**22.3**	
	SD	2.7	1.1	1.2	1.6	1.6	2.2	**2.7**	
MARITAL STATUS	Single (%)	98	98	100	95	100	94	**329**	98%
	Married (%)	2	2	0	5	0	6	**7**	2%
RESIDENCE TYPE	Independent (%)	53	36	24	38	43	50	**121**	36%
	Campus (%)	31	48	36	38	31	35	**138**	41%
	Family (%)	16	16	40	24	26	15	**77**	23%
PERCEIVED SES	Low (%)	10	14	20	17	29	15	**57**	17%
	High (%)	21	34	20	12	10	15	**64**	19%
	Mild (%)	69	52	60	71	61	70	**215**	64%
SUBJECTIVE PERFOMANCE	Performing (%)	51	50	36	71	55	50	**181**	54%
	Underperforming (%)	49	50	64	29	45	50	**155**	46%

TABLE 4.6: SOCIODEMOGRAPHIC VARIABLES AND SLEEP QUALITY

SDV	**Categories**	**Total N (336)**	**Good sleepers**		**Poor sleepers**		**F value Sig. (p<0.05)**	**Rho Sig. (p<0.05)**
			N	**%**	**N**	**%**		
Age	<20 years	94	32	(34)	62	(66)	1.342 (p=0.263)	r_s=0.083, (p=0.127)
	21-25 years	211	59	(28)	152	(72)		
	>25 years	31	10	(32)	21	(68)		
Sex	Male	151	53	(35)	98	(65)	5.582 *(p=0.019)* *	r_s=0.130, *(p=0.017)* *
	Female	185	48	(26)	137	(74)		
Study level	Preclinical	176	55	(31)	121	(69)	3.600 *(p=0.003)* *	r_s=0.070, (p=0.198)
	Clinical	160	46	(29)	114	(71)		
Perceived SES	Bad	57	16	(28)	41	(72)	3.232 *(p=0.041)* *	rs=0.134, *(p=0.014*) *
	Satisfactory	215	58	(27)	157	(73)		
	Good	64	27	(41)	37	(59)		
Residency type	On campus	138	52	(38)	86	(62)	5.911 *(p=0.003)* *	r_s=0.184, *(p=0.01)* *
	Off campus	121	32	(26)	89	(74)		
	Family	77	17	(21)	60	(79)		
Marital status	Single	329	99	(30)	230	(70)	0.164 (p=0.686)	r_s=0.028, (p=0.609)
	Married	7	2	(29)	5	(71)		
Academic Performance	Underperforming	155	33	(21)	113	(79)	18.377 *(p=0.000)* *	r_s=0.233, *(p=0.01)* *
	Performing	181	68	(38)	122	(62)		

TABLE 4.7: SOCIODEMOGRAPHIC VARIABLES AND EXHAUSTION

Socio-demographic	**Categories**	**Total N=336**	**Exhaustion**		**No Exhaustion**		**F value Sig. (p<0.05)**	**Rho Sig. (p<0.05)**
			N	**(%)**	**N**	**(%)**		
Age	<20 years	94	77	(82)	17	(18)	5.766 *(p=0.003)**	r_s=0.142, *(p=0.009)**
	21-25 years	211	190	(90)	21	(10)		
	>25 years	31	25	(81)	6	(19)		
Sex	Male	151	127	(84)	24	(16)	5.036 *(p=0.025)**	r_s=0.107, *(p=0.049)**
	Female	185	165	(89)	20	(11)		
Study level	Preclinical	176	153	(87)	23	(13)	3.891 *(p=0.002)**	r_s=0.175, *(p=0.001)**
	Clinical	160	138	(86)	22	(14)		
Perceived SES	Bad	57	52	(91)	5	(9)	4.07 *(p=0.018)**	r_s=0.190, *(p=0.002)**
	Satisfactory	215	189	(88)	26	(12)		
	Good	64	50	(78)	14	(22)		
Residency type	On campus	138	115	(83)	23	(17)	5.807 *(p=0.003)**	r_s=0.126, *(p=0.021)**
	Off campus	121	123	(93)	8	(7)		
	Family	77	65	(84)	12	(16)		
Marital status	Single	329	286	(87)	43	(13)	0.042 (p=0.839)	r_s=0.022, (p=0.694)
	Married	7	6	(86)	1	(14)		
Academic Performance	Underperforming	155	143	(92)	12	(8)	19.7 *(p=0.000)**	r_s=0.-245, *(p=0.000)**
	Performing	181	148	(82)	33	(18)		

TABLE 4.8: SOCIODEMOGRAPHIC VARIABLES AND DISENGAGEMENT

SDV	Categories	Total N=336	Disengagement		No Disengagement		F value Sig. (p<0.05)	Rho Sig. (p<0.05)
			N	(%)	N	(%)		
Age	<20 years	94	79	(84)	15	(16)	1.961 *(p=0.142)**	r_s=0.071, (p=0.195)
	21-25 years	211	171	(81)	40	(19)		
	>25 years	31	24	(77)	7	(23)		
Sex	Male	151	120	(80)	31	(20)	0.240 (p=0.624)	r_s=0.042, (p=0.444)
	Female	185	155	(84)	30	(16)		
Study level	Preclinical	176	149	(85)	27	(15)	3.342 *(p=0.006)**	r_s=0.164, *(p=0.01)**
	Clinical	160	126	(79)	34	(21)		
Perceived SES	Bad	57	47	(82)	10	(18)	0.391 (p=0.677)	r_s=0.088, (p=0.490)
	Satisfactory	215	174	(81)	41	(19)		
	Good	64	54	(84)	10	(16)		
Residency type	On campus	138	110	(80)	28	(20)	0.750 (p=0.473)	r_s=0.083, (p=0.336)
	Off campus	121	100	(83)	21	(17)		
	Family	77	65	(84)	12	(16)		
Marital status	Single	329	269	(82)	60	(18)	0.005 (p=0.943)	r_s=0.004, (p=0.939)
	Married	7	6	(86)	1	(14)		
Academic Performance	Underperforming	155	137	(88)	18	(12)	12.273 *(p=0.001)**	r_s=0.198, *(p=0.000)**
	Performing	181	138	(76)	43	(24)		

TABLE 4.9: CORRELATION TESTS BETWEEN COMPONENTS OF BURNOUT AND THE SUBSCALES OF SLEEP QUALITY.

		Exhaustion	**Disengagement**	**Burnout**
Subjective sleep quality	Correlation Coefficient	.381**	.173**	.302**
	Sig. (2-tailed)	.000	.001	.000
Sleep latency	Correlation Coefficient	.248**	.125*	.157**
	Sig. (2-tailed)	.000	.022	.004
Sleep duration	Correlation Coefficient	.114*	.035	.034
	Sig. (2-tailed)	.036	.518	.540
Sleep efficiency	Correlation Coefficient	-.023	-.001	-.015
	Sig. (2-tailed)	.677	.985	.781
Sleep disturbances	Correlation Coefficient	.229**	.157**	.181**
	Sig. (2-tailed)	.000	.004	.001
Use of sleep medication	Correlation Coefficient	.168**	.107	.109*
	Sig. (2-tailed)	.002	.051	.045
Daytime function	Correlation Coefficient	.347**	.266**	.289**
	Sig. (2-tailed)	.000	.000	.000
Global PSQI score	Pearson's Correlation	.389**	.263**	.378**
	Sig. (2-tailed)	.000	.000	.000

. Correlation is significant at the 0.01 level (2-tailed).

. Correlation is significant at the 0.05 level (2-tailed).

APPENDIX II: FIGURES

FIGURE 4.4: SLEEPING TIMES EXPRESSED AS PERCENTAGES.

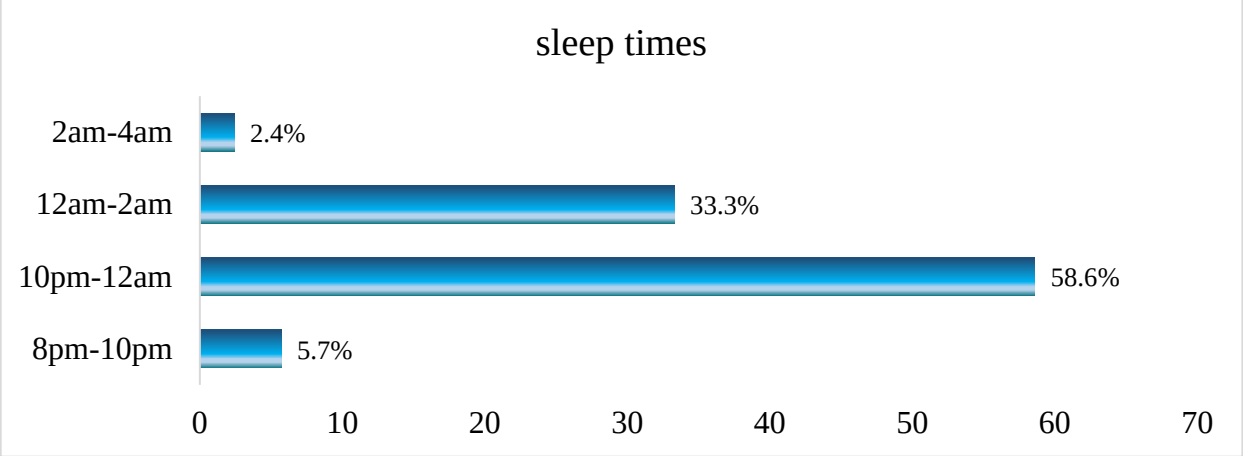
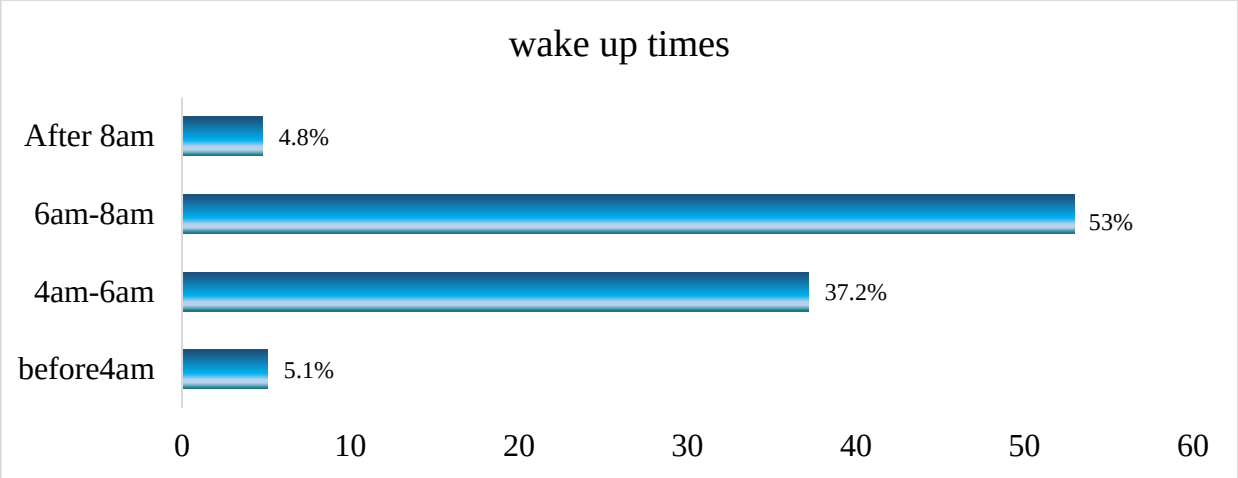


FIGURE 4.5: WAKING UP TIMES EXPRESSED AS PERCENTAGES.



APPENDIX III: PARTICIPANT INFORMATION AND CONSENT FORM

PARTICIPANT INFORMATION FOR ENROLLMENT IN THE STUDY

Title of Study: **QUALITY OF SLEEP AND BURNOUT AMONG UNDERGRADUATE MEDICAL STUDENTS AT THE UNIVERSITY OF NAIROBI**

Principal Investigator\and institutional affiliation: Dr. Linda Nyamute, Mmed Psychiatry Student at the University of Nairobi

Introduction:

I would like to tell you about a study being conducted by the above listed researcher. The purpose of this consent form is to give you the information you will need to help you decide whether or not to be a participant in the study. Feel free to ask any questions about the purpose of the research, what happens if you participate in the study, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. When we have answered all your questions to your satisfaction, you may decide to be in the study or not. This process is called 'informed consent'. Once you understand and agree to be in the study, I will request you to sign your name on this form. You should understand the general principles which apply to all participants in a medical research: i) Your decision to participate is entirely voluntary ii) You may withdraw from the study at any time without necessarily giving a reason for your withdrawal iii) Refusal to participate in the research will not affect the services you are entitled to in this institution or other institutions. We will give you a copy of this form for your records.

May I continue? YES / NO

This study has approval by The Kenyatta National Hospital-University of Nairobi Ethics and Research Committee Protocol No. _____

What is this study about?

The researchers listed above are interviewing undergraduate medical students in all years of study. The purpose of the interview is to find out the quality of sleep and burnout among students in the medical school. Participants in this research study will be required to fill a questionnaire with questions pertaining to the above topic. There will be approximately 355 participants chosen in this study. We are asking for your consent to consider participating in this study.

What will happen if you decide to be in this research study?

If you agree to participate in this study, the following things will happen:

You will be administered a questionnaire which you can fill in a private area where you feel comfortable. The questionnaire takes about 6-15 minutes to fill. The questions will cover topics such as sleep times, sleep patterns, your energy and engagement in school work.

Afterwards, you will be handed an information sheet on quality of sleep and burnout that may provide prevention strategies and management solutions to the same.

Are there any risks, harms discomforts associated with this study?

Medical research has the potential to introduce psychological, social, emotional and physical risks. Effort should always be put in place to minimize the risks. One potential risk of being in the study is having an overwhelming reaction to some of the questions asked. Some questions in the questionnaire may be uncomfortable for some participants. If there are any questions you feel you cannot answer, you can skip them. You have been advised not to have your contact details on the questionnaire to maintain anonymity and privacy. None the less, only the researcher will have access to the questionnaire.

Are there any benefits being in this study?

You may benefit by receiving free health information leaflets that may help you self-assess and seek care if need be as well as how to promote good mental health for you and those around you. Also, the information you provide will help us better understand sleep patterns and burnout among medical students. This information is a contribution to science and may help guide formation of self-help groups, prevention and awareness programs.

Will being in this study cost you anything?

It will cost you only 6-15 minutes of your time.

You are not required to undergo any preliminary procedures and there are no monetary expenses expected from you as a participant.

What if you have questions in future?

If you have further questions or concerns about participating in this study, please call or send a text message to the study staff at the number provided at the bottom of this page.

For more information about your rights as a research participant you may contact the Secretary/Chairperson, Kenyatta National Hospital-University of Nairobi Ethics and Research Committee Telephone No. 2726300 Ext. 44102 email uonknh_erc@uonbi.ac.ke.

The study staff will pay you back for your charges to these numbers if the call is for studyrelated communication.

What are your other choices?

Your decision to participate in research is voluntary. You are free to decline participation in the study and you can withdraw from the study at any time without injustice or loss of any benefits.

CONSENT FORM

Participant's statement

I have read this consent form or had the information read to me. I have had the chance to discuss this research study with the primary researcher. I have had my questions answered in a language that I understand. The risks and benefits have been explained to me. I understand that my participation in this study is voluntary and that I may choose to withdraw any time. I freely agree to participate in this research study.

I understand that all efforts will be made to keep information regarding my personal identity anonymity.

By signing this consent form, I have not given up any of the legal rights that I have as a participant in a research study.

No

I agree to participate in this research study: Yes

Participant signature _____ Date _____

Researcher's statement

I, the undersigned, have fully explained the relevant details of this research study to the participant named above and believe that the participant has understood and has willingly and freely given his/her consent.

Researcher 's Name: Dr. Linda Nyamute Signature _____

Role in the study: Primary researcher

For more information, you can contact Dr. Linda Nyamute at the department of psychiatry, school of medicine, University of Nairobi. This can be from 8am to 5pm, Monday through Friday.

APPENDIX IV: QUESTIONNAIRE

This questionnaire will consist of three parts.

Part I: Researcher developed sociodemographic questions

Part II: The Pittsburg Sleep Quality Index (PSQI)

Part III: The Oldenburg Burnout Inventory (OLBI)

PART I: RESEARCHER DEVELOPED SOCIODEMOGRAPHIC QUESTIONS

Age: 20 and below ( ) 21-25( ) 26 and above ( )

Please state your age as per this year (2019) ……

Sex: Male ( ) Female ( )

Current year of study: Yr1 ( ) Yr2 ( ) Yr3 ( ) Yr4 ( ) Yr5 ( ) Yr6 ( )

Civil status: Single ( ) Married ( )

Do you have any child(ren) Yes ( ) No ( )

What is your current state of living?

On campus( ) Independently off campus( ) With family ( )

Who finances your course here at the university?

Scholarship ( ) Family ( ) Self ( )

Are you currently working? (Employed or self-employed) Yes ( ) No ( )

How would you assess your current overall financial state?

Good ( ) Satisfactory ( ) Bad [ )

In relation to my studies and academic achievement:

( ) I feel satisfied

( ) I feel like I am underperforming

What do you think contributes most to your major stressors? (*Not limited to the list below, it is just a guidance)*

Academic related: excessive workload, inadequate support from allied health professionals, inadequate mentorship or guidance, facing your patient with bad news, death of your patient. Personal: my relationships, family problems, financial issues, isolation, rejection or difficulty making and maintaining friends, limited free time to relax or develop and maintain support systems, uncertainty about the future and career planning etc…

……..……

……..……

…….

Have you been diagnosed with a chronic illness before? YES____ NO___

If YES, are you currently on any medication for the same?

PART II: PITTSBURGH SLEEP QUALITY INDEX (PSQI)

Instructions: The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

During the past month,

1. When have you usually gone to bed? _____ 2. How long (in minutes) has it taken you to fall asleep each night?_____

3. When have you usually gotten up in the morning?_____ 4. How many hours of actual sleep do you get at night? (This may be different than the number of hours you spend in bed)_____

How many hours do you spend in bed in total? _____

5. During the past month, how often have you had trouble sleeping because you…	*Not during the past month*	*Less than once a week*	*Once or twice a week*	*Three or more times a week*
a. Cannot get to sleep within 30 minutes				
b. Wake up in the middle of the night or early morning				
c. Have to get up to use the bathroom				
d. Cannot breathe comfortably				
e. Cough or snore loudly				
f. Feel too cold				
g. Feel too hot				
h. Have bad dreams				
i. Have pain				
j. Other reason(s), please describe, including how often you have had trouble sleeping because of this reason(s):				
6. During the past month, how often have you taken medicine (prescribed or "over the counter") to help you sleep?				
7. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?				
8. During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done?				
	Very good	*Fairly good*	*Fairly bad*	*Very bad*
9. During the past month, how would you rate your sleep quality overall?				

PART III: THE OLDENBURG BURNOUT INVENTORY SCALE

This next section includes questions about your daily activities and energy in the past one month.

Please select according to each statement the term (out of these four) that identifies with you	Strongly agree	Agree	Disagree	Strongly disagree
I always find new and interesting aspect of my school work				
There are days when I feel tired before school				
It happens more and more often that I talk about school in a negative way				
After school, I tend to need more time than in the past in order to relax and feel better				
I can tolerate the pressure of my school work well				
Lately, I tend to think less at school and do my work automatically				
I find my school work to be a positive challenge				
During school, I often feel emotionally drained				
Over time, one can become disconnected from school				
After school, I have enough time for my leisure activities				
Sometimes I feel sickened by my school tasks				
After school, I usually feel worn out and weary				
This is the only type of course I can imagine myself doing				
Usually, I can manage the amount of my school work well				
I feel more and more engaged in my school work				
When I am at school, I usually feel energized				

APPENDIX V: INTERPRETING THE OLBI

Each question is scored from 1 (low burnout) to 4 (high burnout). In statements marked [R] reverse coding is used – a negative response indicates high burnout and a positive answer indicates low burnout.

Items tested by each question

Exhaustion: 2, 4, 5, 8, 10, 12,14,16

There are days when I feel tired before school
After school, I tend to need more time than in the past in order to relax and feel better
I can tolerate the pressure of my school work well [R]
During school, I often feel emotionally drained
After school, I have enough time for my leisure activities [R]
After school, I usually feel worn out and weary
Usually, I can manage the amount of my school work well [R]
When I am at school, I usually feel energized [R]

Disengagement: 1, 3, 6, 7, 9, 11, 13,15

I always find new and interesting aspect of my school work [R]
It happens more and more often that I talk about school in a negative way
Lately, I tend to think less at school and do my work automatically
I find my school work to be a positive challenge [R]
Over time, one can become disconnected from school
Sometimes I feel sickened by my school tasks
This is the only type of course I can imagine myself doing [R]
I feel more and more engaged in my school work [R]

Cut off points that have been used are **2.25** for exhaustion and **2.1** for disengagement. There is however no severity scale for the same.

APPENDIX VI: INTERPRETING THE PSQI

Component 1: Subjective sleep quality

Component 2: Sleep latency

Component 3: Sleep duration

Component 4: Sleep efficiency

Component 5: Sleep disturbance

Component 6: Use of sleep medication

Component 7: Daytime function

Scoring for each of the components as shown below

Component 1	**#9** Score..... C1_____
Component 2	**#2** Score (≤15min=0; 16-30 min=1; 31-60 min=2, >60 min=3) + **#5a** Score (If sum is equal 0=0; 1-2=1; 3-4=2; 5-6=3) ..... C2_____
Component 3	**#4** Score (>7=0; 6-7=1; 5-6=2; <5=3)..... C3_____
Component 4	(total # of hours asleep)/(total # of hours in bed) x 100 >85%=0, 75%-84%=1, 65%-74%=2, <65%=3..... C4_____
Component 5	Sum of Scores **#5b to #5j** (0=0; 1-9=1; 10-18=2; 19-27=3)..... C5_____
Component 6	**#6** Score..... C6_____
Component 7	**#7** Score + **#8** Score (0=0; 1-2=1; 3-4=2; 5-6=3) ..... C7_____

Add the seven-component scores together _____ Global PSQI Score _____

A total score of "5" or greater is indicative of poor sleep quality.

APPENDIX VII: BUDGET

Item	Cost per unit (in KES)	No of units	Total Cost (in KES)
Stationery (Photocopying costs per questionnaire)	23 ksh	423 questionnaires	9,729 ksh
Ethical Clearance Fee	3,000 ksh	1 (one-time fee)	3,000 ksh
Cost of Publication	15,000 ksh	1 (one time fee)	15,000 ksh
Logistics (transport costs)			5,000 ksh
Total budget			**32,729 ksh**