EFFECTS OF SLEEP DEPRIVATION ON STUDENTS' LEARNING: A STUDY OF MEDICAL STUDENTS IN UNIVERSITY OF CAPE COAST

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Abstract

This study set out to answer six research questions as to whether University of Cape Coast School of Medical Sciences (UCCSMS) students were truly sleep deprived and whether there was a significant difference in the sleepiness scale score among the three levels of medical students in UCCSMS. The Epworth Sleepiness Scale (Johns, 1991) and a self-administered questionnaire adopted from Nojomi, Bandi, Mir, Kaffashi & Siyamak (2009) were used. A total of 125 UCCSMS medical students were conveniently selected to take part in the study. One -Way ANOVA, Descriptive statistics and Post Hoc comparisons using the Turkey HSD test, were used to analyse the data. The results: majority of the students were not generally sleep deprived in most times of the semester except during the frequent examination times when the majority reported sleep deprivation. There were differences between levels 200 and 400 in amount of sleep and in hours of sleep that were statistically significant at the $p < 0.05$ level of significance. There were no significant statistical differences between levels 200 and 300. The average of 5 hours of sleep experienced by level 400 students and 6 hours of sleep reported by level 200 and 300 students, were below the reported hours of sleep that is adequate for adults. Despite this amount of inadequate quantity of sleep that UCCSMS students had at the time of their training, they did not experience physical symptoms of sleep deprivation. The major effect of sleep deprivation reported was concentration difficulties. The findings have group and personal counselling, curriculum and pedagogical implications.

Key words: sleep, sleep deprivation, medical student, University of Cape Coast School of Medical Sciences (UCCSMS)

Introduction

Sleep is essential for maintenance of physical, sexual, and mental functions in the body (Majid, Farah, Salahuddin, Zaman, Rehmat, Rizwan, Ayesha, Kashif & Ali, 2006). Sleep, according to the American Heritage Medical Dictionary (2007), is defined as "a natural periodic state of rest for the mind and body in which the eyes usually close and consciousness is completely or partially lost so that there is a decrease in bodily movement and responsiveness to external stimuli." Sleep is beneficial. It plays an important role in promoting physical health, longevity and emotional wellbeing. Without adequate sleep, judgments, mood, and ability to learn and retain information are weakened. Overtime, chronic sleep deprivation may lead to serious medical conditions. Adults need 7 to 9 hours of sleep. When achieved, sleep helps the body to repair; strengthens the body's ability to fight infection and stay healthy; keeps the heart healthy; keeps blood pressure and cholesterol level in check; reduces stress and lowers elevated levels of stress hormones. Sleep improves memory and concentration. Sleeping well eliminates concentration difficulties because as we sleep the brain is busy organising and correlating memories. It allows the brain to better process new experiences and knowledge which increases understanding and retention (Majid et al., 2006). Sleep deprivation is described as the overall lack of the necessary amount of sleep. Sleep deprivation occurs when an individual fails to get enough sleep (American Academy of Sleep Medicine, 2008).

Effects: Sleep disorders are associated with an increased prevalence of various somatic and/ or psychiatric disorders as well as social problems (Newman, Enright, Manolia, Haporick, & Wahl, 1997; Partinen & Guilleminault, 1990; & Rocha, Guerra, & Limar-Costa, 2002). One consequence is intrusion of sleep into wakefulness. Cirelli and Tononi (2008) noted that it is easier to keep humans awake for several days, especially when subjects are motivated to keep awake, busy with pleasurable activities. But seriously, sleep deprived persons have been reported to fall asleep even in the most dangerous situations. There is sleepiness and impairment in neurocognitive and psychomotor performance (Pilcher & Huffcut 1996;

Harrison & Horne 2000) of humans. Nojomi et al., (2009) similarly stated that during sleep, some behavioural, physiological and neuro-cognitive processes occur. Sleep impairs these processes. Owen (2004) explained the following as consequences of sleep deprivation: 1) Stress and anxiety; 2). Anger, irritability and depression; 3). Lack of focus: the brain loses function as a result of sleep deprivation; that students in particular fit into this category as learning requires intense concentration. 4). Short term memory loss: memory is affected by lack of sleep, that this is a problem for those trying to study and for those learning new job skills. 5). Impaired ability to drive a motor vehicle. 6). Suppression of the immune system.

Effect of sleep deprivation on medical students

Sleep pattern and sleepiness affect the cognitive and psychomotor performance of medical students. These, according to Nojomi et al. (2009), are functions which are very important for medical students who are responsible for the life of patients. With regard to how sleep deprivation affects medical students. Owen and Philips (2001) mentioned neurobiological and work-related tasks, mood, and the fact that it affects learning, and risks of committing medical errors. It also affects the health and wellbeing of medical students.

Other effects include the facts that students who are sleep deprived enjoy less day time naps, go to bed later than usual 1to 3 times a week, and their enthusiasm to get social activities are decreased (Nojomi et al., 2009). They found out, too, that pre-internship groups have difficulty in getting up early, while 50.3% (n= 181) of the subjects they studied reported attention deficit during the day time.

In a research conducted by Browne, Van, Onsager, Simpson, Salaymeh, & Condon (1994), it was concluded that sleep deprivation led to subjective feelings of increased fatigue and decreased motivation. Residents and medical students, however, whether sleep deprived or not, obtained comparable scores on objective tests that measured both short term and long term retention of newly learned material. The research found that the ability to learn medically relevant information did not appear to be significantly changed by the degree of sleep

deprivation associated with clinical rotations on surgical services. What this meant was that sleep deprivation could have obvious negative consequences for learning and assimilating academic material but not practical skills like surgery. Probably practical learning makes students more alert when they are sleep deprived than when they do theoretical learning.

Finally, in a literature research that sought to examine whether sleep deprivation significantly impairs house staff performance, Leung and Becker (1992) reported studies that supported the impairment of physician mood with increasing sleep deprivation.

So far, from the studies reviewed, the following have been identified as the effects of sleep deprivation on medical students: cognitive and psychomotor performance of medical students, neurobiological and work-related tasks, mood, learning, risks of committing medical errors, affects the health and wellbeing of medical students, enjoying less day time naps, going to bed later than usual (1 to 3 times a week), and decreased enthusiasm to get social activities. Other effects include difficulty in getting up early, attention deficit during the day time, subjective feeling of increased fatigue and decreased motivation.

University of Cape Coast School of Medical Sciences (UCCSMS) is one of the medical schools in Ghana that is very young. It started in 2007, and runs an integrated curriculum which is different from all the traditional medical schools in Ghana. Medical students spend more time in school for their professional training than regular undergraduate students. This is due to the structure of their training which demands a lot of skill and practical knowledge before one can graduate and practice as a professional medical doctor. This causes the students to study more to the detriment of their sleep pattern. Like all medical schools, UCCSMS students work hard to progress from one class level to another and to avoid failure. Some write examination resits along side running modules and signs of fatigue and complaints of sleeplessness come. What all these mean for the student's personal effort at academic achievement and especially their implications for sleep patterns need to be investigated immediately. As far as we are aware, no such study has been conducted for UCCSMS students.

There is therefore the need to find out the sleep pattern of medical students in the University of Cape Coast School Of Medical Sciences and to determine if students are sleep deprived and what effects this has on their studies, performance and wellbeing. The objective of the study was to determine self-reported sleep pattern of medical students in University of Cape Coast School of Medical Sciences (UCCSMS). This will help us know how to improve the medical school curriculum, and to do academic and personal counselling for students

To this end, the following research questions were posed to guide the study:

1. Are UCCSMS students sleep deprived?
2. Are there significant differences in the sleepiness scale scores among the current three levels of medical students in UCCSMS?
3. What are the effects of sleep deprivation on UCCSMS students?
4. What is the nature of sleep pattern during examination times?
5. What is the nature of students' coping strategies for sleep deprivation, among various class levels?
6. Are there significant differences in the amount of hours of sleep between the various levels of medical students?

Methodology

Participants

The total number of medical students as at the time of the study was one hundred and forty two (142), comprising fifty one (51) level 200, forty nine (49) level 300, and forty two (42) level 400 students. This comprised the accessible population for the study. Convenience sampling method was used during lecture break periods to recruit 125 students to participate in the study. The study and its purpose were described to prospective participants. Their verbal consent was obtained and questionnaires were given to all students who were present during the lecture break period and were willing to complete. Only one student failed to respond to the questionnaire items.

Instrument and Data Collection

A questionnaire made up of the Epworth Sleepiness Scale (Johns, 1991) and a self-administered questionnaire adopted from Nojomi, et al. (2009) was used to collect data for the study. Face validity for the self-administered questionnaire was established by two clinical psychologists and a counsellor from the University of Cape Coast. The Epworth Scale measured sleep or wake habits, self-perception of sleep satisfaction, use of sleep pills, causes of sleep deprivation and coping strategies used to overcome the effects of sleep deprivation.

Psychometric performance of the Epworth Sleepiness Scale (ESS) has not been evaluated in groups of workers. A study evaluated its use in a sample of 843 long-haul truckers. Interitem correlations and Cronbach's alpha were conducted. Correlation of the ESS with the sleep problems subscale of the Trucker Strain Monitor (TSM) was performed. Dimensionality was evaluated using factor analysis. Cronbach's alpha (.79) was strong. Interitem correlations were significant. A weak but significant correlation between the ESS and TSM sleep problems subscale was found to be r = .18 (Heaton, 2011).

The ESS has been used extensively as an indicator of sleepiness in clinical and research populations. The instrument has identified sleepiness in normal subjects (Baas, Charlton, & Bastin, 2000; Pilcher, Pury, & Muth, 2003; Powell, Schectman, Riley, Li, & Guilleminault, 2002).

The scores of the Epworth Sleepiness Scale are interpreted as follows

0 - 10: Normal range

11 - 12: Borderline

13 - 24: Abnormal

Data Analysis

Data were analysed using SPSS version 16.0 (SPSS Inc. Chicago. IL). Descriptive statistics (frequencies, mean, mode, and standard deviations) were used to present the

distribution of nominal data and to present numeric data; ANOVA was used to analyse other data at a significance level of $p< 0.05$.

Results

This section presents results of the data analysis.

To the research question: Are UCCSMS students sleep deprived?, Table 1 below summarises the results.

Table 1: Summary Table showing results on the Epworth Sleepiness Scale

	Frequency	**Percent**
Normal range	84	67.2
Borderline	19	15.2
Abnormal	22	17.6
Total	**125**	**100.0**

From Table 1 above, 84 students (67.2%) had scores within the normal range. 19 students (15.2%) had borderline scores, while 22 students (17.6%) had scores in the abnormal range.

Research question 2 asked if there were significant differences in the sleepiness scale scores among the current three levels of medical students in UCCSMS. It was analysed using means, standard deviations and one -way ANOVA and the result are shown in Tables 2 and 3 below.

Table 2: Descriptive statistics showing differences in sleepiness scale score of the three levels of students.

	N	**Mean**	**Std. Deviation**
Level 200	48	8.479	5.369
Level 300	46	6.587	3.778
Level 400	31	10.823	5.965
Total	125	8.364	5.235

Epworth Sleepiness Scale Scores

Table 2 shows that Level 200 medical students had a mean score of 8.5, the Level 300 students had a mean score of 6.6, and Level 400 students had a mean score of 10.8. Table 3

below is, however, a description of the differences between the three class levels by One Way ANOVA analysis.

Table 3: One Way ANOVA showing differences in sleepiness scale scores of the three levels of medical students.

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	333.282	2	166.641	6.634	.002
Within Groups	3064.406	122	25.118		
Total	3397.688	124			
Epworth Sleepiness Scale Scores		p< 0.05			

A one-way analysis of variance was conducted to analyze the differences between the Epworth Scale scores of the three class levels. There was a statistically significant difference at the p< 0.05 level between the class levels. Despite reaching statistical significance, the actual difference in the mean scores between the groups was average. The effect size calculated using eta squared was 0.09. Post- hoc comparison using the Turkey HSD test indicated that the mean score for level 200 (M= 8.4792, SD= 5.36) was significantly different from that of Level 400 (M = 10.8226, SD = 5.96). Level 200 (M = 8.4792, SD = 5.36) and Level 300 (M = 6.5870, SD = 3.77) did not differ significantly from each other. The actual mean scores of Levels 300 (M=10.8226, SD= 5.96) and 400 (M= 8.3640, SD = 5.23) also did not differ significantly.

To the question 3 "What do UCCSMS students feel are the effects of sleep deprivation in their medical student life?", Table 4 below summarises the results.

Table 4: Summary results of effects of sleep deprivation on lecture performance

	Frequency	Percentage
Difficulty concentrating in class	80	64.0
Feeling under pressure	6	4.8
Little or no effect	18	14.4
Others	17	13.6
Missing items	4	3.2
Total	**125**	**100.0**

From Table 4 above, 80 students (64%) responded that they had difficulty concentrating in class. 6 students (4.8%) said they felt under pressure. 18 students (14.4%) said sleep deprivation had little or no effect on them. 17 students (13.6%) gave different views about the

effect of sleep deprivation on their lecture performance which include lateness to lectures, boring lectures, sleeping in class and not having enough time to study. Four students (3.2%) did not respond.

Research question 5 asks what the nature of sleep pattern during examination times was. The results are shown in Table 5 below.

Table 5: Descriptive statistics showing sleep deprivation during examination.

	Frequency	**Percent**
Yes	109	87.2
No	16	12.8
Total	**125**	**100.0**

From the Table 5 above, 109 students (87.2%) indicated that they are sleep deprived during mid, end of module and end of semester examination, while 16 students (12.8%) indicated that they are not sleep deprived during examination times.

Research question 6 asked about the nature of students' coping strategies for sleep deprivation, among various class levels. Table 6 below summarizes the results.

Table 6: Coping strategies for sleep deprivation among students

Strategies	**Frequencies**	**Percent**
Taking rest	63	33.9
Exercise	21	11.3
Playing with friends	19	10.2
Others	83	44.6
Total	186	100.0

Students were asked to state various coping strategies used to overcome the effect of sleep deprivation. Sixty-three students (33.9%) gave taking rest as coping strategy, 21 students (11.3%) gave exercise as coping strategy, 19 students (10.2%) gave playing with friends as

their coping strategy, and 83 students (44.9%) gave other coping strategies such as chewing of gum, playing with mobile phones, taking coffee, missing lectures to rest, consuming energy drinks, listening to music, watching movie and prayers.

Finally, the seventh question asked if there was a significant difference between levels of students in the amount of hours of sleep. Table 7 below summarises the results.

Table 7: Descriptive Statistics Summary Table showing differences between levels of students in hours of sleep.

	N	**Mean**	**Std. Dev**
Level 200	48	6.095	.9534
Level 300	46	6.000	.8944
Level 400	31	5.371	1.016
Total	**125**	**5.880**	**.986**

Table 7 indicates that level 200 students had a mean of 6 hours of sleep per night. Level 300 students had 6 hours of sleep per night, while Level 400 students had 5 hours of sleep per night.

Table 8: One-Way ANOVA on Differences in Hours of Sleep between the Three Class Levels.

	Sum of Squares	**Df**	**Mean Square**	**F**	**Sig.**
Between Groups	10.931	2	5.465	6.078	.003
Within Groups	109.703	122	.899		
Total	**120.634**	**124**			

$p < 0.05$

Table 8 reports that a one- way analysis of variance was conducted to analyze differences between the hours of sleep of the three class levels. The students were divided into three groups according to their levels (Levels 200, 300 and 400). There was a statistically

significant difference at the $p< 0.05$ level in the hours of sleep scores for the students in the various levels {F (2, 122) = 6.078, p= 0.003}. Despite reaching statistical significance, the actual difference in mean scores between the levels was average. The effect size calculated using eta squared was .09. Post hoc comparisons using the Turkey HSD test indicated that the mean score for Level 200 (*M* = 6.0958, *SD*= .953) was significantly different from that of Level 400 (M= 5.3710, *SD*= 1.016). The mean score of Level 300 *(M* = 6.0, *SD*= .894) did not differ significantly from that of Level 200.

Table 9: Other Findings (Observations)

Statements	**Mode**	**Percentage**	**Modal class**
Causes of sleep deprivation	51	40.8	Sleeping late at night
How well you enjoy sleep when you exercise	72	57.6	Good sleep
Noise from my phone affects my sleep	78	62.4	Yes
Noise from my roommate affects my sleep	79	63.2	Yes
Worry about illness is associated with sleep deprivation	69	55.2	No
How often you go to bed than usual (per week)?	63	50.4	1 to 2 times
Duration of day time naps	37	29.6	60-120 minutes
How often you wake-up due to noise?	36	28.8	1-2 times
Specific effects of sleep deprivation	70	56.0	Tiredness

Table 9 reports other observations from the data collected. Fifty-one students (40.8%) reported that sleeping late at night is the cause of their sleep deprivation. With regard to what role exercise plays in sleep, seventy-two students (57.6%) indicated that it affords them good sleep. The effect of noise from phone on sleep saw 78 students (62.4%) responding that noise from their phones deprives them of good sleep. About the same number (79) of students (63.2%) similarly reported that noise from roommates' phones affect their sleep. Worry about illness,

however, is not associated with sleep deprivation for 69 students (55.2%). Even though noise affects sleep, only a few students (36) who make up 28.8% mentioned that they wake up from sleep one or two times due to noise. The number of times students go to bed more than usual is reported as one to two times per week by 63 students (50.4%). Only few students (37) who constitute 29.6%, had 60-120 minutes day time naps. Finally, 70 students (56%) reported that tiredness is a specific effect of sleep deprivation for them.

Discussions

The first research question asked if UCCSMS students were sleep deprived. Since the result showed that only 27.5% (n= 22) out of 100% (n= 125) of students reported that they were sleep deprived, we can conclude that only the minority were sleep deprived in UCCSMS. Nineteen (19) students had borderline score, meaning they are either uncertain about being sleep deprived or not sleep deprived or they are moving from normal sleep condition toward abnormal but have, at the time of the study, arrived at the threshold. It could mean that they could easily move into an abnormal sleep condition. Adding the borderline and the abnormal groups of students (22 + 19 = 41), however, still makes the students who reported having normal sleep patterns far more than those who were sleep deprived or becoming sleep deprived. Since the Epworth Sleepiness Scale instrument had accurately identified sleepiness in normal subjects (Baas, Charlton, & Bastin, 2000; Pilcher, Pury, & Muth, 2003; Powell, Schectman, Riley, Li, & Guilleminault, 2002), we can say that it was able to identify correctly the sleepiness condition in UCCSMS medical students. It could be concluded that the verbal complaints of some UCCSMS students that they were sleep deprived did not reflect the sleepiness condition of the majority of UCCSMS students. Probably, the majority of students was sleep deprived during a particular season of the academic year.

Research question two asked if there were significant differences in the sleepiness scale score among the three levels of medical students in UCCSMS. The result indicated that there was a statistically significant difference at the $p < 0.05$ level between the class levels,

specifically between the scores of Level 200 and 400. The reason there was a statistically significant difference between levels 200 and 400 students was difficult to explain since our research was not a qualitative one. The scores could only tell that the Level 400s were more sleep deprived than the Level 200s and even the Level 300s. We could also assume that since the current level 400 students are experiencing clinical rotations for the first time, they might report severe sleep deprivation compared with the Level 300 and/or 200 students who are learning the basic medical sciences and needed to do more theoretical learning than practical skills learning in a clinical setting.

Browne, et al., (1994) reported a different finding in which sleep deprivation led to subjective feelings of increased fatigue and decreased motivation among medical students who had to study and retain newly learned material than residents doing clinical rotations in surgical services. Level 200 students in UCCSMS who participated in this study were in their first year of medical school studies. It was likely that unfamiliarity with the curriculum, lecturers style of teaching, lack of adjustment to demands of medical education, and fear of taking mid module, end of module and end of year examinations, might lead to working hard to avoid failure and thus resulted in sleeplessness. The level 400 students who participated in this study had already had three years of exposure to medical school demands and so are expected to have adjusted somehow, and could have controlled their sleep patterns.

The lack of significant difference between levels 200 and 300 students in sleep deprivation could be attributable to their being in the same cycle I of the medical school curriculum, which is mainly devoted to teaching the basic medical sciences. Cycle II of the curriculum are the clinical years and they emphasise the clinical sciences and general clinical rotations. Level 400 is the beginning (phase I) of curriculum cycle II. Because this phase is quite new, it might be a bit scary and anxiety provoking for students in Level 400. Both Levels 200 and 400 are breaking new grounds. Fear and anxiety associated with the unknown could lead to sleep problems. Future research can compare sleep deprivation between Levels 300 and

500 students. Their stages in the medical curriculum appear relatively stable compared to Levels 200 and 400 who are both beginners of phases I and II of the medical curriculum.

Research question three sought to find out what UCCSMS students felt were the effects of sleep deprivation on their medical student life. Difficulty concentrating in class as reported by 80 students (64%) was indicated as major effect. Nojomi, et al., (2009) found similar effect. They found out, too, that pre-internship groups had difficulty in getting up early, while 50.3% (n= 181) of the subjects they studied reported attention deficit during the day time. Attention deficit and difficulty concentrating are similar cognitive effects of sleep deprivation. These all deal with school academic studies.

Sleep deprivation had little or no effect on 18 students (14.4%). This was ambiguous since we did not know whether those who gave this response were those who reported having sleep deprivation or those who reported they were not sleep deprived. In an article entitled "Sleep deprivation damages student concentration," Fay (2010) indicated that students who managed to stay awake and listened to the teacher while drowsy did not comprehend much of the information being taught. In a similar article, Owen (2004) mentioned one consequence of sleep deprivation as lack of focus and concentration. She explained how the brain loses function as a result of sleep deprivation; that students in particular fit into this category as learning requires intense concentration. She mentioned studies that found that from the age of puberty, the need for sleep increases until adulthood. UCCSMS students in this study were aged past puberty and therefore any activities that frustrated the satisfaction of their need for sleep would likely result in concentration difficulties. Sleep deprivation had a definite effect on learning, memory, and the ability to think clearly. It is noteworthy that 70 students (69%) specifically mentioned tiredness as specific effect of sleep deprivation on them (Table 9).

Research question four sought to find out the nature of sleep pattern during examination times. One hundred and nine (109) students representing 87.2% indicated that they were sleep deprived during mid, end of module and end of semester examination, while 16 students

(12.8%) indicated that they were not sleep deprived during examination times. What this means is that if 84 students (67.2%) noted that they were not sleep deprived (had normal sleep) but 109 (87.2%) noted that they were sleep deprived during examinations, then it could be concluded that majority of the student respondents associated sleep deprivation mostly to examination periods. Examination periods could be moments of distress for many students in this study. It was possible that students used other periods that were not examination times to have some good sleep. This could be true because in UCCSMS, many examinations are taken throughout the year. Examinations are taken at least twice for a module (one mid module examination and one end of module examination). Five or six modules are run in a semester. This will make twelve examinations in just one semester. If two modules are running concurrently, then module examinations also run toe to heel. This can be stressful and can deprive students of adequate sleep.

Research question five sought to explore the nature of students' coping strategies for sleep deprivation, among various class levels. As the results revealed, 63 students took rest as coping strategy, 21 students exercised as coping strategy, 19 students gave playing with friends as their coping strategy, and 83 students gave other coping strategies such as chewing of gum, playing with mobile phones, taking coffee, missing lectures to rest, consuming energy drinks, listening to music, watching movie and prayers. About half of the respondents indicated that they take rest to cope. The respondents did not clarify what they meant by taking rest. But if this rest meant sleeping and is different from the other coping strategies, it was understandable why UCCSMS students missed classes during examination periods, and frequently asked lecturers to end or forgo lectures to enable them have some sleep (these came up in informal discussion with some students). Some missed lectures to rest. This points to previous findings that indicated that beyond puberty to adulthood, need for sleep increases (Owen, 2004).

Finally, research question six sought to find out if there was a significant difference between levels of students in the amount of hours of sleep. The result showed that there was a

statistically significant difference at the $p< 0.05$ level in the hours of sleep scores for the students in the various levels. The Post hoc comparisons using the Turkey HSD test indicated that the mean score for Level 200 was significantly different from Level 400. Level 300 did not differ significantly from Level 200 or 400.

Comparing these results with that of research question two, a similar trend was observed. Levels 200 and 400 had statistically significant differences in hours of sleep compared with the difference between levels 200 and 300 which was not significant. The research found that the Levels 200 students had more hours (6 hours) than the Level 400 students (5 hours) of sleep. Level 200 students in UCCSMS were in their first year of medical school studies when they participated in the study. It was likely that unfamiliarity with the curriculum, lecturers' style of teaching, lack of adjustment to demands of medical education, and fear of taking mid module, end of module and end of year examinations, might lead to working hard to avoid failure and thus resulted in some sleeplessness. The level 400 students had already had three years of exposure to medical school demands and were expected to have adjusted somehow and enjoyed longer sleep hours. But Cycle II of the curriculum are the clinical years and they emphasized the clinical sciences and clinical rotations. This additional demand of the curriculum can reduce sleep hours of Level 400 students.

The lack of significant difference between levels 200 and 300 students in sleep deprivation could be attributable to their being in the same cycle 1 of the medical school curriculum, which is mainly devoted to teaching the basic medical sciences.

Discussion of Other Findings

From Table 9 above, other findings can be observed. Fifty-one students (40.8%) noted that sleeping late at night caused sleep deprivation. In addition to this 72 students (62.4%) said noise from phone affected their sleep and a similar number of students 79 (63.2) said noise from roommates affected their sleep. As many as 63 students (50.4%) often went to bed late than usual 2 times per week. All these facts about UCCSMS students pointed to the

inevitability of sleep deprivation that could possibly affect their concentration and studies. Sixty nine students (55.2%) indicated that worry about sickness was not associated with sleep deprivation. Good sleep was also associated with exercise as showed by the responses of 72 students (57.6%).

In expressing their opinion about what could be introduced into their programme to improve the negative effect of sleep deprivation, 51 students (40.8%) suggested short breaks, changes in lecture styles, more practical sessions, increase in the number of vacation days, introduction of lecture free days, provision of academic counsellors, provision of rest room at the hospital and improvement in transportation system. Unimportant though these opinions might seem, it is useful to consider students suggestion of providing academic counsellors.

Conclusion

In conclusion our data demonstrated that sleep deprivation was not a problem for the majority of UCCSMS students. We concluded that only the minority were sleep deprived in UCCSMS. However, during examinations, which are a frequent phenomenon in medical education, students experienced sleep deprivation. The differences among the three levels of students (Levels 200, 300, 400) in sleep deprivation were statistically significant, the difference being very significant between Levels 200 and 400 than it was between Levels 200 and 300 or Levels 300 and 400. The reason for the differences, even though not explicitly captured in this quantitative research, were possibly attributable to the freshness of the level 200s to the medical curriculum and education and the possible adjustment of the level 300s to the medical curriculum and education, while the Level 400s experienced little sleep hours because in addition to attending regular clinical sciences lectures and their various examinations, students must do clinical rotations and be examined practically as well in an examination called Objective Structured Clinical Examination (OSCE).

In terms of hours of sleep, Levels 200 and 400 students had statistically significant differences in hours of sleep compared with the difference between Levels 200 and 300

students which was not significant. The average of 5 hours of sleep experienced by Level 400 students and average of 6 hours of sleep reported by Level 200 and 300 students were below the reported hours of sleep that is adequate for adults for their normal mental and bodily functioning. Yet, the majority reported they were only sleep deprived and experienced negative consequences only during times of various examinations. Despite this amount of inadequate quantity of sleep UCCSMS students have at this time of their training, they did not experience physical symptoms of sleep deprivation.

Counselling services, probably academic and personal counselling, should be introduced among these medical students. Qualitative research strategy and approach should be considered in future researches, to discover the reasons or motives behind students' responses. The findings also have educational implications, both for teaching and learning. Medical school curriculum and teaching methodology should take into account students' sleep needs. Loaded curricula will leave students little time to sleep and rest. Medical students' study habits should be revised and students should be made to benefit from the study clinic of the University Counselling Centre.

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