

# Excessive daytime sleepiness, nocturnal sleep duration and psychopathology among Nigerian university students

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*Background and objectives.* Short nocturnal sleep duration resulting in sleep debt may be a cause of excessive daytime sleepiness (EDS). Severity of depression (psychopathology) has been found to be directly related to EDS. There is an association between sleep duration and mental health, so there may therefore be an interrelationship between sleep duration, EDS and psychopathology. The objectives of this study were to determine the prevalence rates of EDS and general psychopathology among university students in Nigeria; determine the range of and mean sleep duration in the students; and determine the extent to which sleep duration and EDS predict general psychopathology in the same group of subjects.

*Materials and methods.* Eight hundred and forty-five students at Obafemi Awolowo University, Ile-Ife, Nigeria, were recruited for the study. The subjects were required to provide information on their age, gender and the total amount of sleep per night they usually had. General psychopathology was assessed using the English language version of the 30-item General Health Questionnaire (GHQ-30). They were also evaluated for EDS using the English language version of the Epworth Sleepiness Scale (ESS).

*Results.* Six hundred and thirty-four subjects (75.03% of the participants) provided complete data. The prevalence of EDS was 11.2% and the rate of general psychopathology in the subjects 13.1%. The range of sleep duration was 2 - 9 hours with a mean of 5.1 hours (standard deviation 1.3). On a regression model with the GHQ score as the dependent variable and sleep duration and ESS as the independent variables, the correlation coefficient between EDS, sleep duration and psychopathology (R) was 0.47.

*Conclusion.* EDS and psychopathology are common in the student population studied. Nocturnal sleep duration for an average student is far less than that for an average adult. Nocturnal sleep duration and EDS acted as moderate predictors of general psychopathology among Nigerian university students.

The average adult human sleeps for about 8 of every 24 hours.<sup>1</sup> Most of our sleep occurs at night, since we function predominantly during the day and it is necessary to be awake and alert. Under certain conditions, humans are unable to maintain the state of wakefulness needed for daytime functioning. Excessive daytime sleepiness (EDS) manifests with increased sleepiness in situations in which the individual would reasonably be expected to be awake and alert.

Common causes of EDS include sleep deprivation,<sup>2</sup> obstructive sleep apnoea, narcolepsy, idiopathic hypersomnia and sedative/hypnotic drugs.<sup>3</sup> Obstructive sleep apnoea is characterised by snoring and episodes of apnoeic attacks during sleep. Narcolepsy is characterised by excessive daytime sleepiness, cataplexy (sudden decrease or loss of muscle tone often precipitated by intense emotion), sleep paralysis and hypnagogic (sleep-onset) hallucinations. The features of idiopathic hypersomnia include chronic sleepiness without cataplexy or other features of narcolepsy.

Short total nocturnal hours of sleep and depression are among the known risk factors for daytime sleepiness.<sup>4</sup> Total sleep time has an inverse relationship with excessive daytime sleepiness.<sup>4</sup> On the other hand, the severity of depression (psychopathology) has been found to be directly related to EDS.<sup>5-8</sup>

Many factors account for total nocturnal sleep duration. It has been found that older age, depression, coffee intake, especially at night, and excessive Internet use at night are significantly associated with short nocturnal sleep duration.<sup>9</sup> Short nocturnal sleep duration has been found to reduce cognitive and behavioural functioning<sup>10</sup> and to be associated with poor health status.<sup>11</sup> Short sleep duration also increases the risk of motor vehicle accidents.<sup>12</sup> It would therefore appear that both daytime sleepiness and sleep duration are important variables contributing to neurocognitive and behavioural functioning, health status (including mental health), and public safety risks.

Information on the possible relationship between excessive daytime sleepiness, sleep duration and general psychopathology in Nigeria is generally inadequate. The present study aimed to provide information in this regard, with respect to university students. The study aimed to determine the extent to which nocturnal sleep duration and EDS act as predictors of general psychopathology among Nigerian university students, the prevalence rates of EDS and general psychopathology, and the range of and mean nocturnal sleep duration in the study subjects.

## Materials and methods

### Study setting and ethical considerations

The proposal for this study was approved by the Ethics and Research Committee of the Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Nigeria. The participants were undergraduates of Obafemi Awolowo University, Ile-Ife. Written informed consent was obtained from all who took part in the study. It was a cross-sectional study.

### Sampling

A total of 845 students were recruited into the study. Obafemi Awolowo University has 13 faculties and a student population of about 25 000. Sixty-five students were recruited from each faculty through a multi-stage, stratified sampling technique, aiming for a total of 845 students.

### Instruments

The General Health Questionnaire is a widely used screening instrument. It detects a wide range of psychological disorders and therefore gives a measure of current mental health. It was developed by Goldberg as a screening instrument to identify psychological distress in primary care settings<sup>13</sup> and has been extensively used and shown to be a valid and reliable instrument across cultures.<sup>14-21</sup> The questionnaire was initially developed as a 60-item instrument but there are a wide range of shortened versions including the GHQ-30, the GHQ-28, the GHQ-20 and the GHQ-12. The scale asks whether the subject has experienced a particular symptom recently. Each item is rated on a 4-point scale (less than usual, no more than usual, rather more than usual, or much more than usual). The common scoring methods are bimodal (0-0-1-1) and Likert scoring styles (0-1-2-3). Depending on the scoring method used, the 30-item version therefore gives a score range of 0 - 30 or 0 - 90, with higher scores indicating greater psychopathology. When the 0-0-1-1 scoring system is used, the cut-off point for identifying 'cases' for the GHQ-30 is a score of  $\geq 5$ . With the Likert scoring system a score in the range of 0 - 24 indicates that the individual is generally free from psychological disturbance. In the present study, in addition to using the bimodal system for case identification, the Likert scoring system was also used since it gives a preferred distribution for regression analysis.

The Epworth Sleepiness Scale (ESS) was developed by Murray Johns in Australia.<sup>22</sup> So called because it was developed at the Epworth Hospital in Melbourne, it is a well-validated, 8-item sleep questionnaire. It is a subjective sleepiness scale in which subjects are asked to score the likelihood of falling asleep in eight different situations. The range of scores on the ESS is 0 - 24, with higher scores indicating greater chances or likelihood of sleepiness. A score of 10 but less than 18 is considered sleepy, while a score of 18 or more is considered very sleepy. In the present study, EDS was defined as ESS score  $\geq 10$ .

### Procedure

The subjects were required to provide information on their age, gender and the usual total amount of sleep they had per night.

General psychopathology was assessed using the English language version of the GHQ-30, while the English language version of the ESS was used to evaluate EDS.

### Statistical analysis

The data were analysed using the Statistical Packages for the Social Sciences, version 16 (SPSS 16.0). Regression analysis was done with GHQ-30 scores as the dependent variable. The independent variables were sleep duration and ESS score.

### Results

Of the 845 subjects who participated in the study, 634 (75.03%) provided complete data. The rest were excluded from the analysis. The 634 subjects comprised 397 males (62.6%) and 237 females (37.4%). The group had an age range of 17 - 31 years with a mean of 22.1 years (standard deviation (SD) 3.4). The range of scores on the ESS was 3 - 17 with a mean of 9.8 (SD 3.2), while the range for sleep duration was 2 - 9 hours with a mean of 5.1 hours (SD 1.3). The mean score on the GHQ-30 using the Likert scoring system was 19.9 (SD 6.6) with a range of 6 - 38. With the bimodal system, the range of scores was 3 - 13 and the mean was 6.4 (SD 2.1). These results are set out in Table I.

**Table I. Age, ESS score, sleep duration and GHQ-30**

Variable	Range	Mean	SD
Age (yrs)	17 - 31	22.1	3.4
ESS score	3 - 17	9.8	3.2
Sleep duration (h)	2 - 9	5.1	1.3
GHQ-30 Likert	6 - 38	19.9	6.6
GHQ-30 bimodal	3 - 13	6.4	2.1

Forty-three of the 397 males (10.8%) and 28 of the 237 females (11.8%) had EDS, defined as ESS score of  $\geq 10$  ( $\chi^2=0.062$ ,  $df=1$ ,  $p=0.8$ ). A total of 71 out of the 634 subjects (11.2%) therefore had EDS. Fifty-one of the 397 males (12.8%) and 32 of the 237 females (13.5%) had psychopathology, defined as a GHQ-30 score  $\geq 5$  using the bimodal scoring system ( $\chi^2=0.013$ ,  $df=1$ ,  $p=0.9$ ). A total of 83 out of the 634 subjects (13.1%) were therefore identified as cases.

Using a regression model with the GHQ score as the dependent variable and sleep duration and ESS as the independent variables, the correlation coefficients were as follows: the correlation between EDS and psychopathology ( $r_1$ ) was 0.41 ( $p=0.000$ ), that between sleep duration and psychopathology ( $r_2$ ) was -0.36 ( $p=0.00$ ), and that between EDS and sleep duration ( $r_3$ ) was -0.37 ( $p=0.000$ ). These showed that EDS had a moderate, significant direct relationship with psychopathology; sleep duration had a moderate, significant inverse relationship with psychopathology; and EDS had a moderate, significant inverse relationship with sleep duration. The correlation between EDS, sleep duration and psychopathology ( $R$ ) was 0.47 ( $p=0.000$ ) and  $R^2$  was 0.22, showing that EDS and sleep duration accounted for 22% of the variance of psychopathology by

virtue of their linear relationship. Nocturnal sleep duration and EDS therefore acted as moderate predictors of general psychopathology among Nigerian university students. The results of the regression analysis are shown in Table II.

**Table II. Regression analysis with psychopathology as dependent variable and ESS and sleep duration as independent variables**

Variable	Value
Correlation	
r1	0.41
r2	-0.36
r3	-0.37
Significance (r1, r2, r3)	0.000
Model summary	
R	0.47
R <sup>2</sup>	0.22
Adjusted R <sup>2</sup>	0.22
ANOVA	
df	2,631
F	88.32
Significance	0.000

The correlation coefficient between EDS and psychopathology is denoted by r1, that between sleep duration and psychopathology by r2, and that between EDS and sleep duration by r3. The correlation coefficient between EDS, sleep duration and psychopathology is R.

## Discussion

Many university students are adolescents and young adults, and due to the demands of the academic environment may be involved in late-night study and use of the Internet. They are likely to consume stimulants such as caffeine in order to stay awake and alert at night, a practice found to be common among adolescents.<sup>23</sup> Their sleep patterns are therefore likely to differ from those of non-students of the same age.<sup>6</sup> It is therefore not surprising that the mean sleep duration for our subjects was 5.1 hours (SD=1.3), with a range of 2 - 9 hours. However, the present study did not focus on drug use, or aim to determine the causes of short nocturnal sleep duration.

EDS is common, and said to be one of the common complaints of patients seen in sleep clinics.<sup>24</sup> Its prevalence varies with the study population and operational definition. It is therefore difficult to compare the results of different studies. Prevalence rates of 12 - 20% have been reported in population-based studies.<sup>24,25</sup> However, prevalence rates of 25.4%<sup>26</sup> and 33.3 - 39.2%<sup>27</sup> have been reported in schoolchildren. It has also been found that children whose school day started at 07:10 complained significantly more about daytime sleepiness compared with those who started later.<sup>28</sup> The prevalence of 11.2% reported in this study is consistent with previous findings in population-based studies. In a recent study, 44.8% of depressed patients had EDS, defined as ESS score of equal to or greater than 10.<sup>8</sup>

Using the 12-item version of the GHQ, Nur *et al.* found 27.8% of medical students to be suffering from an emotional disorder,<sup>29</sup> while

Radovanovic *et al.*<sup>30</sup> identified 14.1% of medical students as cases using the 60-item version. The 13.1% prevalence rate found in the present study is probably a fair representation of the situation in a student population, because the two studies cited<sup>29,30</sup> focused on medical students, who are likely to have a higher workload than most other students. Students with a heavy workload are more prone to psychopathology than those who have fewer academic demands.

Reduced sleep at night is a known risk factor for EDS.<sup>25,31</sup> Subjects suffering from EDS may exhibit psychosocial distress.<sup>24</sup> Psychopathology has been reported to be common among university students,<sup>32,33</sup> though these were specific cases of depression. A previous study has found an association between sleep duration and mental health.<sup>23</sup> In the present study, an inverse relationship was found between sleep duration and psychopathology, and a direct one was found between psychopathology and EDS.

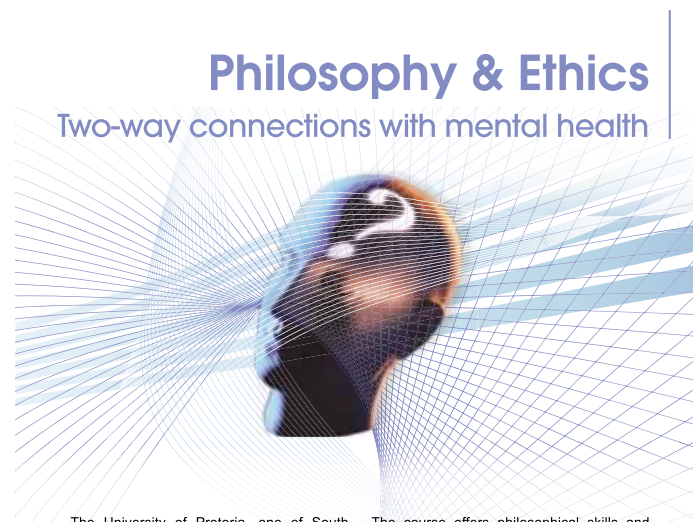
The present study found an interrelationship between sleep duration at night, EDS and general psychopathology. Although causation may not be easy to establish in this relationship, it is clear that EDS may result from short nocturnal sleep duration due to any cause such as insomnia or sleep deprivation, as well as from psychopathology. This study did not consider possible causes of EDS, psychopathology or short sleep duration, but it is considered that the sleep habits of the students must have been influenced by their academic commitments.

EDS is very disruptive to the lives of individuals, and so is psychopathology – both impair social and occupational functions. Insomnia and short nocturnal sleep duration are regular accompaniments of psychopathology. The triad of EDS, short nocturnal sleep duration and psychopathology must necessarily impact adversely on the lives and academic performance of those who suffer from them. If a student (or indeed any person) is found to be suffering from one of them, it would be beneficial to enquire about the others. Further studies are necessary to establish the exact nature of the predominant relationship between these three variables in student populations. On an individual basis it is sometimes possible to determine when one factor results from another (for example when psychopathology is the cause of insomnia, or when EDS results from sleep deprivation). Appropriate measures are advocated in such cases.

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