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Assessment of the Effects of Sleep Hours and Academic Performance on Psychological Distress in University Students

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Authors' contributions

This work was carried out in collaboration between both authors. Author VM designed the study, wrote the manuscript, collect and performed the statistical analysis of the data. Author GA managed the analyses of the study, literature searches and reviewed the manuscript. Both authors read and approved the final manuscript.

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ABSTRACT

Like in other parts of the world, the extent of psychological distress among young adults in the Nigerian universities is worrisome with over 31.9% likely to have a severe mental disorder. It is a fact that a number of factors contribute to the problem. This article presents the results of a study designed to investigate the effects of sleep hours and academic performance on psychological distress among University students. The correlational research design was used and three hundred and eighty-five students (385 [male=200 and female= 185]) participated in the study. The data collected through questionnaire was analyzed using one-way analyses of variance at p<.05. The analysis was done using JMP version. 13.2. The results revealed significant effects of sleep hours on the psychological distress F (3,381) = 17.750, p<.001, with students sleeping an average of ≤ 4 hrs reporting significant distress level, t = 6.16, p<.001. Academic performance was found to predict psychological distress F (3,381) 381 = 6.864, p<.001, with performance below average predicting psychological distress positively, t = 4.09, p<.001. The study concludes that poor sleep quantity and academic performance below average may significantly predict psychological distress among the study sample. The outcome of this study, therefore, provides psychologists,

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counsellors and educationist with the necessary information required to enable the development of an intervention that can help to encourage good sleep habit and improved academic performance to reduce psychological distress.

Keywords: Academic performance; psychological distress; sleep hours; undergraduate students.

1. INTRODUCTION

Entrance into a university or other tertiary education institutions is a joyous time; it can as well be a stressful life event for some students [1]. First-year students are particularly at-risk as they face a number of new stressors during the transitional period of starting a new life in university or college [2]. Just as all young adults, undergraduate students need to cope not only with psychological and psychosocial changes that are connected with the development of an autonomous personal life but also with the academic and social demands that they encounter in university studies in their preparation for professional careers. Therefore, the period of undergraduate education is a sensitive period in an individual's life span. This period is regarded by many as important for developing systems and intervention methods that may prevent or reduce mental problems [3]. Evidence that suggests that university students are vulnerable to mental-health problems has generated increased public concern in many societies [4]. Previous studies suggest high rates of psychological morbidity, especially depression and anxiety among university students all over the world [2,5,6,7]. Edwards and Holden [8] found that among college students, seeking counselling services, psychological distress of anxiety and depression was ranked first and third as presenting problems, respectively.

Psychological distress is a state of emotional suffering characterized by symptoms of depression (e.g., lost interest; sadness; hopelessness) and anxiety (e.g., restlessness; feeling tense) [9]. It is an emotional disturbance that may affect the social functioning and day-to-day living of individuals [10]. Proponents of the stress-distress models posit that the defining features of psychological distress are the exposure to a stressful event that threatens the physical or mental health, the inability to cope effectively with this stressor and the emotional turmoil that results from this ineffective coping [11,12]. They argue that psychological distress vanishes when the stressor disappears or when an individual comes to cope effectively with this stressor [12].

Among university students, inadequate sleep is a pervasive problem for many and may have serious consequences on health and affect overall well-being. In one study, Victor and Abdulwahid [13] found that over 87% of undergraduate students in a Nigerian university reported not having adequate sleep at night and of this number, 29% majorly students within age range 23-38 reported below average academic performance. Aside academic performance, lack of sleep may additionally exacerbate psychiatric concerns, such as symptoms of psychological distress [14,15]. In fact, a change in sleep pattern is a key identifier of many mood disorders. Research has shown that around 90% of adults with symptoms of psychological distress complain of impaired sleep, and it is the second most frequently reported consequence. Research has also revealed that individuals who report severe psychological distress is more likely to have sleep problems than an individual are with mild distress [16]. Of note, the relationship between sleep quantity and psychological distress appears to be bidirectional, as psychological distress results in disturbed sleep and sleep loss escalate the severity of psychological distress.

A previous study by Trockel, Barnes, and Egget [17] to evaluate health-related variables on academic performance found that sleep had the largest effect on semester GPA compared to the other health-related variables such as exercise, nutrition intake, mental health, and stress and time management. There was a significant relationship between sleep habits and higher GPA. Long sleepers (sleep 9 or more hours a day) were found to achieve higher GPAs than short sleepers (sleep 6 or fewer hours a day) [18].

In summarizing studies of the relationship between children's emotional distress and achievement behavior, researchers found that students with frequent feelings of internalized distress (e.g., sadness, anxiety, depression) show diminished academic functioning and those with externalized distress (e.g., anger, frustration, and fear) exhibit school difficulties, including learning delays and poor achievement [19].

Research on the relationship between emotional dispositions and academic performance among middle school students provides support for the conclusion that emotional regulation significantly contributes to grade-point averages of students, over and above the contribution made by cognition-related abilities [20].

Adolescents with depression are at increased risk of impairment in school and educational attainment [21]. Longitudinal research employing the California Healthy Kids Survey indicated that increasing sadness or hopelessness among students was related to subsequent declines in gains in test scores in reading, language, and mathematics [22].

Therefore, since students are at the core of learning process, a study tailored to their sleep pattern, mental health and academic performance is imperative as students themselves play central roles in advancing their own learning and acquiring enhanced academic achievement. It is on this basis that the study was undertaken to assess students' sleep hours, and academic performance and to determine the extent they influence psychological distress. Another focus was to establish ideal sleep hours among the students to help improve their studies and distress.

2. METHODOLOGY

2.1 Design

The study used a correlation research design. The correlation research design was used to determine the relationship between two or more variables and to explore their implications for cause and effect.

2.2 Participants

The study participants were three hundred and eighty-five undergraduate students of Ahmadu Bello University, Zaria, Nigeria, who voluntarily participated by filling questionnaires given to them. Of this number, 51.9% were males, while 48.1% were females. No significant difference in the number of male and female participants, χ^2 (1) = .584, p = 0.444. There is a significant difference in the number of respondents based on age range, χ^2 (3) = 117.327, p<.001 as the majority of the study participants (77%) were those from the age range 18–27. Participants from age range 28–38 constituted 23% of the respondents. Table 1, shows the gender and age characteristics of the respondents.

2.3 Outcome Measure

The study used the Kessler Psychological Distress Scale (K10) [23,24] to measure psychological distress. The K10 scale involves 10 questions about emotional states, each with a five-level response scale. The measure can be used as a brief screen to identify levels of distress. The tool can be given to patients to complete. Each item is scored from one 'none of the time' to five 'all of the time.' Scores of the 10 items are then summed, yielding a minimum score of 10 and a maximum score of 50. Low scores indicate low levels of psychological distress, and high scores indicate high levels of psychological distress [25]. Reliability tests done on the K10 by Grande, Taylor and Wilson [26] showed the values of the kappa and weighted kappa scores ranged from 0.42 to 0.74, which indicates that K10 is a moderately reliable instrument. In the present study, reliability analysis conducted on the k10, which was administered to fifty Nigerian university students yielded a Cronbach α value of 0.753.

Item 4 on the Pittsburgh Sleep Quality Index (PSQI) was used to assess student's sleep hours. It reads; how many hours of actual sleep do you get at night? (This may be different from the number of hours you spend in bed)? PSQI has an overall reported Cronbach α = 0.83 [27].

To determine student's Academic Performance, the researcher used the student's current GPA. In the Nigerian higher-education system, student's GPA grades are categorized into four.

4.50 – 5.00
3.50 – 4.49
2.50 – 3.49
1.50 – 2.49

The respondents were required to honestly, tick a single option that represents their present GPA status. Responses were interpreted as thus; 4.50–5.00 = excellent, I am probably one of the very best, 3.50–4.49 = above average, 2.50–3.49 = average, 1.50–2.49 = below average.

2.4 Data Collection

The instruments were administered to the subjects at the university campus with a majority

Table 1. Descriptive analysis of respondent's demography

Gender	Frequency	Percent	χ^2	p
Male	200	51.9	.584	.444
Female	185	48.1		
Total	385	100.0		
Age range				
18-22	164	42.60	117.327	.000
23-27	131	34.03		
28-32	56	14.54		
33-38	34	8.83		
Total	385	100.0		

of the respondents residing in the hostels. Two research assistants assisted the investigator in the administration and collection of the instruments. Overall, data collection lasted for three days. All the three hundred and eighty-five questionnaires distributed were properly filled in, returned and considered useful for research purpose.

2.5 Data Analysis

The data were analyzed using descriptive statistics and one-way analysis of variance on JMP ver. 13.2. A standard P value < 0.05 was considered statistically significant. Firstly, a bivariate correlation analysis for the study variables was done to examine how the dependent and independent variables interact. The result showed a significant negative relationship between academic performance and psychological distress, r = -.194, p<.001; and between sleep hours and psychological distress, r = -.284, p<.001. The relationship between sleep hours and academic performance was positive, but not significant in the study sample (see Table 2).

3. RESULTS

Fig. 1 showed the frequency and percentage response to sleep hours, academic performance and psychological distress. It showed that 60 students representing 16% of the respondents reported an average sleep < 4 hrs. About 25% reported average sleep between 4-6 hrs, 43% reported sleep between 7-9 hrs while 16% of the respondents reported sleep average above 10 hrs. Concerning academic performance, 30% reported performance below average, 48% reported average performance, 17%, above average, while only 5% reported excellent performance. Analysis of participants' psychological distress showed that 32% reported the likelihood of having the severe mental disorder, 27% reported moderate mental disorder, and 19% reported mild mental disorder, while 22% were likely to be well.

Result in Table 4 showed there is a significant effect of sleep hours on psychological distress in university students, F (3,381) = 17.7501, p <.001, R^2 = 0.123, RMSE = 6.889. Respondents sleeping <4 hrs (32.400±0.889, 95% CI = 30.651-34.149) reported significant psychological distress, t = 6.16, p <.001. Expanded parameter estimate (see Table 5), showed that as sleep < 4hrs increases by a standard deviation, psychological distress will increase by 4.537 (95%CI = 3.089-5.985).

Conversely, sleeping an average of 7-9 hrs (24.934±0.533; 95% CI = 23.886-25.982) significantly reduces the distress level, t = -5.45, p < .001. Parameter estimate showed that as sleep 7-9 hrs increases by a standard deviation, psychological distress reduces by -2.929 (95% CI = -3.986- -1.872). Comparative analysis using Tukey-Kramer HSD ordered differences report of psychological distress by sleep hours (see Table 7), showed that a significant difference in psychological distress exists between sleeping <4 hrs and 7-9 hrs (7.466±1.037; 95% CI =4.790-10.141), p<.001. Also, between <4 hrs and 10+ hrs (5.967±1.258; 95% CI = 2.721-9.212,), p<.001, < 4hrs and 4-6 hrs (4.716±1.129; 95% CI = 1.802-7.630), p< .001, and 4-6 hrs and 7-9 hrs (2.749±0.877; 95% CI = 0.488-5.011, p = .009). Generally, therefore, sleeping < 4 hrs or 4-6 hrs may not favour student's psychological wellbeing as sleeping 7-9hrs does.

There is a significant effect of academic performance on psychological distress in university students, F (3,381) = 6.8639, p< .001, R^2 = 0.051, RMSE = 7.163 (see Table 9). Respondents with academic performance below average (29.522±0.668; 95%CI = 28.208-30.835)

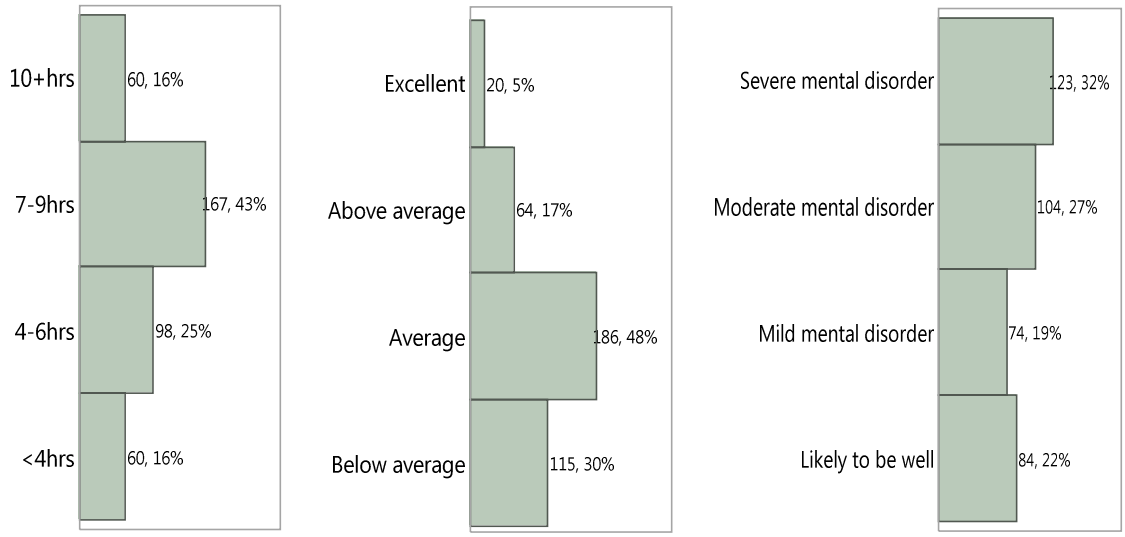

Fig. 1. Frequency and percentage response to sleep hours, academic performance and psychological distress

reported significant psychological distress, t = 4.09, p<.001. Expanded parameter estimate as showed in Table 10, indicated that as academic performance below average increases by 1 standard deviation, psychological distress increases by 2.829 (95% CI = 1.469-4.189). Average academic performance (26.220±0.525; 95% CI = 25.188-27.253), above average (25.328±0.895, 95% CI = 23.568-27.089), and excellent performance (25.700±1.602; 95% CI = 22.551-28.849) do not significantly predict psychological distress. Tukey-Kramer HSD ordered differences report of psychological distress by academic performance showed that there is a significant difference in psychological distress between below average performance and above average (4.194±1.117; 95% CI = 1.997-6.390), p<.001, below average and excellent (3.823±1.735; 95% CI = 0.409-7.234), p = 0.028, and below average and average (3.301±0.850; 95% CI = 1.630-4.972), p < .001 (see Table 12). Generally, therefore, academic performance below average may strongly predict distress in students.

Table 2. Correlation among study variables of sleep hours, academic performance, and psychological distress

Variable	Academic performance	Psychological Distress	Sleep hours
Academic performance	1		
Psychological Distress	-.194**	1	
	.000		
Sleep hours	.012	-.284**	1
	.816	.000	

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

Table 3. Means for one-way analysis of variance (ANOVA) of sleep hours and psychological distress

Level	Number	Mean	Std error	Lower 95%	Upper 95%
<4hrs	60	32.400	0.889	30.651	34.149
4-6hrs	98	27.684	0.696	26.315	29.052
7-9hrs	167	24.934	0.533	23.886	25.982
10+hrs	60	26.433	0.889	24.685	28.182

Table 4. One-way analysis of variance of psychological distress by sleep hours

Source	DF	Sum of squares	Mean square	F ratio	Prob > F
Sleep hours	3	2527.023	842.341	17.7501	<.0001*
Error	381	18080.603	47.456		
C. Total	384	20607.626			

Summary of Fit; Rsquare = 0.123, Adj Rsquare = 0.116, Root Mean Square Error = 6.889, Mean of Response = 27.031, Observations (or Sum Wgts) = 385

Table 5. Expanded parameter estimates of psychological distress by sleep hours

Term	Estimate	Std error	t Ratio	Prob>|t|	Lower 95%	Upper 95%
Intercept	27.863	0.383	72.70	<.0001*	27.109	28.616
Sleep hours[<4hrs]	4.537	0.736	6.16	<.0001*	3.089	5.985
Sleep hours[4-6hrs]	-0.179	0.624	-0.29	0.7741	-1.405	1.047
Sleep hours[7-9hrs]	-2.929	0.538	-5.45	<.0001*	-3.986	-1.872
Sleep hours[10+hrs]	-1.429	0.736	-1.94	0.0530	-2.877	0.0186

Table 6. Tukey-kramer HSD difference matrix of psychological distress by sleep hours Dif=Mean[i]-Mean[j]

Sleep quantity	<4hrs	4-6hrs	10+hrs	7-9hrs
<4hrs	0.000			
4-6hrs	-4.716	0.000		
10+hrs	-5.967	-1.250	0.000	
-9hrs	-7.466	-2.749	-1.499	0.000

Table 7. Tukey-Kramer HSD ordered differences report of psychological distress by sleep hours

Level	- Level	Dif	Std Err Dif	Lower CL	Upper CL	p-Value
<4hrs	7-9hrs	7.466	1.037	4.790	10.141	<.0001*
<4hrs	10+hrs	5.967	1.258	2.721	9.212	<.0001*
<4hrs	4-6hrs	4.716	1.129	1.802	7.630	0.0002*
4-6hrs	7-9hrs	2.749	0.877	0.488	5.011	0.0099*
10+hrs	7-9hrs	1.499	1.037	-1.176	4.175	0.4715
4-6hrs	10+hrs	1.250	1.129	-1.664	4.164	0.6853

Table 8. Means for one-way analysis of variance (ANOVA) of psychological distress by academic performance

Level	Number	Mean	Std error	Lower 95%	Upper 95%
Below average	115	29.522	0.668	28.208	30.835
Average	186	26.220	0.525	25.188	27.253
Above average	64	25.328	0.895	23.568	27.089
Excellent	20	25.700	1.602	22.551	28.849

Table 9. One-way analysis of variance of psychological distress by academic performance

Source	DF	Sum of squares	Mean square	F ratio	Prob > F
Academic performance	3	1056.659	352.220	6.8639	0.0002*
Error	381	19550.967	51.315		
C. Total	384	20607.626			

Rsquare = 0.051, Adj Rsquare = 0.044, Root Mean Square Error = 7.163, Mean of Response = 27.031, Observations (or Sum Wgts) = 385

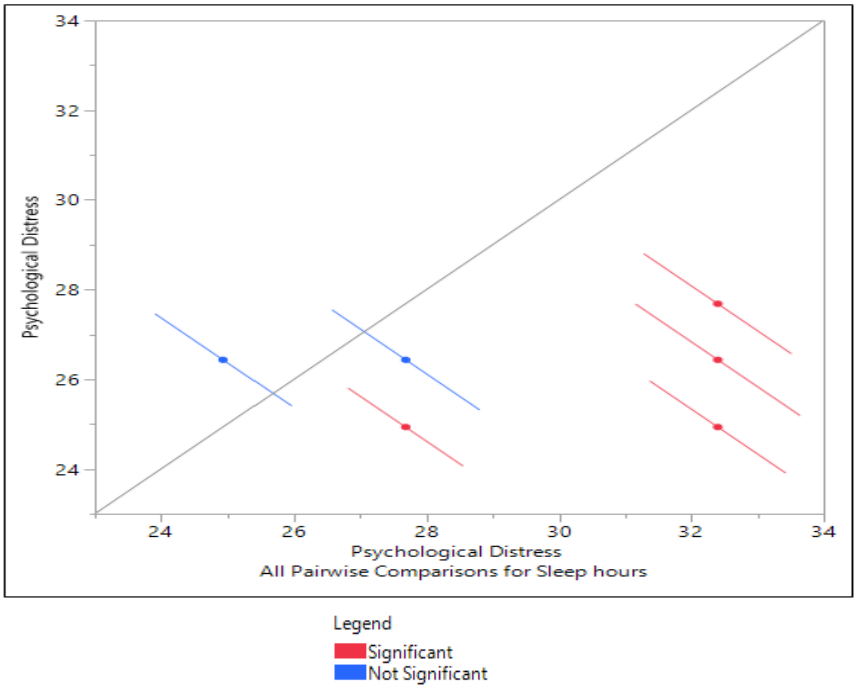

Fig. 2. Tukey-Kramer HSD all pairwise comparison scatter plot of psychological distress during sleep hours

Table 10. Expanded parameter estimates of psychological distress by sleep hours

Term	Estimate	Std Error	t Ratio	Prob>|t|	Lower 95%	Upper 95%
Intercept	26.693	0.506	52.80	<.0001*	25.698	27.687
Below average	2.829	0.692	4.09	<.0001*	1.469	4.189
Average	-0.472	0.627	-0.75	0.4521	-1.706	0.761
Above average	-1.364	0.810	-1.68	0.0930	-2.958	0.229
Excellent	-0.993	1.240	-0.80	0.4241	-3.431	1.446

Table 11. Tukey-Kramer HSD difference matrix of psychological distress by academic performance Dif=Mean[i]-Mean[j]

Performance	Below average	Average	Excellent, I am probably one of the very best	Above average
1	0.000			
2	-3.301	0.000		
3	-3.822	-0.520	0.000	
4	-4.194	-0.892	-0.372	0.000

Note: 1 = below average, 2 = average, 3 = excellent, I am probably one of the very best, 4 = above average

Table 12. Tukey-kramer HSD ordered differences report of psychological distress by academic performance

Level	- Level	Difference	Std Err Dif	Lower CL	Upper CL	p-Value
1	4	4.194	1.117	1.997	6.390	0.0002*
1	3	3.823	1.735	0.409	7.234	0.0283*
1	2	3.301	0.850	1.630	4.972	0.0001*
2	4	0.892	1.038	-1.149	2.933	0.3906
2	3	0.520	1.686	-2.794	3.835	0.7577
3	4	0.372	1.835	-3.236	3.980	0.8395

Note: 1 = below average, 2 = average, 3 = excellent, I am probably one of the very best, 4 = above average

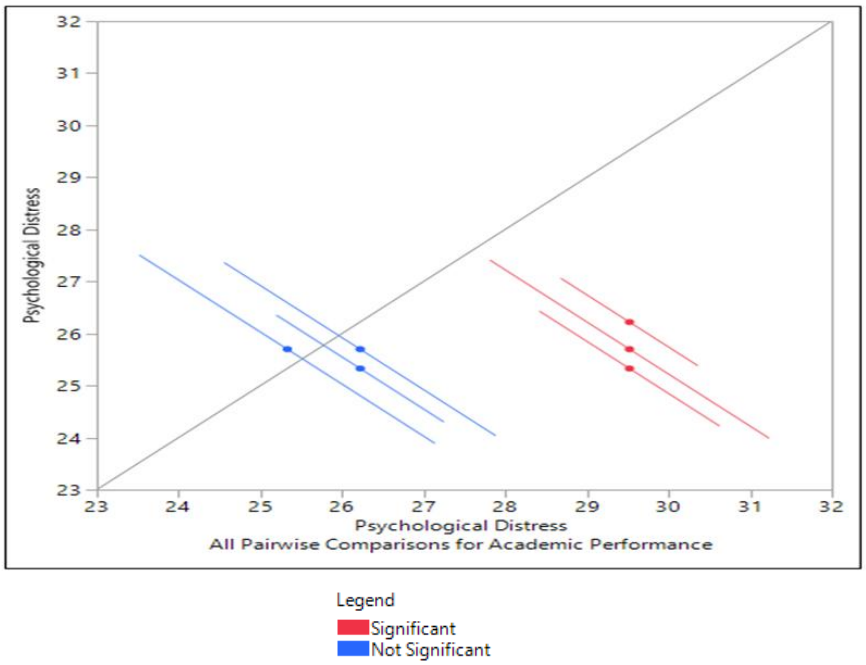

Fig. 3. Tukey-Kramer HSD all pairwise comparison scatter plot of psychological distress for academic performance

4. DISCUSSION

The major essence of the study was to investigate the impact of sleep hours and academic performance on psychological distress among undergraduate students. Findings have shown that sleep hours significantly predict psychological distress among students with sleep duration less ≤4 hrs contributing positively to student's distress. Conversely, sleep duration between 7-9 hrs contributes negatively to distress level among students. This outcome corroborates the previous study by Trockel et al. [17], who evaluates health-related variables on academic performance and found that sleep had the largest effect on semester GPA compared to the other health-related variables such as exercise, nutrition intake, mental health, and stress and time management. There was a significant relationship ($p<0.001$) between sleep habits and higher GPA. Long sleepers (sleep 9 or more hours a day) were found to achieve higher GPAs than short sleepers (sleep 6 or fewer hours a day) [18]. Kazim and Abrar [28] reported mean sleep of students in routine was 7.30 +1.66 hours and before the exam was 4.74 + 2.57 hours. Students felt refreshed after a mean sleep of 8.99+3.31 hours. About 84.3% (86/102) of the passed students and 81.6% (71/89) failed students slept for < 7 hours. The lower GPAs of the short sleepers may have been the result of a decreased ability to focus on education-related activities, so it is possible other psychological variables will help to explain the results better.

Findings have also shown that poor academic performance significantly predicts psychological distress among students with performance below average contributing positively to student's distress. Conversely, academic performance between average and excellence contributes negatively to distress level among students. This outcome corroborates the previous finding by Rothon, Head, Clark, Klineberg, Cattell and Stansfeld [29], who reported that overall score for psychological distress was negatively associated with achievement at GCSE for both boys and girls. There was evidence for an association between achievement and depressive symptoms. Since poor academic performance at school can have a substantial effect on opportunities in adult life, students with poor performance have a higher tendency of suffering from psychological distress. WestEd [30], found a strong tie between students' overall health and resilience and their academic achievement. The relationship between academic achievement and overall mental health of students was found to be bidirectional.

5. CONCLUSION

Psychological distress affects almost four out of every ten of the study participants, and over 40% are having average sleep a night < 6hrs, which is below the recommended 7.5 – 8hrs to feel refreshed the next morning. This has led to the poor academic performance of over 30% of the study sample. It should be noted, however, that the outcome of this study is not absolute as the lower performance of the short sleepers (< 4hrs) may be because of reduced efforts to concentrate on learning-related undertakings or other factors not accounted for by this study. Other psychological variables may help explain the extent of distress among the study sample with academic performance below average. Further investigation using objective means of measuring academic performance and exclude weekends compensatory sleep hour is, therefore, recommended. Generally, the study outcome shows average sleep between 7-9hrs favours good performance in school. This provides psychologists, counsellors and educationist with essential information required to enable the development of an intervention that can help to encourage good sleep habit and improved academic performance to reduce psychological distress. A multi-throng and concerted approach by stakeholders may help.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the author.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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