

A Statistical Analysis of Depression, Anxiety, & Stress Among Students in Kolhapur City & Their Association with Lifestyle Factors & Academic Workload

Shubham. S. Shipugade¹, Shubham. S. Kamble², Prashant S. Chavan²

Student, DoS, Rajarshi Chhatrapati Shahu College, Kolhapur (MS), India¹

Assistant Professor, DoS, Rajarshi Chhatrapati Shahu College, Kolhapur (MS), India²

shipugadeshubham45@gmail.com, shubham129kamble@gmail.com, mr.prashantchavan07@gmail.com

Abstract: *Mental health problems such as depression, anxiety and stress are prevalent among university students, who are often affected by academic pressure and lifestyle behaviours. The aim of this study was to assess the prevalence of depression, anxiety and stress among higher education students in Kolhapur city and to examine their association with lifestyle factors and perceived academic workload. A cross-sectional study was conducted among 318 students aged 18-25 years enrolled in undergraduate and postgraduate programs. Data were collected using a structured questionnaire covering demographic information, lifestyle factors (sleep duration, screen time, hours of self-study and physical activity) and perceived academic workload. Mental distress was measured using the Depression Anxiety Stress Scale (DASS-21). Descriptive statistics, reliability analysis, Shapiro-Wilk normality test, chi-square test, Spearman rank correlation analysis, multiple linear regression, logistic regression, random forest. Mediation analysis was applied to examine the relationships between variables. The findings show that a significant proportion of students experience psychological distress, with moderate levels of depression and anxiety being relatively common. The results indicate that academic workload and screen time are positively associated with depression, anxiety, and stress, while sleep duration and physical activity show protective effects. Multiple regression analysis identified academic workload as a significant predictor of psychological distress, whereas longer sleep duration significantly reduced symptoms. Machine learning models, including logistic regression and random forest classification, achieved predictive accuracies of 82% and 84%, respectively, demonstrating that lifestyle factors can effectively identify students at higher risk of psychological distress. These findings highlight the importance of promoting healthy lifestyle habits and reducing excessive academic pressure to improve student mental health.*

Keywords: *Depression, Anxiety, Stress, DASS-21, Higher Education Students, Lifestyle Factors, Academic Workload, Functional Impairment, Mental Health, Kolhapur City*

I. INTRODUCTION

Mental health issues such as depression, anxiety and stress have become increasingly common among students. Students often suffer from mental distress due to academic pressures, lifestyle changes, excessive screen time and inadequate sleep patterns. Several recent studies have shown that higher education students are particularly vulnerable to emotional and psychological challenges during their educational journey [8]. Lifestyle behaviours such as sleep duration, physical activity and screen time have been identified as important factors in mental health outcomes. For example, research on university students has shown that unhealthy lifestyle behaviours, including low physical activity and poor sleep quality, are significantly associated with higher levels of depression and anxiety [5]. Similarly, excessive screen time has been



linked to increased symptoms of stress and depression in adolescents and young adults [4]. Another factor that increases mental stress among students is academic workload. Stress levels often increase due to a large number of assignments, exam pressure and time management challenges. Studies conducted among university students during and after the COVID-19 period have shown that academic responsibilities and lifestyle changes have a significant impact on students' mental health.[9].

In addition, lifestyle factors such as physical activity and healthy routines have been shown to reduce stress levels and improve mental health. Research has shown that students who exercise regularly and maintain healthy habits have lower levels of depression and anxiety compared to students with sedentary lifestyles [6]. Despite the increasing research globally, limited studies have focused specifically on students in urban Indian educational environments such as Kolhapur city, where academic competition and technological connectivity are rapidly increasing. Therefore, the aim of this study is to statistically analyse depression, anxiety, and stress among students in Kolhapur and examine how lifestyle factors and academic workload affect mental distress.

II. LITERATURE REVIEW

Depression, anxiety and stress are among the most common mental health problems among students. A cross-sectional study conducted among university students found that a large proportion of students reported moderate to severe levels of depression and anxiety due to academic pressure and social challenges [9]. Similarly, research on mental health among students pursuing higher education has found that academic stress, uncertainty about career opportunities and social pressure contribute significantly to mental distress among students [8]. Lifestyle behaviours play an important role in shaping mental health. Studies have shown that sleep quality, physical activity and daily routine are related to mental health. Poor sleep quality has been linked to increased symptoms of depression and anxiety in many populations [3]. Research focusing on university students shows that healthy lifestyle habits such as regular exercise, a balanced diet and a structured daily routine are positively associated with mental health [5]. In addition, lifestyle clustering studies have shown that several unhealthy habits - such as poor diet, lack of exercise and excessive screen time - often occur together and significantly increase the risk of mental health problems [6]. With the rapid increase in smartphone and internet use, screen time has become an important lifestyle factor affecting students' mental health. Research has found that excessive screen time is associated with higher levels of depression, anxiety and stress in adolescents and young adults [4]. Furthermore, smartphone addiction and digital dependency have also been linked to reduced life satisfaction and increased mental distress in young people [11].

Physical activity is widely recognized as a protective factor against mental distress. Studies have shown that individuals who engage in regular physical exercise experience less stress and anxiety than those who lead a sedentary lifestyle [7]. Another study examining lifestyle-related risk factors in college students found that low physical activity significantly increases the likelihood of developing depression and anxiety [10]. Academic workload has consistently been identified as a major cause of stress among students. Studies have shown that exam pressure, assignment deadlines, and academic expectations can significantly increase stress levels [1]. Similarly, research focusing on students in different educational settings has found that academic workload, along with lifestyle factors such as poor sleep and limited physical activity, contribute to increased psychological distress among students [2]. Overall, the literature suggests that depression, anxiety, and stress among students are influenced by a combination of lifestyle behaviours and academic factors, which highlights the importance of studying these relationships in a specific regional context.

While previous studies have consistently identified academic pressure and lifestyle behaviours as important determinants of student mental health, many studies focus primarily on traditional statistical analysis and lack predictive modelling approaches. In addition, limited research has examined these relationships in smaller urban educational environments within India. Therefore, this study contributes to the existing literature by integrating statistical analysis, mediation analysis, and machine learning techniques to provide a more comprehensive understanding of psychological distress among students.



III. METHODOLOGY

Research Design and Study Population

This study used a cross-sectional research design to assess the prevalence of depression, anxiety, and stress among higher education students and to examine their associations with lifestyle behaviors and perceived academic workload.

The study was conducted among students aged 18–25 years enrolled in undergraduate and postgraduate programs in colleges located in Kolhapur city, Maharashtra, India. The estimated population of students in the study area was 44,955. The required sample size was determined using Cochran's sample size formula for large populations with a 95% confidence level ($Z = 1.96$) and 5.5% margin of error. After applying finite population correction, the required sample size was approximately 315 students. A total of 318 students participated in the study.

Data Collection and Sampling

Data were collected using a structured self-administered questionnaire distributed to students across different colleges in Kolhapur city. A non-probability convenience sampling method was used to recruit participants due to accessibility and time constraints. The questionnaire consisted of five sections: Socio-demographic characteristics (age, gender, education level, living arrangement), Lifestyle factors (Sleep duration (hours/day), Screen time (hours/day), Self-study hours, Physical activity, Perceived academic workload, Depression, Anxiety, Stress Scale, Functional impairment Scale.

Measurement of Depression, Anxiety, and Stress

Depression, anxiety, and stress levels among students were measured using the Depression Anxiety Stress Scales 21. The DASS-21 consists of 21 items divided into three subscales: Depression (7 items), Anxiety (7 items), Stress (7 items). Participants were asked to rate how much each statement applied to them over the past week using a 4-point Likert scale: 0 (Did not apply to me at all), 1 (Applied to me to some times), 2 (Applied to me a considerable degree), 3 (Applied to me very much).

DASS-21 Scoring Method

Each subscale contains 7 items.

Step 1: Sum the item scores

$$\text{For each participant: } \textit{Subscale Score} = \sum_{i=1}^7 \textit{Item}_i \quad (1)$$

Step 2: Multiply by 2

Because DASS-21 is a shortened version of the original 42-item scale, the summed score is multiplied by 2.

$$\text{Final Score} = \textit{Subscale Score} \times 2 \quad (2)$$

Measurement of Functional Impairment

Functional impairment was assessed using a self-reported scale measuring the extent to which psychological distress interferes with students' academic performance and daily activities. Participants rated their level of difficulty in performing academic tasks, maintaining concentration, and managing daily routines. Higher scores indicate greater impairment in functioning due to psychological distress

Statistical Methods

All statistical analyses were conducted to examine relationships between lifestyle behaviors, academic workload, and psychological distress.

Descriptive Statistics

Descriptive statistics were used to summarize the basic characteristics of the dataset. Measures such as mean, standard deviation, frequency, and percentage were calculated for demographic variables, lifestyle factors, and DASS-21 scores. These statistics help in understanding the overall distribution of depression, anxiety, and stress levels among students and provide an initial overview of the sample characteristics.

$$\text{Mean Formula: } \bar{X} = \frac{\sum X_i}{n}$$

$$\text{Standard Deviation Formula: } SD = \sqrt{\frac{\sum (X_i - \bar{X})^2}{n-1}} \quad (3)$$

Where: X_i = individual observation, n = number of observations



Reliability Testing (Cronbach's Alpha)

Reliability analysis was conducted to assess the internal consistency of the DASS-21 questionnaire. Cronbach's Alpha coefficient measures how closely related a set of items are as a group. A Cronbach's Alpha value above 0.70 indicates acceptable reliability.

Formula:

$$\alpha = \frac{k}{k-1} \left(1 - \frac{\sum \sigma_i^2}{\sigma_t^2} \right) \quad (4)$$

Where: k = number of items, σ_i^2 = variance of each item, σ_t^2 = variance of total score

TABLE I

Alpha	Interpretation	Alpha	Interpretation
>0.9	Excellent	0.7–0.8	Acceptable
0.8–0.9	Good	0.6–0.7	Questionable but acceptable

Normality Testing (Shapiro–Wilk Test)

Before conducting further statistical analysis, the normality of the data distribution was tested using the **Shapiro–Wilk test**.

The test examines whether the sample data follow a normal distribution.

Hypotheses:

H0: Data follow a normal distribution v/s H1: Data do not follow a normal distribution

Test Statistic: $W = \frac{(\sum a_i x_i)^2}{\sum (x_i - \bar{x})^2} \quad (5)$

Where: x_i = ordered sample values, a_i = constants derived from covariance matrix

If $p < 0.05$, the data significantly deviate from normal distribution.

Chi-Square Test for Association

The Chi-square test was used to determine whether there is a significant association between categorical variables.

Formula: $\chi^2 = \sum \frac{(O-E)^2}{E} \quad (6)$

Where: O = observed frequency and E = expected frequency

If the p-value is less than 0.05, the association between variables is considered statistically significant.

Spearman Correlation Analysis

Spearman's rank correlation coefficient was used to examine the strength and direction of the relationship between lifestyle variables and psychological distress scores. This test is suitable when the data are not normally distributed.

Formula: $\rho = 1 - \frac{6 \sum d^2}{n(n^2-1)} \quad (7)$

Where: d = difference between ranks and n = number of observations

Multiple Linear Regression

Multiple linear regression was used to identify the significant predictors of stress, anxiety, and depression.

This method evaluates the relationship between one dependent variable and multiple independent variables.

Regression Model:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \epsilon \quad (8)$$

Where: Y = dependent variable (stress, anxiety, or depression score)

X_1, X_2, X_3 = independent variables (sleep, screen time, physical activity, academic workload)

β_0 = intercept, β_1 = regression coefficients, ϵ = error term

Residual Normality

Residual normality was assessed using Q-Q plots



Coefficient of Determination (R^2)

The coefficient of determination (R^2) measures the proportion of variation in the dependent variable that is explained by the independent variables.

$$R^2 = 1 - \frac{\sum(y_i - \hat{y}_i)^2}{\sum(y_i - \bar{y})^2} \quad (9)$$

Where: y_i = observed value, \hat{y}_i = predicted value, \bar{y} = mean of observed values

Adjusted R^2

Adjusted R^2 accounts for the number of predictors in the regression model and provides a more accurate measure of model performance.

$$\text{Adjusted } R^2 = 1 - \left(\frac{(1-R^2)(n-1)}{n-p-1} \right) \quad (10)$$

Where: n = number of observations (318 students), p = number of predictors in the model

IV. MACHINE LEARNING MODELS

Machine learning models were included in the analysis to complement traditional statistical techniques and to evaluate the predictive capability of behavioural variables in identifying students at risk of psychological distress. The dataset was divided into training and testing subsets using an 80:20 ratio. Using 80% of the data for training allows the model to learn meaningful patterns, while the remaining 20% is used to assess the model's predictive performance on unseen data.

4.1 Logistic Regression

Logistic regression was applied to predict the probability of high psychological distress among students. In this study, students were categorized as: High risk (1) and Low risk (0)

Logistic Model:

$$P(Y = 1) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_1 + \dots + \beta_k X_k)}} \quad (11)$$

This model estimates the likelihood that a student belongs to a high-risk group based on lifestyle factors and academic workload.

4.2 Random Forest Classification

Random Forest is a machine learning algorithm used to classify students into different psychological distress categories. It works by constructing multiple decision trees and combining their predictions.

Random Forest Prediction:

$$\hat{y} = \frac{1}{T} \sum_{t=1}^T f_t(x) \quad (12)$$

Where: T = number of trees, $f_t(x)$ = prediction from each tree

Model Evaluation Metrics

The predicted Reviews were measured using five metrics, namely precision (Prec), recall (Rec), f1score (F1), and accuracy (Acc.)

Accuracy:

$$\text{Accuracy} = \frac{TP+TN}{TP+TN+FP+FN} \quad (13)$$

Precision:

$$\text{Precision} = \frac{TP}{TP+FP} \quad (14)$$

Recall:

$$\text{Recall} = \frac{TP}{TP+FN} \quad (15)$$

F1 Score:

$$F1 \text{ Score} = 2 \times \frac{\text{Precision} \times \text{Recall}}{\text{Precision} + \text{Recall}} \quad (16)$$

Where: TP = True Positives, TN = True Negatives, FP = False Positives, FN = False Negatives



Mediation Analysis

Mediation analysis was conducted to determine whether stress mediates the relationship between academic workload and psychological distress.

Mediation Model:

Academic Workload → Stress → Depression/Anxiety

The indirect effect was tested using regression analysis.

Mediation Equations: $M = aX + e_1$ (17)

$Y = c'X + bM + e_2$ (18)

Where: X = academic workload, M = stress, Y = depression or anxiety

If the indirect effect ($a \times b$) is significant, mediation is present.

Ethical Considerations

Participation in the study was voluntary, and informed consent was obtained from all respondents before completing the questionnaire. The collected data were kept anonymous and used solely for academic research purposes.

V. GRAPHICAL ANALYSIS

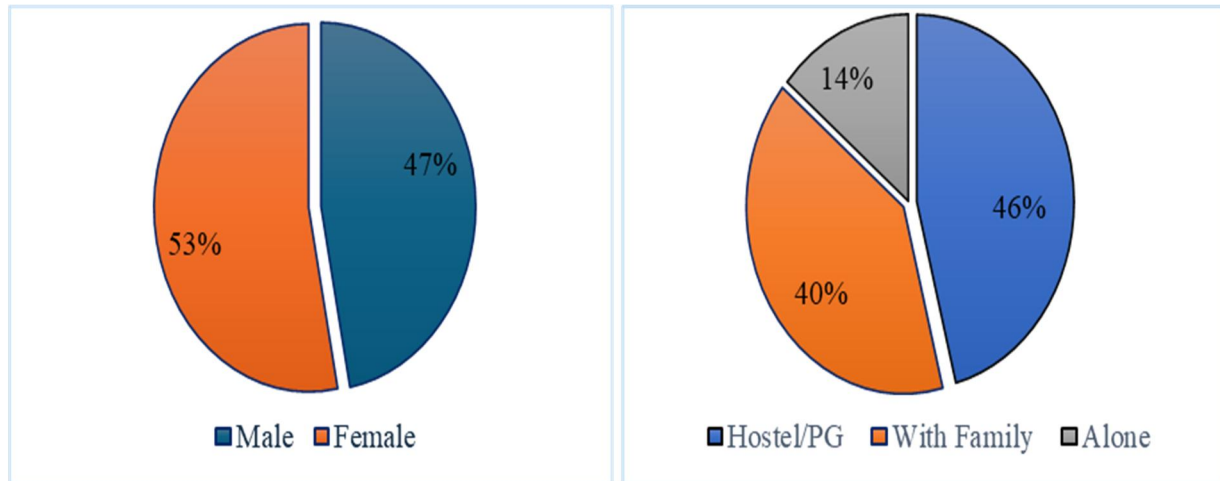


Fig. 1 Demographic Characteristics of the Respondents

Figure 1 presents the demographic characteristics of respondents. The gender distribution is nearly balanced, with 53% females and 47% males. Most students live in hostels or paying guest accommodations (46%), followed by those living with family (40%), while a smaller proportion live alone (14%), indicating that many students stay away from their families.

Figure 2 shows the majority of participants were undergraduate students (69%), followed by postgraduate students (22%). A smaller proportion consisted of diploma students (6%) and others (3%). This indicates that the sample is predominantly composed of undergraduate students.

Figure 3 illustrates the overall severity levels of psychological distress among students. About 32% of students fall in the normal category and another 32% in the mild category, while 22% experience moderate distress and smaller proportions report severe (10%) and extremely severe (3%) levels

Figure 4 shows the prevalence of depression, anxiety, and stress among students. Moderate depression (31%) and moderate anxiety (34%) are the most common conditions, while severe levels are reported by about 17% of students and extremely severe anxiety by 22%, whereas most students (59%) report normal stress levels.



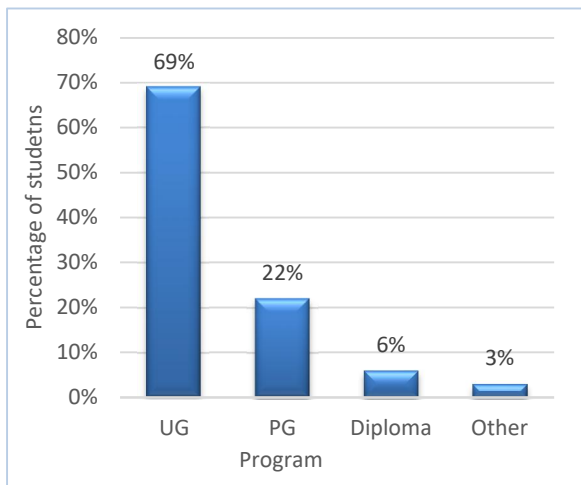


Fig. 2 Academic Qualification Distribution

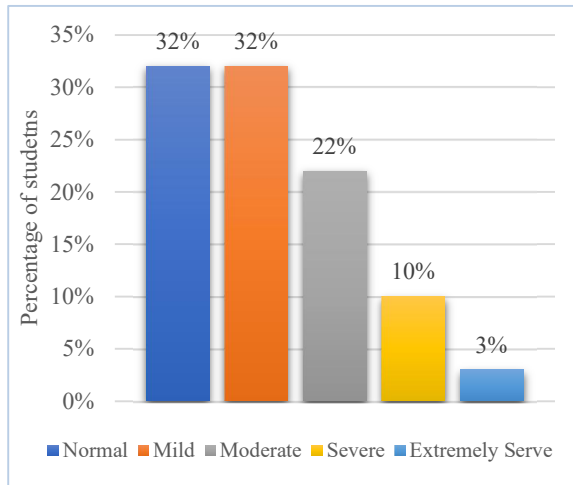


Fig.3 Overall Severity Level of Psychological Distress

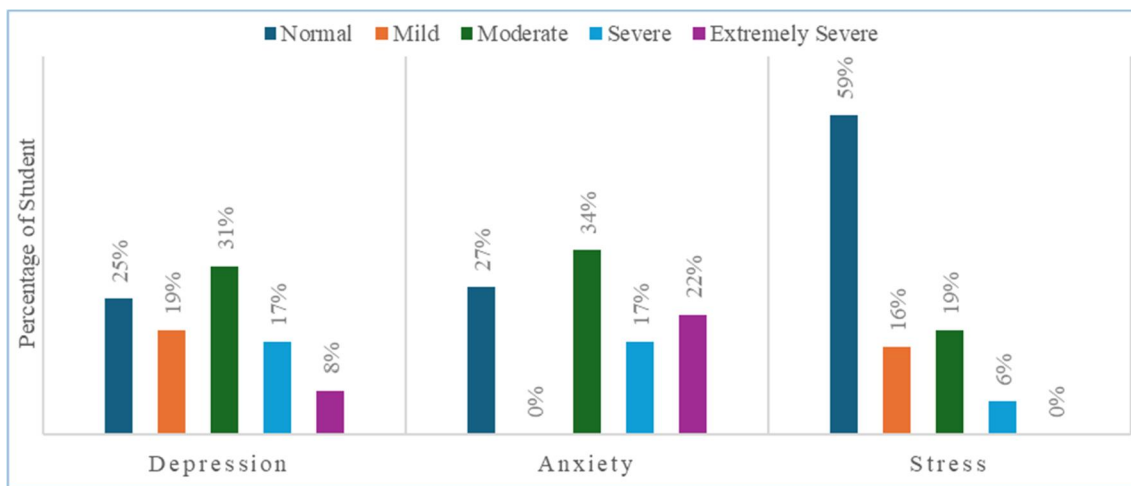


Fig.4 Prevalence of Depression, Anxiety, and Stress

VI. STATISTICAL ANALYSIS

Descriptive Statistics

Descriptive statistics were used to summarize the demographic characteristics and behavioural variables of the respondents, including age, sleep hours, screen time, self-study hours, physical activity, workload, and psychological variables (depression, anxiety, and stress).

TABLE II

Variable	Mean	Std. Dev	Min	Max
Age	21.39	2.31	18	25
Sleep Hours	6.21	1.3	3	9
Screen Time	6.65	1.88	2	11
Self-Study	3.13	1.09	0	6
Physical Activity	27.92	15.85	0	65
Workload	3.31	0.79	1	5



Depression	1.65	1.25	0	4
Anxiety	2.07	1.46	0	4
Stress	0.73	0.97	0	3

The TABLE II shows the average age of respondents was **21.39 years**. The mean depression score was **1.65**, anxiety **2.07**, and stress **0.73**, indicating moderate psychological symptoms among students. The students reported an average sleep duration of 6.21 hours, which is slightly below the recommended sleep duration for young adults. In contrast, average screen time was relatively high (6.65 hours per day), suggesting a substantial level of digital engagement among students.

Reliability Analysis (Cronbach's Alpha)

TABLE III

Reliability analysis was conducted to evaluate the internal consistency of the DASS-21 psychological scale.

Scale	Cronbach's Alpha	Interpretation
Depression	0.773	Good reliability
Anxiety	0.719	Acceptable reliability
Stress	0.682	Questionable but acceptable

From above TABLE III, Cronbach's alpha values above **0.70** indicate acceptable internal consistency. Therefore, the DASS-21 scales used in this study demonstrate **adequate reliability** for measuring psychological distress.

Normality Test

TABLE IV

The Shapiro–Wilk test was used to assess whether the variables followed a normal distribution.

Variable	Skewness	Shapiro p-value	Interpretation
Stress	0.9616	<0.001	Not normal
Depression	0.1732	<0.001	Not normal
Anxiety	-0.2188	<0.001	Not normal
Screen Time	0.0693	<0.001	Not normal
Self-Study	0.1102	<0.001	Not normal
Sleep Hours	-0.2369	<0.001	Not normal
Workload	-0.0363	<0.001	Not normal
Physical Activity	0.1125	<0.001	Not normal

From TABLE IV, Since the p-values are **less than 0.05**, the variables do not follow a normal distribution. Therefore, **non-parametric statistical methods**, such as **Spearman correlation**, were used for further analysis.

Chi-Square Test for Association

The Chi-square test was used to determine whether there is a significant association between gender and the psychological variables (depression, anxiety, and stress).



TABLE V

Null Hypothesis	Variable	Chi-square	p-value	Result
H₀ : Gender has no significant relationship with depression, anxiety, and stress.	Gender vs DP	1.309	0.859	No significant relationship
	Gender vs AN	0.6	0.897	No significant relationship
	Gender vs ST	0.686	0.876	No significant relationship
H₀ : Physical activity has no significant relationship with depression, anxiety, and stress.	Physical Activity vs DP	38.14	p < 0.001	Significant relationship
	Physical Activity vs AN	29.06	p < 0.001	Significant relationship
	Physical Activity vs ST	35.13	p < 0.001	Significant relationship
H₀ : Sleep hours have no significant relationship with depression, anxiety, and stress.	Sleep Hours vs DP	96.88	p < 0.001	Significant relationship
	Sleep Hours vs AN	86.71	p < 0.001	Significant relationship
	Sleep Hours vs ST	58.65	p < 0.001	Significant relationship
H₀ : Screen time has no significant relationship with depression, anxiety, and stress.	Screen Time vs DP	47.52	p < 0.001	Significant relationship
	Screen Time vs AN	32.14	p < 0.001	Significant relationship
	Screen Time vs ST	32.18	p < 0.001	Significant relationship

In TABLE V, (DP - Depression, AN – Anxiety, ST – Stress)

Gender does not show a statistically significant association with depression, anxiety, or stress in this sample. This suggests that mental health outcomes appear similar across genders in the studied group.

Physical activity shows a significant relationship with depression anxiety and stress, indicating that physical activity levels may influence these mental health conditions.

Sleep duration is significantly associated with depression, anxiety, and stress. This suggests that the amount of sleep individuals get may play an important role in their overall mental well-being.

Screen time shows a significant relationship with depression, anxiety, and stress. Higher or varying levels of screen exposure may therefore be linked to changes in mental health outcomes.

Spearman’s Rank Correlation

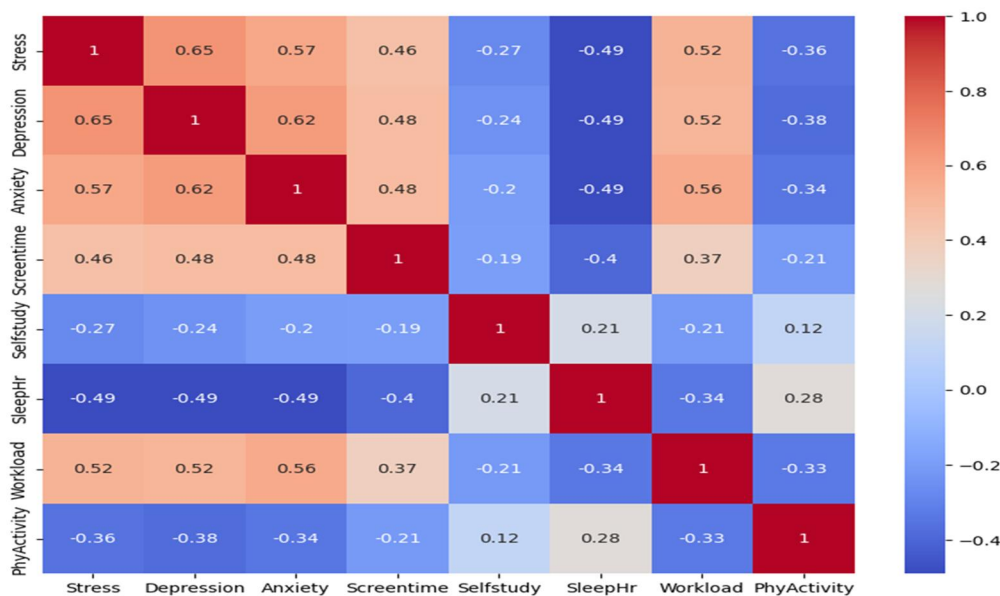


Fig.5 Correlation Heatmap of Psychological and Lifestyle Variables



The correlation heatmap (Fig. 5) illustrates the relationships among the study variables. Stress shows strong positive correlations with depression ($r = 0.65$) and anxiety ($r = 0.57$), while depression and anxiety are also strongly related ($r = 0.62$), indicating that these mental health conditions often occur together among students. Screen time and academic workload display moderate positive correlations with stress, depression, and anxiety, suggesting that higher screen exposure and academic demands are associated with greater psychological distress. In contrast, sleep duration and physical activity show negative correlations with stress, depression, and anxiety, indicating that adequate sleep and regular physical activity are linked to better mental well-being. Overall, the heatmap suggests that workload and screen time increase psychological distress, whereas sleep and physical activity help improve students' mental health. These correlations suggest that unhealthy lifestyle behaviours may contribute to increased psychological distress among students, highlighting the importance of balanced daily routines.

Multiple Linear Regression Analysis

Multiple linear regression analysis was conducted to identify the predictors of depression, anxiety, and stress among students. Independent variables included screen time, self-study hours, sleep duration, academic workload, and physical activity, functional impairment score.

TABLE VI

Regression Analysis Predicting Depression

Predictor	β Coefficient	Standard Error	t-value	p-value	Interpretation
Screen Time	0.049	0.03	1.637	0.103	Not significant
Self-Study	-0.023	0.044	-0.525	0.6	Not significant
Sleep Hours	-0.095	0.043	-2.192	0.029	Significant negative effect
Workload	0.213	0.072	2.959	0.003	Significant positive effect
Physical Activity	-0.006	0.003	-1.692	0.092	Marginal / Not significant
Functional Impairment	0.265	0.028	9.511	<0.001	Strongest predictor

Model Fit: $R^2 = 0.581$ Adjusted $R^2 = 0.573$ F-statistics = 71.95

The results indicate that **higher academic workload significantly increases depression**, while **greater sleep duration reduces depression symptoms** among students.

TABLE VII

Regression Analysis Predicting Anxiety

Predictor	β Coefficient	Standard Error	t-value	p-value	Interpretation
Screen Time	0.093	0.037	2.525	0.012	Significant positive effect
Self-Study	0.039	0.055	0.719	0.473	Not significant
Sleep Hours	-0.132	0.053	-2.472	0.014	Significant negative effect
Workload	0.428	0.088	4.838	<0.001	Strong positive effect
Physical Activity	-0.002	0.004	-0.596	0.552	Not significant
Functional Impairment	0.24	0.034	7.015	<0.001	Strong predictor

Model Fit: $R^2 = 0.531$ Adjusted $R^2 = 0.522$ F-statistics = 58.80

Screen time and academic workload were found to be **significant predictors of anxiety**, whereas **adequate sleep helps reduce anxiety levels**.

TABLE VIII

Regression Analysis Predicting Stress

Predictor	β Coefficient	Standard Error	t-value	p-value	Interpretation
Screen Time	0.05	0.025	2.033	0.043	Significant positive effect
Self-Study	-0.058	0.037	-1.585	0.114	Not significant



Sleep Hours	-0.097	0.036	-2.698	0.007	Significant negative effect
Workload	0.214	0.06	3.595	<0.001	Strong positive effect
Physical Activity	-0.004	0.003	-1.387	0.167	Not significant
Functional Impairment	0.159	0.023	6.876	<0.001	Strongest predictor

Model Fit: $R^2 = 0.522$ Adjusted $R^2 = 0.512$ F-statistics = 56.52

The findings show that **students with higher screen time and academic workload tend to experience higher stress levels, while longer sleep duration contributes to lower stress levels.**

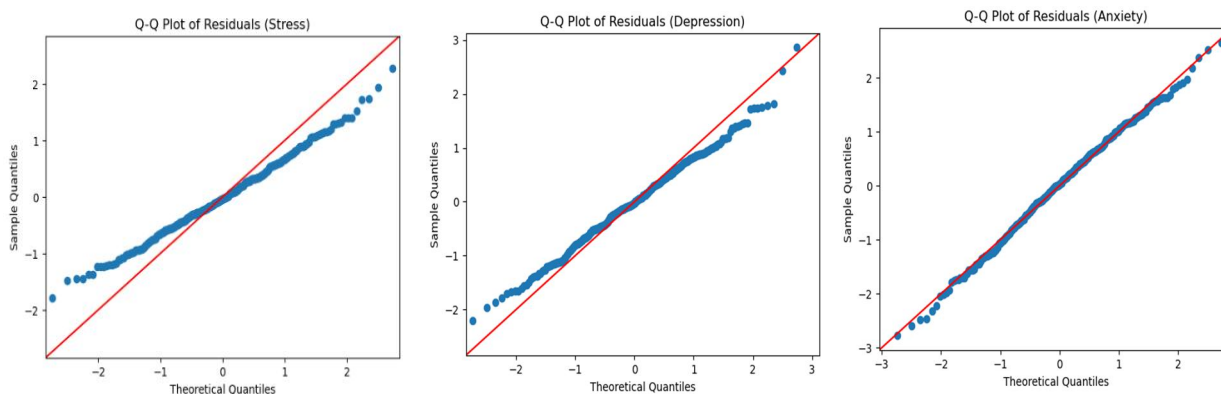


Fig. 6 Q-Q Plot of Residual (Depression, Anxiety, Stress)

In Fig. 6, the Q–Q plots for the stress, depression, and anxiety models show that most data points closely follow the diagonal reference line, indicating that the residuals are approximately normally distributed. Although minor deviations appear at the lower and upper tails, these departures are small and do not substantially affect the overall pattern. Therefore, the normality assumption of residuals is reasonably satisfied for all three regression models, supporting the reliability and validity of the statistical analyses.

Random Forest Classification

Random Forest classification was applied as a machine learning technique to identify students at **high or low mental health risk** based on behavioural and lifestyle variables.

TABLE IX

Feature Importance Model Performance Summary

Predictor	Importance
Physical Activity	0.273
Sleep Hours	0.223
Screen Time	0.194
Workload	0.193
Self-Study	0.118

Model Performance: Overall Accuracy = 84%

From the TABLE IX, the overall model accuracy was **84%**, indicating strong predictive capability. The model correctly identified: **90%** of low-risk students, **72%** of high-risk students

These results indicate that **physical activity and sleep duration are the strongest predictors of students' mental health outcomes.**



Metric	Low Risk (Class 0)	High Risk (Class 1)
Precision	0.88	0.75
Recall	0.90	0.72
F1 Score	0.89	0.74

Logistic Regression Analysis

Logistic regression was used to classify students into **high-risk and low-risk psychological groups**.

Model Performance: Overall Accuracy = 82%

TABLE X

Metric	Class 0 (Low Risk)	Class 1 (High Risk)
Precision	0.88	0.70
Recall	0.87	0.72
F1-Score	0.87	0.71

From the TABLE X, the overall model accuracy was **82%**, indicating strong predictive capability. The model correctly identified: **87%** of low-risk students, **72%** of high-risk students

Mediation Analysis

Mediation analysis was conducted to examine whether stress mediates the relationship between academic workload and functional impairment among students.

TABLE XI

Models	Predictor	Coefficient (β)	Std. Error	t statistic	p-value
A: Effect of Workload on Stress	Intercept	-1.414	0.2	-7.065	<0.001
	Workload	0.646	0.059	10.994	<0.001
B: Effect of Stress on Functional Impairment	Intercept	3.901	0.13	30.113	<0.001
	Stress	1.773	0.107	16.584	<0.001
C: Combined Effect of Workload and Stress on Functional Impairment	Intercept	1.028	0.452	2.276	0.023
	Workload	0.958	0.145	6.605	<0.001
	Stress	1.363	0.118	11.552	<0.001

From the TABLE XI the results suggest that **stress partially mediates the relationship between academic workload and functional impairment**, indicating that increased workload leads to higher stress, which in turn negatively affects students' daily functioning.

VIII. CONCLUSION

The study conducted among higher education students in Kolhapur city shows that a considerable proportion of students experience psychological distress, particularly moderate levels of depression and anxiety, although most students report normal levels of stress. However, a meaningful number of students still experience mild to severe psychological symptoms, indicating that mental health concerns are present within the student population. The statistical analyses shows that academic workload is a major factor influencing student's mental health, significantly increasing levels of depression, anxiety, and stress. Similarly, higher screen time is associated with greater psychological distress, particularly anxiety



and stress. These findings suggest that excessive academic pressure and digital exposure may negatively affect student's emotional well-being.

In contrast, healthy lifestyle behaviours act as protective factors. Students who report longer sleep duration tend to experience lower levels of depression, anxiety, and stress, while physical activity shows a negative association with psychological distress, indicating that regular exercise may improve mental well-being. Regression analyses confirm that sleep duration significantly reduces psychological distress, whereas academic workload and screen time increase mental health problems. Furthermore, mediation analysis shows that stress partially mediates the relationship between academic workload and functional impairment, meaning that academic pressure increases stress, which then affects student's daily functioning and academic performance. Machine learning models used in the study also demonstrate strong predictive performance, showing that lifestyle variables such as physical activity, sleep hours, screen time, and academic workload can effectively identify students at higher risk of psychological distress. Overall, the study concludes that student's mental health is influenced by a combination of academic pressures and lifestyle behaviours. Promoting healthy lifestyle habits, improving sleep patterns, encouraging physical activity, and providing institutional mental health support can help reduce psychological distress and improve student's overall well-being and academic functioning.

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