The Prevalence and Severity of Depression, Anxiety and Stress Among Medical Undergraduate Students of Arsi University and Their Association With Substance Use, Southeast Ethiopia.

Leta Melaku (✉ letamelaku@gmail.com)
  Arsi University College of Health Sciences
Guta Bulcha
  Arsi University College of Health Sciences
Deresa Worku
  Arsi University College of Health Sciences

Abstract

Background: Mental health problems can negatively impact physical and psychological well-being of junior medical students and predisposes them to many unhealthy behaviors.

Objective: We aimed to determine the prevalence and severity of depression, anxiety and stress among medical undergraduate students of Arsi University and their association with substance use.

Materials and Methods: Institutional based cross-sectional study was conducted on 265 medical students that were selected by systematic random sampling. Data were collected by pre-tested self-administrative questionnaire and analyzed by SPSS-21 software. Logistic regression analysis were employed and statistical significance was accepted at p<0.05.

Result: In the present study, 5 questionnaires were rejected for incompleteness giving response rate of 98.1%. The current prevalence rate of depression, anxiety, stress, khat chewing, cigarette smoking and alcohol drinking was found to be 52.3%, 60.8%, 40.4%, 21.5%, 15.4% and 33.8% respectively. Depression was significantly associated with monthly income, residency and alcohol drinking. Anxiety was associated with gender, marital status, educational year, residency and cigarette smoking. Stress was significantly associated with monthly income, educational year, residency, khat chewing, and drinking alcohol.

Conclusion: To sum up, depression, anxiety and stress are common problems among medical students of Arsi University. Monthly income, residency and alcohol drinking were identified as risk factors of both depression and stress. Furthermore, educational year and khat chewing were also risk factors for stress. Finally, identified risk factors of anxiety were gender, marital status, educational year, residency and cigarette smoking. Therefore, counseling and awareness creation are recommended.

Introduction

Stress is the generalized, non-specific response of the body to any factor that overwhelms, or threatens to overwhelm, the body's compensatory abilities to maintain homeostasis (1). Stress that enhances physical or mental function is considered as eustress (2,3). Conversely, distress is persistent stress that results in cognitive, behavioral and emotional disturbances like anxiety and depression (4,5). Clinically, anxiety is characterized by intense feeling of dread, accompanied by somatic symptoms that indicate hyperactive autonomic nervous system (6). Whereas, depression manifests as loss of interest or pleasure, sadness, feelings of guilt or low self-worth, disturbed sleep or appetite, extreme tiredness, and poor concentration (7).

In fact, transition from childhood to young adulthood is often marked by beginning of studying in university where certain factors contribute to the development or perpetuation of high incidence of mental illness in undergraduate programs (8–24). It is commonly observed that undergraduate medical students and resident doctors experience high incidences of mental illness across the globe (8,11–13,25–32). The overall prevalence of stress was 31.2% in 3 British universities (33), 26% in US medical school (34), 41.9% in a Malaysian medical school (35), 61.4% in a Thai medical school (36), 94.2% in Nigeria medical school (37), 37.4% - 52.4% in Ethiopia medical school (38,39). Perhaps, prevalence of anxiety was 43.7% in Pakistan (40), 54.5% in Malaysia (41), 65.5% in Greece (42), 69% in Beirut (11), 29.4% in Israel (43), 56% in India (44), and 60% in Pakistan (45). Although the onset of depression can be at any stage of life, the prevalence of major depression is increasing during adolescence and young adulthood (46,47). In a study conducted in United States of America, the prevalence of depression among undergraduate student was found to be 23% (48). Another study conducted in Sweden revealed that the prevalence of depressive symptoms was 12.9% and a total of 2.7% of students had made suicidal attempts (25). In Zimbabwe, 64.5% of first year medical students were found to be at various levels of stress and / or depression with 12% at risk of suicidal tendencies (49). Among students of Obafemi Awolowo University Ile Ife Nigeria, 84% had depression ranging from mild to severe (50).

There are indications that there is a higher rate of psychological morbidity in medical students than students in other disciplines (27,51–53). The study conducted across 10 universities in Hong Kong revealed 21% of students experiencing moderate depression, 41% moderate anxiety, and 27% moderate stress (54). The prevalence of depression, anxiety and stress among medical undergraduates studying in a premier medical institution 51.3%, 66.9% and 53% respectively (17). Studies related to stress in medical education in Arab countries have also confirmed that stress, depression, and anxiety are common among medical students (53,55).

Mental health problems can negatively impact academic achievement, physical health, and psychological well-being of junior medical students (48,56). The excessive amount of stress had led to grave consequences such as tempted to cheat on exams, poor academic

performance, difficulties in solving interpersonal conflicts, decreased attention, reduced concentration, loss of objectivity, increased incidence of errors, negligence, substance misuse, sleep problems, low self-esteem and other stress-related outcomes (38,57). Infrequent exercise, alcohol drinking, smoking, khat chewing, sleep disorders and eating poorly are also identified to be associated with increased stress (58–61). Conversely, chronic nicotine intake affects the brain reward system function which results in depression and anxiety symptoms (62). Khat use was further associated with more mood disturbances than experienced by those who did not use khat and significantly associated with depression, anxiety, and cortisol stress response (63)· Heavy alcohol consumption is also associated with anxiety disorder (64,65). Retrieving knowledge about presence of stress, depression and anxiety is therefore important in itself and if found should be given attention for timely intervention. However, very little is known about depression, anxiety and stress among medical undergraduate students in Ethiopia. Therefore, this study aimed to determine the prevalence and severities of depression, anxiety and stress among medical undergraduate students of Arsi University and their association with substance use.

Methods And Materials

Institutional based cross-sectional design was conducted in Arsi University from January 03 – 31, 2019 among 265 sampled undergraduate medical students. After proportional allocation of the calculated sample size by a correction formula to each academic year level (enrollment year), stratified random sampling was employed. From each stratum after randomly selecting the first respondent based on their id number, required respondents were chosen by every 4 interval through systematic random sampling. All medical students in Arsi University were eligible to participate with exceptions of severely ill students and that were out of town during the time of data collection. Ethical approval was obtained from Arsi University Ethical Review Committee and list the board's name are Hailu Fekadu, Kelil Haji, Gebi Agero, Taresa Kisi, Hinsermu Bayu and Dr. Abebe Sorsa. Informed consent was secured and participation was totally voluntary. Confidentiality was kept unanimously. Data were collected by self-administered questionnaires that comprises of the following parts.

  i. Sociodemographic profile: includes age, gender, enrollment year, marital status, residence, income, religion and ethnicity.
 ii. Depression, Anxiety, Stress Scale – 21 (DASS-21): is self-report tools designed to measure the emotional states of depression, anxiety and stress over the last week (66). Each of the three DASS-21 scales contains 7 items. The responses are given on a 4-point Likert scale, ranging from zero if "I strongly disagree" to 3 if "I totally agree". According to DASS-21 scoring instructions, the obtained DASS-21 scores need to be multiplied by 2 to have the final score and ranges of scores correspond to levels of symptoms, ranging from "normal" to "extremely serious" (**Table 1**). However, to determine the prevalence of DAS, DASS-21 scores with normal levels of depression, anxiety, and stress were coded as "0" whereas those with mild, moderate, severe, or extremely severe levels were coded as "1." Various studies demonstrated the DASS-21 was found to have strong internal consistency (67,68).
iii. Drug Abuse Surveillance Test (DAST): is a 10-item self-administered tool that provides a quick assessment of drug use problems (69). It has been validated in the varied setting; substance-abuse patients (70), primary care (71), in the workplace (72), and adapted for use with adolescents (73). Furthermore, it is also validated to assess uses of substances such as khat chewing, cigarette smoking, and alcohol drinking in undergraduate medical students (38). In present study, khat chewer is the proportion of individuals who had ever used khat at least once in his/her lifetime. Cigarette smoker is the proportion of individuals who had ever used cigarette at least once in his/her lifetime. Alcohol drinker is the proportion of individuals who had ever used alcohol drinks such as tela, tej, katicala/areke, beer, wine, or other drinks that can cause intoxication at least once in his/her lifetime.

The questionnaire was pretested on 13 randomly selected undergraduate medical students of Hawasa University. After checking the collected data for completeness, it was double entered in to Epi-data version 3.1 and exported into SPSS version 21 for analysis. Incomplete and inconsistent data were excluded from the analysis. The data were processed by using descriptive analysis, including frequency distribution, cross tabulation and summary measures. Bivariate logistic regression was used to measure the association between independent variables with dependent variables. Multivariate logistic regression analysis was carried out to find the role of each significant variable in determining the relevant sub-scale scores. Statistical significance was accepted at $p<0.05$.

Results

Sociodemographic Characteristics

From a total of 265 medical students who received the questionnaire, 260 completed the survey, yielding an overall response rate of 98.1%. The age of the respondents ranged between 18 and 27 with the mean (SD) of 22.03 ($\pm$2.62) years. In the present study, most respondents were male (63.1%), single in marital status (75.4%), living in campus (91.5%) and had monthly income of < 700 ETB

(52.7%)(Table 2). Regarding their academic year, religion and ethnicity, 54 (20.8%) were from sixth year, 130 (50%) were Orthodox believers and 139 (53.9%) were Oromo respectively.

Prevalence of Depression, Anxiety and Stress

The present study demonstrated strong internal consistency between depression and anxiety (r = 0.494, p<0.001), depression and stress (r = 0.456, p<0.001), stress and anxiety (r = 0.420, p<0.001). Furthermore, proportion of respondents detected to have depression, anxiety and stress symptoms were 52.3%, 60.8% and 40.4% respectively. Finally, percentage of respondents who had extremely severe symptoms of depression, anxiety and stress were 6.2%, 16.2% and 2.3% respectively (Table 3).

Prevalence of Substance Use

In the present study, the overall prevalence of khat chewing, cigarette smoking and alcohol drinking was found to be 21.5%, 15.4% and 33.8% respectively. Moreover, 32.1% of respondents chewed khat for 2 – 4 years, 35.0% smoked cigarette for 1 – 12 months and 55.7% drank alcohol for > 4 years. Lastly, 44.6% of khat chewers and 75% of alcohol drinkers were occasional users while 32.5% of cigarette smoker smoked cigarette once a week (Table 4).

Association of Socio-Demographic Characteristics and Use of Substance with Depression Level

In a binary logistic regression analysis of the present study, depression had no statistical association with age, educational year, religion and ethnicity (Table 5). Conversely, it had significant association with respondents gender; in which males were 0.59 times less likely depressed than females (95% CI: 0.36 – 0.99). It was also associated with monthly income, wherein respondents who had monthly income of ≤ 700 ETB were 1.68 times more likely depressed than those who had >700 ETB (95% CI: 1.03 – 2.74). Depression was also associated to marital status, in which respondents who had not in relationship (single) were 0.53 times less likely depressed than those in relationship (married)(95%: 0.30 – 0.95). It was also associated to residency, wherein non-dormitory living respondents were 10.52 more likely depressed than those living in dormitory (95% CI: 2.41 – 46.00).

Concerning to substance use/ behavioral factors/, depressions had statistical association with khat chewing: respondents who chewed khat were 2.07 times more likely depressed than non-chewers (95% CI: 1.11 - 3.83). It was also statistically associated with cigarette smoking: respondents who smoke cigarette were 2.42 times more likely depressed than non-smoker (95% CI: 1.17 - 5.00). Lastly, it was also associated to alcohol drinking: participants who drink alcohol were 2.01 times more likely depressed than non-drinkers (95% CI: 1.19 - 3.41).

Association of Socio-Demographic Characteristics and Use of Substance with Anxiety Level

In a binary logistic regression analysis of the present study, anxiety had no significant statistical association with monthly income, religion, and ethnicity (Table 6). Contrariwise, anxiety was statistically associated to age of respondents; those ranged between 20 – 24 years were 1.92 times less likely anxious than those > 24 years (95% CI: 0.34 – 0.99). It had also statistical association with gender of respondents; males were 0.58 less likely anxious than females (95% CI: 0.34 – 0.99). Similarly, it was associated to marital status; respondents who had not in relationship (single) were 0.52 times less likely anxious than those in relationship (married)(95%: 0.28 – 0.96). Anxiety was also associated to educational level of respondents, third year respondents were 4.85 more likely more anxious than sixth year students (95% CI: 1.93 – 12.19). It had also statistical association with residency, non-dormitory living respondents were 15.48 more likely anxious than those living in dormitory (95% CI: 2.05 – 117.00).

Concerning to substance use/ behavioral factors/, anxiety had statistical association with khat chewing; respondent who chewed khat were 2.03 times more likely anxious than non-chewers (95% CI: 1.06 - 3.91). It was also statistically associated with cigarette smoking; respondents that smoke cigarette were 2.52 times more likely anxious than non-smoker (95% CI: 1.15 – 5.55). Finally, anxiety was also associated to alcohol drinking; participants who drink alcohol were 1.75 times more anxious than non-drinkers (95% CI: 1.01 – 3.01).

Association of Socio-Demographic Characteristicsand Use of Substance withStress Level

In the present study, when impact of socio-demographic characteristics and use of substance on stress level was evaluated with binary logistic regression analysis, stress had no association with religion and ethnicity (Table 7). However, it had significant statistical association with age of respondents; those ranged < 20 years were 2.07 more likely stressed than those > 24 years (95% CI: 1.01 – 4.27). It was also associated to gender of respondents with males were 0.57 time less likely stressed than females (95% CI: 0.34 –

0.95). Furthermore, it was also associated to monthly income, participants who had monthly income of ≤ 700 ETB were 1.87 times more likely stressed than those who had > 700 ETB (95% CI: 1.13 − 3.10). Similarly, it was also associated to marital status, respondents who had not in relationship (single) were 0.55 times less likely stressed than those in relationship (married)(95%: 0.31 − 0.96). Likewise, it was also associated to educational level of respondents, in which second year respondents were 4.92 times more likely stressed than those in sixth year (95% CI: 2.09 − 11.61). Again, it was also statistically associated to residency, in which non-dormitory living respondents were 3.52 more likely stressed than those in dormitory (95% CI: 1.38 − 8.97).

Concerning to substance use/ behavioral factors/, stress had statistical association with khat chewing, respondents who chewed khat were 1.99 times more likely stressed than non-chewers (95% CI: 1.09 − 3.61). Furthermore, it was statistically associated with cigarette smoking; respondent who smoke cigarette were 2.02 times more likely stressed than non-smoker (95% CI: 1.02 − 3.98). Finally, stress was also associated to alcohol drinking; participants who drink alcohol were 2.10 more likely stressed than non-drinkers (95% CI: 1.24 − 3.54).

Predictor Risk Factors For Depression

In the present study, gender, monthly income, marital status, residency, khat chewing, cigarette smoking and alcohol drinking were candidates for multivariate logistic regressions (P-value < 0.05). However, monthly income, residency, and alcohol drinking were identified as predictors of the depression (**Table 8**). For instance, the odd of being depressed was more likely increases with 2.13 times among respondents who had monthly income of ≤ 700 ETB than > 700 ETB (95% CI: 1.24 − 3.66). Similarly, the odd of being depressed was also more likely increases with 13.10 times among respondents living non-dormitory than living in dormitory (95% CI: 2.82 − 60.70). Finally, the odd of being depressed were markedly increases with 1.68 times among alcohol users than non-users (95% CI: 1.00 − 3.08).

Predictor Risk Factors For Anxiety

In the present study, age, sex, marital status, educational year, residency, khat chewing, cigarette smoking and alcohol drinking were candidates for multivariate logistic regressions (P-value < 0.05). However, gender, marital status, educational year, residency and cigarette smoking were found to be predictors of the anxiety (**Table 9**). For instance, the odd of being anxious was markedly decreases with 0.51 times among male than female participants (95% CI: 0.27 − 0.94). The odd of being anxious was also markedly decreases with 0.46 times among participants who were single than those who were married (95% CI: 0.23 − 0.94). After first year, the odd of being anxious were markedly decreased as educational level increased. For instance, the odd of being anxious was more likely increases with 20.43 times in second year students than sixth years (95% CI: 4.40 − 94.89). Furthermore, the odd of being anxious was more likely increases with 58.72 times among participants living in non-dormitory than in dormitory (95% CI: 6.33 − 544.87). Finally, the odd of being anxious were markedly increases with 2.60 times among cigarette smokers than non-smokers (95% CI: 1.01 − 8.41).

Predictor Risk Factors For Stress

In the present study, age, sex, monthly income, marital status, educational year, residency, khat chewing, drinking alcohols and cigarette smoking were candidate for multivariate logistic regressions (P-value < 0.05). However, monthly income, educational year, residency, khat chewing and drinking alcohol were found to be predictors of the stress (**Table 10**). The odd of being stressed was markedly increases with 2.21 times among participants who had monthly income of ≤ 700 ETB than those who had above 700 ETB (95% CI: 1.08 - 4.51). Similarly, the odd of being stressed were markedly increases with 3.05 times in second year participants than sixth years (95% CI: 1.05 - 12.47). The odd of being stressed was also more likely increases with 4.82 times among respondent living in non-dormitory than in dormitory (95% CI: 1.61 - 14.46).

Also, the odd of being stressed was more likely increases with 1.90 times among khat chewers than non-chewers (95% CI: 1.02 - 5.01). Finally, the odd of being stressed was more likely increases with 1.84 times among alcohol users than non-users (95% CI: 1.01 - 3.42).

Discussion

Severe mental health problems interfere with individuals' emotional, cognitive, as well as social abilities that can lead to underemployment and reduced productivity (74,75). Depression, anxiety, and stress are now the major mental health problems that cause disability globally, and no one is immune to these problems (76,77). Therefore, the main aim of this study was to determine the

prevalence and severity of depression, anxiety and stress among medical undergraduate students of Arsi University and their association with substance use.

A medical school is a tertiary educational institution that involve a difficult examination system and year-long courses over a long duration (8,25,52,78–81). Actually, medical academic atmosphere promotes competition among learners rather than co-operation (82). Furthermore, medical students are overloaded with a tremendous amount of information with limited time for internalization, new study environment with obligations to succeed especially during preclinical encounters (25,83,84). This greater degree of workload creates feeling of distress and disappointments that predisposes students to have difficulties in solving problems, impaired judgments; absenteeism from class lesson and break their mental stability (38,41,85–87).

In the present study, the overall prevalence of depression, anxiety and stress symptoms were 52.3%, 60.8% and 40.4% respectively. Actually, our present finding is almost similar to the prevalence reported by Basudan et al (88), Kulsoom and Afsar (89), Inam et al (45) and Iqbal et al (17). Conversely, it is higher than study report of Shamsuddin et al (90), Faud et al (91), Moutinho et al (92), Mehta et al (93) and Wong et al (54). This difference could be due to difference in cultural perception of stressful factors, economic burden, very high tuition fees, lack of family support, and higher or lower 'readiness' to report different complaint. In our present setup, academic counselling is not a common practice which may be also a contributor.

In the present study, proportion of respondents who had extremely severe symptoms of depression, anxiety and stress were 6.2%, 16.2% and 2.3% respectively. This prevalence was similar with finding of Patil et al (94). However, inconsistent with study result of Iqbal et al (17), Gan et al (95) and Al-Ani Radeef and Ghazi (96). Discrepancies stemming from methodology and type of questionnaire used, could account for this high prevalence obtained by the aforementioned authors. The other possible reasons for the variability could be due to certain differences in the curricula, teaching facilities, qualification and experience of the instructors, and levels of care given to the students.

In this cross-sectional study we correlated socio-demographic risk factors and substance use (as independent variables) with the prevalence of depression, anxiety and stress level amongst the undergraduate medical students of Arsi University. In the present study, those students living in non-dormitory have considerably higher degree of depression, anxiety and stress as compared to students living within dorm. It can be inferred from the above data that living in dormitory came out to be a protective. This finding is in line with study reported by Rab et al (40) and Shendarkar (97). However, it is inconsistent with study report of Kunwar et al (98) and Liaqat et al (99). This unequivocal distribution tells us that probably depression, anxiety and stress are associated with a multitude of factors such as poor dormitory conditions, more economic stress, distance from the family, less structured environment, and problems dealing with roommates, which might be different or parallel in the two study groups under consideration.

In the present study, medical students who had lower monthly income were more likely depressed and stressed as compared to students who had higher monthly income. Despite the fact that food and dormitory services are provided to the students by the university, students need money for excursions, to print hand outs, to buy dressings, and other basic necessities (38). This indicates that financial constraints could be an additional source of depression, anxiety and stress besides academic stressors (100–104). However, other studies have noted no difference (105,106). Again, geographical, racial and sample size differences may possibly account for these different results.

In the present study, there was a significant association between students' academic year and level of anxiety and stress. There are many associated studies that implies stress and stress-related illness was highest in 2nd year medical students as compared to other academic year (38,45,84,107). The possible reason could be the amount and complexity of the material to be learned in the second year with progressive assessments of anatomy, physiology, and biochemistry that they have to pass to join the next higher level. Additional supportive evidence is senior students may developed skills of how to manage stress and stress-related illness than students in the early years (108).

In the present study, higher scores of anxiety and stress were associated with female and married students. Genetic, psychosocial, and hormonal factors have been adduced as possible reason for this differences (109,110). This is in line with previous literature which suggests that female medical students have higher rates of symptoms of depression, anxiety, and stress (111–113). The findings can also be contextualized with literature among the general population, which suggest that women are more likely to suffer from depression and anxiety than men (114). However, our finding is inconsistent with result finding of Koochaki *et al* (105) that noted no gender difference in level of stress among Iranian medical students. The possible explanation for this difference may be setup difference, technological difference, and curricular approach. Also, these studies have used different measuring tool.

In the present study, the prevalence of khat chewing was found to be 21.5%. And, the level of stress was higher among khat chewers than nonchewers students. The possible reason is that khat stimulates adrenocortical function. This finding suggests that khat chewers show diversified psychological symptoms including stress, anxiety, depression, and emotional instability; this is due to its content of cathinone and cathine, which causes an increase in the release of cortisol, norepinephrine, and dopamine from presynaptic storage site (sympathomimetic effect) in the body of chewers (115,116). Consequently, the respondents experience psychostimulatory effects such as excitement and talkativeness initially. Then, they develop excessive worry, depressed mood, and tension (115,116). Supporting evidence was reported by Al'Absi *et al* (117), that the level of cortisol in saliva samples was higher among khat chewers than nonchewers. The other possible justification is the socioeconomic problems caused due to increased demand of money to buy khat.

In the present study, the prevalence of cigarette smoking among medical students was 15.4%. And, the level of anxiety was higher among cigarette smokers than non-smokers students. As reported by Parrott (118), smokers often mistakenly report that cigarettes help relieves feelings of stress, but the fact is it does not alleviate stress. However, the stress levels of adult smokers are slightly higher than those of nonsmokers (38). The level of stress was increased as they develop regular patterns of smoking and cessation of smoking reduces stress. Furthermore, chronic nicotine intake affects the brain reward system function which results in depression and anxiety symptoms (62).

In the present study, the prevalence of alcohol consumption among medical students was 33.8%, which is consistent with studies reported by Kalayu et al (119). However, it was a bit higher than study reported by Seipone et al (120), because studies have used different measuring tool. In the present study, alcohol users were 1.68 times more likely to have depression and 1.84 times more likely to have stress than non-user students. Alcohol drinking predisposes students to mental illness (38). A related finding was reported by Britton (121) that there is a positive relationship between stress and alcohol use. Brady and Sonne (122) have described that people under chronic stress drinks more alcohol and eat less nutritious foods than nonstressed individuals. Alcohol largely affects the brain and the endocrine system. Alcohol is both a sedative and a depressant that affects the central nervous system. Alcohol changes levels of serotonin and other neurotransmitters in the brain. This can make stress and stress related-illness worse (123,124). Furthermore, alcohol actually increases the stress response by stimulating production of stress hormones. Alcohol directly activates the hypothalamus-pituitary-adrenal axis to produce excess cortisol(38).

Conclusion

Healthy medical students are likely to become healthy doctors. To sum up, overall prevalence rate of depression, anxiety and stress is alarmingly high among Arsi University medical students. Monthly income, residency and alcohol drinking were identified as risk factors of both depression and stress. In addition to after mention factors educational year and khat chewing were identified as risk factors stress. However, gender, marital status, educational year, residency and cigarette smoking were identified as risk factors of anxiety. Besides stress reduction interventions, implementation of structured orientation program that addresses issues like expectations for each phase, how students are going to be evaluated, how to cope and how to get through each phase smoothly were recommended. In addition to awareness creation about the adverse effect of substance use, establishing student counseling center in the campus with qualified staff is also highly recommended. Family or close friend problem (recent death or accident), distance from family, frequency of money sent and being first from home to go far were not assessed.

Abbreviations

AOR – Adjusted odds ratio

COR – Crudes odds ratio

CI – Confidence interval

Epi Data – Epidemiological Data

ETB – Ethiopia Birr

SD – Standard deviation

Declarations

AVAILABILITY OF DATA AND MATERIALS

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

ETHICAL ISSUE

Ethical approval was obtained from Arsi University Ethical Review Committee. Written informed consent was taken from the students during data collection. The confidentiality was kept anonymous.

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COMPETING INTERESTS

The authors declare that there is no conflict of interests regarding the publication of this paper.

AUTHORS' CONTRIBUTIONS

LM, GB and DW had participated in the design of the study data analyses and manuscript preparation. All authors have equal contribution; and all authors have read and approved the final manuscript.

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RIGHTS AND PERMISSIONS

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Tables

Table No. 1: Items of Depression, Anxiety and Stress Scale-21 with their respective.

	Depression	Anxiety	Stress
Normal	0-9	0-7	0-14
Mild	10-13	8-9	15-18
Moderate	14-20	10-14	19-25
Severe	21-27	15-19	26-33
Extremely Severe	28+	20+	34

Table No. 2: Sociodemographic characteristics in relation to gender, N = 260, AU, January 2019.

Sociodemographic Variables		Male	Female	Total (N = 260)
Age	< 20 Years	36 (54.5%)	30 (45.5%)	66 (100.0%)
	20 - 24 Years	**91 (67.4%)**	**44 (32.6%)**	**135 (100.0%)**
	> 24 Years	37 (62.7%)	22 (37.3%)	59 (100.0%)
Marital Status	**Single**	**128 (65.3%)**	**68 (34.7%)**	**196 (100.0%)**
	Married	36 (56.3%)	28 (43.8%)	64 (100.0%)
Monthly Income	**≤ 700 ETB**	**87 (63.5%)**	**50 (36.5%)**	**137 (100.0%)**
	> 700 ETB	77 (62.6%)	46 (37.4%)	123 (100.0%)
Educational Year	1st Year	27 (61.4%)	17 (38.6%)	44 (100.0%)
	2nd Year	22 (48.9%)	23 (51.1%)	45 (100.0%)
	3rd Year	23 (59.0%)	16 (41.0%)	39 (100.0%)
	4th Year	36 (76.6%)	11 (23.4%)	47 (100.0%)
	5th Year	23 (74.2%)	8 (25.8%)	31 (100.0%)
	6th Year	**33 (61.1%)**	**21 (38.9%)**	**54 (100.0%)**
Residency	Non-dormitory	11 (50.0%)	11 (50.0%)	22 (100.0%)
	Dormitory	**153 (64.3%)**	**85 (35.7%)**	**238 (100.0%)**
Religion	**Orthodox**	**80 (61.5%)**	**50 (38.5%)**	**130 (100.0%)**
	Muslim	40 (62.5%)	24 (37.5%)	64 (100.0%)
	Protestant	42 (67.7%)	20 (32.3%)	62 (100.0%)
	Others[¥]	2 (50.0%)	2 (50.0%)	4 (100.0%)
Ethnicity	**Oromo**	**97 (69.8%)**	**42 (30.2%)**	**139 (100.0%)**
	Amhara	38 (53.5%)	33 (46.5%)	71 (100.0%)
	Sidama	2 (33.3%)	4 (66.7%)	6 (100.0%)
	Tigre	7 (50.0%)	7 (50.0%)	14 (100.0%)
	Wolayita	5 (62.5%)	3 (37.5%)	8 (100.0%)
	Gurage	12 (66.7%)	6 (33.3%)	18 (100.0%)
	Others[††]	3 (75.0%)	1 (25.0%)	4 (100.0%)

Key: - [¥]Catholic, Waqefatta, Faith and Pagan. [††]Silte, Harari and Kambata. ETB = Ethiopian Birr. Current exchange rate: $1USD = 36.05 ETB.

Table No. 3: Severity distribution of depression, anxiety and stress in relation to gender, N = 260, AU, January 2019.

Sub-scale		Sex		Total
		Male	Female	N (%)
		N (%)	N (%)	
Depression	Normal	85 (50.6)	39 (42.4)	124 (47.7)
	Mild	34 (20.2)	20 (21.7)	54 (20.8)
	Moderate	29 (17.3)	16 (17.4)	45 (17.3)
	Severe	15 (8.9)	6 (6.5)	21 (8.1)
	Extremely Severe	**5 (3.0)**	**11 (12.0)**	**16 (6.2)**
Anxiety	Normal	73 (43.5)	29 (31.5)	102 (39.2)
	Mild	12 (7.1)	10 (10.9)	22 (8.5)
	Moderate	44 (26.2)	19 (20.7)	63 (24.2)
	Severe	20 (11.9)	11 (12.0)	31 (11.9)
	Extremely Severe	**19 (11.3)**	**23 (25.0)**	**42 (16.2)**
Stress	Normal	104 (61.9)	51 (55.4)	155 (59.6)
	Mild	23 (13.7)	14 (15.2)	37 (14.2)
	Moderate	31 (18.5)	10 (10.9)	41 (15.8)
	Severe	8 (4.8%)	13 (14.1%)	21 (8.1%)
	Extremely Severe	**2 (1.2%)**	**4 (4.3%)**	**6 (2.3%)**

Table No. 4: Distribution of behavioral factors /substance use/ among study participants in relation to gender, N = 260, AU, January 2019.

Substance use		Khat chewer	Cigarette smoker	Alcohol drinker
		N (%)	N (%)	N (%)
Duration	< 1 month	12 (21.4)	9 (22.5)	9 (10.2)
	1 – 12 months	14 (25)	**14 (35.0)**	8 (9.1)
	2 – 4 years	**18 (32.1)**	11 (27.5)	22 (25)
	> 4 years	12 (21.4)	6 (15)	**49 (55.7)**
Frequency	Every day	10 (17.9)	12 (30)	0 (0)
	2 – 3 days per week	13 (23.2)	5 (12.5)	6 (6.8)
	Once a week	8 (14.3)	**13 (32.5)**	16 (18.2)
	Occasionally	**25 (44.6)**	10 (25)	**66 (75)**

Table No. 5: Bivariate logistic regression of factors associated with depression, N = 260, AU, January 2019.

Variables		Total	Depression		COR
		N (%)	Yes	No	
			N (%)	N (%)	
Age	< 20 years	66 (100.0)	35 (53.0)	31 (47.0)	1.09 (0.54 − 2.20)
	20 − 24 years	135 (100.0)	71 (52.6)	64 (47.4)	1.07 (0.58 − 1.98)
	> 24 years	59 (100.0)	30 (50.8)	29 (49.2)	1.00*
Sex	Male	164 (100.0)	78 (47.6)	86 (52.4)	**0.59 (0.36 − 0.99)**
	Female	96 (100.0)	58 (60.4)	38 (39.6)	1.00*
Monthly income	≤ 700 ETB	137 (100.0)	80 (58.4)	57 (41.6)	**1.68 (1.03 − 2.74)**
	> 700 ETB	123 (100.0)	56 (45.5)	67 (54.5)	1.00*
Marital status	Single	196 (100.0)	95 (48.5)	101 (51.5)	**0.53 (0.30 − 0.95)**
	Married	64 (100.0)	41 (64.1)	23 (35.9)	1.00*
Educational year	First year	44 (100.0)	23 (52.3)	21 (47.7)	1.27 (0.57 − 2.82)
	Second year	45 (100.0)	26 (57.8)	19 (42.2)	1.59 (0.72 − 3.52)
	Third year	39 (100.0)	18 (46.2)	21 (53.8)	0.99 (0.44 − 2.27)
	Fourth year	47 (100.0)	25 (53.2)	22 (46.8)	1.32 (0.60 − 2.89)
	Fifth year	31 (100.0)	19 (61.3)	12 (38.7)	1.84 (0.75 − 4.51)
	Sixth year	54 (100.0)	25 (46.3)	29 (53.7)	1.00*
Residency	Non-dormitory	22 (100.0)	20 (90.9)	2 (9.1)	**10.52 (2.41 − 46.00)**
	Dormitory	238 (100.0)	116 (48.7)	122 (51.3)	1.00*
Religion	Orthodox	130 (100.0)	68 (52.3)	62 (47.7)	4.39 (0.43 − 44.51)
	Muslim	64 (100.0)	38 (59.4)	26 (40.6)	3.29 (0.33 − 32.47)
	Protestant	62 (100.0)	29 (46.8)	33 (53.2)	2.64 (0.26 − 26.76)
	Others	4 (100.0)	1 (25.0)	3 (75.0)	1.00*
Ethnicity	Oromo	139 (100.0)	67 (48.2)	72 (51.8)	0.93 (0.13 − 6.79)
	Amhara	71 (100.0)	40 (56.3)	31 (43.7)	1.29 (0.17 − 9.68)
	Sidama	6 (100.0)	3 (50.0)	3 (50.0)	1.00 (0.08 − 12.56)
	Tigre	14 (100.0)	7 (50.0)	7 (50.0)	1.00 (0.11 − 9.23)
	Wolayita	8 (100.0)	6 (75.0)	2 (25.0)	3.00 (0.24 − 37.67)
	Gurage	18 (100.0)	11 (61.1)	7 (38.9)	1.57 (0.18 − 13.86)
	Others	4 (100.0)	2 (50.0)	2 (50.0)	1.00*
Khat chewing	Yes	56 (100.0)	37 (66.1)	19 (33.9)	**2.07 (1.11 - 3.83)**
	No	204 (100.0)	99 (48.5)	105 (51.5)	1.00*
Cigarette smoking	Yes	40 (100.0)	28 (70.0)	12 (30.0)	**2.42 (1.17 - 5.00)**
	No	220 (100.0)	108 (49.1)	112 (50.9)	1.00*
Alcohol drinking	Yes	88 (100.0)	56 (63.6)	32 (36.4)	**2.01 (1.19 - 3.41)**
	No	172 (100.0)	80 (46.5)	92 (53.5)	1.00*

Table No. 6: Bivariate logistic regression of factors associated with anxiety, N = 260, AU, January 2019.

Variables		Total N = 260	Anxiety		COR
			Yes N (%)	No N (%)	
Age	< 20 years	66 (100.0)	41 (62.1)	25 (37.9)	1.70 (0.83 − 3.46)
	20 − 24 years	135 (100.0)	88 (65.2)	47 (34.8)	**1.94 (1.04 − 3.61)**
	> 24 years	59 (100.0)	29 (49.2)	30 (50.8)	1.00*
Sex	Male	164 (100.0)	92 (56.1)	72 (43.9)	**0.58 (0.34 − 0.99)**
	Female	96 (100.0)	66 (68.8)	30 (31.3)	1.00*
Monthly income	≤ 700 ETB	137 (100.0)	89 (65.0)	48 (35.0)	1.45 (0.88 − 2.39)
	> 700 ETB	123 (100.0)	69 (56.1)	54 (43.9)	1.00*
Marital status	Single	196 (100.0)	112 (57.1)	84 (42.9)	**0.52 (0.28 − 0.96)**
	Married	64 (100.0)	46 (71.9)	18 (28.1)	1.00*
Educational year	First year	44 (100.0)	25 (56.8)	19 (43.2)	1.91 (0.85 − 4.28)
	Second year	45 (100.0)	34 (75.6)	11 (24.4)	**4.50 (1.88 − 10.73)**
	Third year	39 (100.0)	30 (76.9)	9 (23.1)	**4.85 (1.93 − 12.19)**
	Fourth year	47 (100.0)	29 (61.7)	18 (38.3)	**2.34 (1.05 − 5.22)**
	Fifth year	31 (100.0)	18 (58.1)	13 (41.9)	2.014 (0.82 − 4.94)
	Sixth year	54 (100.0)	22 (40.7)	32 (59.3)	1.00*
Residency	Non-dormitory	22 (100.0)	21 (95.5)	1 (4.5)	**15.48 (2.05 − 116.00)**
	Dormitory	238 (100.0)	137 (57.6)	101 (42.4)	1.00*
Religion	Orthodox	130 (100.0)	75 (57.7)	55 (42.3)	0.93 (0.40 - 2.17)
	Muslim	64 (100.0)	45 (70.3)	19 (29.7)	0.79 (0.31 - 2.03)
	Protestant	62 (100.0)	34 (54.8)	28 (45.2)	0.77 (0.31 - 1.90)
	Others	4 (100.0)	4 (100.0)	0 (0.0)	1.00*
Ethnicity	Oromo	139 (100.0)	82 (59.0)	57 (41.0)	1.44 (0.20 − 10.51)
	Amhara	71 (100.0)	42 (59.2)	29 (40.8)	1.45 (0.19 − 10.88)
	Sidama	6 (100.0)	5 (83.3)	1 (16.7)	5.00 (0.27 − 91.52)
	Tigre	14 (100.0)	10 (71.4)	4 (28.6)	2.50 (0.26 − 24.38)
	Wolayita	8 (100.0)	5 (62.5)	3 (37.5)	1.67 (0.15 − 18.87)
	Gurage	18 (100.0)	12 (66.7)	6 (33.3)	2.00 (0.22 − 17.89)
	Others	4 (100.0)	2 (50.0)	2 (50.0)	1.00*
Khat chewing	Yes	56 (100.0)	41 (73.2)	15 (26.8)	**2.03 (1.06 - 3.91)**
	No	204 (100.0)	117 (57.4)	87 (42.6)	1.00*
Cigarette smoking	Yes	40 (100.0)	31 (77.5)	9 (22.5)	**2.52 (1.15 - 5.55)**
	No	220 (100.0)	127 (57.7)	93 (42.3)	1.00*
Alcohol drinking	Yes	88 (100.0)	61 (69.3)	27 (30.7)	**1.75 (1.01 - 3.01)**
	No	172 (100.0)	97 (56.4)	75 (43.6)	1.00*

Key: - *Reference category.

Table No. 7: Bivariate logistic regression of factors associated with stress, N = 260, AU, January 2019.

Variables		Total N = 260	Stress		COR
			Yes N (%)	No N (%)	
Age	< 20 years	66 (100.0)	34 (51.5)	32 (48.5)	**2.07 (1.01 − 4.27)**
	20 − 24 years	135 (100.0)	51 (37.8)	84 (62.2)	1.18 (0.62 − 2.25)
	> 24 years	59 (100.0)	20 (33.9)	39 (66.1)	1.00*
Sex	Male	164 (100.0)	58 (35.4)	106 (64.6)	**0.57 (0.34 − 0.95)**
	Female	96 (100.0)	47 (49.0)	49 (51.0)	1.00*
Monthly income	≤ 700 ETB	137 (100.0)	65 (47.4)	72 (52.6)	**1.87 (1.13 − 3.10)**
	> 700 ETB	123 (100.0)	40 (32.5)	83 (67.5)	1.00*
Marital status	Single	196 (100.0)	72 (36.7)	124 (63.3)	**0.55 (0.31 − 0.96)**
	Married	64 (100.0)	33 (51.6)	31 (48.4)	1.00*
Educational year	First year	44 (100.0)	15 (34.1)	29 (65.9)	1.03 (0.45 − 2.40)
	Second year	45 (100.0)	32 (71.1)	13 (28.9)	**4.92 (2.09 − 11.61)**
	Third year	39 (100.0)	10 (25.6)	29 (74.4)	0.69 (0.28 − 1.72)
	Fourth year	47 (100.0)	18 (38.3)	29 (61.7)	1.24 (0.55 − 2.81)
	Fifth year	31 (100.0)	12 (38.7)	19 (61.3)	1.26 (0.50 − 3.16)
	Sixth year	54 (100.0)	18 (33.3)	36 (66.7)	1.00*
Residency	Non-dormitory	22 (100.0)	15 (68.2)	7 (31.8)	**3.52 (1.38 − 8.97)**
	Dormitory	238 (100.0)	90 (37.8)	148 (62.2)	1.00*
Religion	Orthodox	130 (100.0)	50 (38.5)	80 (61.5)	0.83 (0.11 − 6.25)
	Muslim	64 (100.0)	29 (45.3)	35 (54.7)	0.63 (0.09 − 4.58)
	Protestant	62 (100.0)	24 (38.7)	38 (61.3)	0.63 (0.08 − 4.79)
	Others	4 (100.0)	2 (50.0)	2 (50.0)	1.00*
Ethnicity	Oromo	139 (100.0)	55 (39.6)	84 (60.4)	0.22 (0.02 − 2.15)
	Amhara	71 (100.0)	28 (39.4)	43 (60.6)	0.22 (0.02 − 2.19)
	Sidama	6 (100.0)	4 (66.7)	2 (33.3)	0.67 (0.04 − 11.29)
	Tigre	14 (100.0)	6 (42.9)	8 (57.1)	0.25 (0.02 − 3.04)
	Wolayita	8 (100.0)	2 (25.0)	6 (75.0)	0.11 (0.01 − 1.78)
	Gurage	18 (100.0)	7 (38.9)	11 (61.1)	0.21 (0.02 − 2.47)
	Others	4 (100.0)	3 (75.0)	1 (25.0)	1.00*
Khat chewing	Yes	56 (100.0)	30 (53.6)	26 (46.4)	**1.99 (1.09 - 3.61)**
	No	204 (100.0)	75 (36.8)	129 (63.2)	1.00*
Cigarette smoking	Yes	40 (100.0)	22 (55.0)	18 (45.0)	**2.02 (1.02 - 3.98)**
	No	220 (100.0)	83 (37.7)	137 (62.3)	1.00*
Alcohol drinking	Yes	88 (100.0)	46 (52.3)	42 (47.7)	**2.10 (1.24 - 3.54)**
	No	172 (100.0)	59 (34.3)	113 (65.7)	1.00*

Key: - *Reference category.

Table No. 8: Multivariate logistic regression of depression and predictor variables, N = 260, AU, January 2019.

Predictor variables		Total	Depression		AOR
		N (%)	Yes	No	
			N (%)	N (%)	
Sex	Male	164 (100.0)	78 (47.6)	86 (52.4)	0.57 (0.33 - 0.99)
	Female	96 (100.0)	58 (60.4)	38 (39.6)	1.00*
Monthly income	≤ 700 ETB	137 (100.0)	80 (58.4)	57 (41.6)	**2.13 (1.24 - 3.66)**
	> 700 ETB	123 (100.0)	56 (45.5)	67 (54.5)	1.00*
Marital status	Single	196 (100.0)	95 (48.5)	101 (51.5)	0.56 (0.30 - 1.06)
	Married	64 (100.0)	41 (64.1)	23 (35.9)	1.00*
Residency	Non-dormitory	22 (100.0)	20 (90.9)	2 (9.1)	**13.10 (2.82 - 60.70)**
	Dormitory	238 (100.0)	116 (48.7)	122 (51.3)	1.00*
Khat chewing	Yes	56 (100.0)	37 (66.1)	19 (33.9)	1.33 (0.54 - 3.28)
	No	204 (100.0)	99 (48.5)	105 (51.5)	1.00*
Cigarette smoking	Yes	40 (100.0)	28 (70.0)	12 (30.0)	2.05 (0.75- 5.60)
	No	220 (100.0)	108 (49.1)	112 (50.9)	1.00*
Alcohol drinking	Yes	88 (100.0)	56 (63.6)	32 (36.4)	**1.68 (1.00 - 3.08)**
	No	172 (100.0)	80 (46.5)	92 (53.5)	1.00*

Key: - *Reference category.

Table No. 9: Multivariate logistic regression of anxiety and predictor variables, N = 260, AU, January 2019.

Predictor variables		Total N = 260	Anxiety		AOR
			Yes N (%)	No N (%)	
Age	< 20 years	66 (100.0)	41 (62.1)	25 (37.9)	0.31 (0.07 - 1.46)
	20 − 24 years	135 (100.0)	88 (65.2)	47 (34.8)	0.56 (0.21 - 1.54)
	> 24 years	59 (100.0)	29 (49.2)	30 (50.8)	1.00*
Sex	Male	164 (100.0)	92 (56.1)	72 (43.9)	**0.51 (0.27 - 0.94)**
	Female	96 (100.0)	66 (68.8)	30 (31.3)	1.00*
Marital status	Single	196 (100.0)	112 (57.1)	84 (42.9)	**0.46 (0.23 - 0.94)**
	Married	64 (100.0)	46 (71.9)	18 (28.1)	1.00*
Educational year	First year	44 (100.0)	25 (56.8)	19 (43.2)	**12.91 (2.40 - 69.36)**
	Second year	45 (100.0)	34 (75.6)	11 (24.4)	**20.43 (4.40 - 94.89)**
	Third year	39 (100.0)	30 (76.9)	9 (23.1)	**18.03 (4.54 - 71.58)**
	Fourth year	47 (100.0)	29 (61.7)	18 (38.3)	**9.16 (2.65 - 31.66)**
	Fifth year	31 (100.0)	18 (58.1)	13 (41.9)	**6.89 (2.10 - 22.55)**
	Sixth year	54 (100.0)	22 (40.7)	32 (59.3)	1.00*
Residency	Non-dormitory	22 (100.0)	21 (95.5)	1 (4.5)	**58.72 (6.33 - 544.87)**
	Dormitory	238 (100.0)	137 (57.6)	101 (42.4)	1.00*
Khat chewing	Yes	56 (100.0)	37 (66.1)	19 (33.9)	1.57 (0.57 - 4.33)
	No	204 (100.0)	99 (48.5)	105 (51.5)	1.00*
Cigarette smoking	Yes	40 (100.0)	28 (70.0)	12 (30.0)	**2.60 (1.01 - 8.41)**
	No	220 (100.0)	108 (49.1)	112 (50.9)	1.00*
Alcohol drinking	Yes	88 (100.0)	56 (63.6)	32 (36.4)	1.41 (0.73 - 2.74)
	No	172 (100.0)	80 (46.5)	92 (53.5)	1.00*

Key: - *Reference category.

Table No. 10: Multivariate logistic regression of stress and predictor variables, N = 260, AU, January 2019.

Predictor variables		Total N = 260	Stress		AOR
			Yes N (%)	No N (%)	
Age	< 20 years	66 (100.0)	34 (51.5)	32 (48.5)	1.94 (0.42 - 8.92)
	20 − 24 years	135 (100.0)	51 (37.8)	84 (62.2)	0.90 (0.35 - 2.33)
	> 24 years	59 (100.0)	20 (33.9)	39 (66.1)	1.00*
Sex	Male	164 (100.0)	58 (35.4)	106 (64.6)	0.59 (0.33 - 1.06)
	Female	96 (100.0)	47 (49.0)	49 (51.0)	1.00*
Monthly income	≤ 700 ETB	137 (100.0)	65 (47.4)	72 (52.6)	**2.21 (1.08 - 4.51)**
	> 700 ETB	123 (100.0)	40 (32.5)	83 (67.5)	1.00*
Marital status	Single	196 (100.0)	72 (36.7)	124 (63.3)	0.55 (0.29 - 1.04)
	Married	64 (100.0)	33 (51.6)	31 (48.4)	1.00*
Educational year	First year	44 (100.0)	15 (34.1)	29 (65.9)	0.57 (0.11 - 3.04)
	Second year	45 (100.0)	32 (71.1)	13 (28.9)	**3.05 (1.05 - 12.47)**
	Third year	39 (100.0)	10 (25.6)	29 (74.4)	0.53 (0.15 - 1.89)
	Fourth year	47 (100.0)	18 (38.3)	29 (61.7)	1.14 (0.34 - 3.79)
	Fifth year	31 (100.0)	12 (38.7)	19 (61.3)	1.15 (0.33 - 3.99)
	Sixth year	54 (100.0)	18 (33.3)	36 (66.7)	1.00*
Residency	Non-dormitory	22 (100.0)	15 (68.2)	7 (31.8)	**4.82 (1.61 - 14.46)**
	Dormitory	238 (100.0)	90 (37.8)	148 (62.2)	1.00*
Khat chewing	Yes	56 (100.0)	37 (66.1)	19 (33.9)	**1.90 (1.02 - 5.01)**
	No	204 (100.0)	99 (48.5)	105 (51.5)	1.00*
Cigarette smoking	Yes	40 (100.0)	28 (70.0)	12 (30.0)	0.99 (0.33 - 2.96)
	No	220 (100.0)	108 (49.1)	112 (50.9)	1.00*
Alcohol drinking	Yes	88 (100.0)	56 (63.6)	32 (36.4)	**1.84 (1.01 - 3.42)**
	No	172 (100.0)	80 (46.5)	92 (53.5)	1.00*

Key: - *Reference category.