



Contents lists available at ScienceDirect

Currents in Pharmacy Teaching and Learning

journal homepage: <https://www.journals.elsevier.com/currents-in-pharmacy-teaching-and-learning>

Research Note

Perceived stress and its predictors, stressors and coping strategies among undergraduate pharmacy students in northern Nigeria

Roland N. Okoro^{a,*}, Aminu A. Biambo^b, Muslim O. Jamiu^c^a Department of Clinical Pharmacy and Pharmacy Administration, Faculty of Pharmacy, University of Maiduguri, Borno State, Nigeria^b Department of Clinical Pharmacy and Pharmacy Practice, Faculty of Pharmaceutical Sciences, Usmanu Danfodiyo University, Sokoto State, Nigeria^c Department of Clinical Pharmacy and Pharmacy Practice, Faculty of Pharmaceutical Sciences, University of Ilorin, Kwara State, Nigeria

ARTICLE INFO

Keywords:

Coping strategies
Northern Nigeria
Pharmacy students
Stress
Stressors
Stress predictors

ABSTRACT

Introduction: Pharmacy education may be associated with stress due to the nature of its curriculum and expectations of high-quality services from students on graduation. This study evaluated perceived stress and its predictors, stressors, and coping strategies among undergraduate pharmacy students in northern Nigeria.

Methods: This was a prospective longitudinal study conducted at three randomly selected pharmacy schools in northern Nigeria. The validated 10-item Perceived Stress Scale was used to assess participant stress at the beginning (Time₁) and middle (Time₂) of the semester. Data were analyzed with descriptive statistics, a paired sample *t*-test, point-biserial correlations, and multivariate linear regression at $P < .05$. **Results:** The stress scores at Time₁ and Time₂ of the 866 participants were 18.3 ± 6.0 and 19.3 ± 5.4 , respectively. Most participants at both Time₁ and Time₂ had moderate stress (76.6% and 79.6%, respectively). The multivariate regression analyses revealed gender, marital status, year of study, and access to education funds as significant predictors of stress. Major stressors identified were academic-related (76.3%) and environment-related (24.6%). Time management (69.6%) and relaxation (46.1%) were the major coping strategies.

Conclusions: Moderate stress was observed among the majority of participants. Identified predictors of stress, stressors, and coping mechanisms were similar to those previously reported in other countries. Although most pharmacy students adopt positive strategies to mitigate stress, pharmacy educators should further adopt holistic initiatives to help students reduce their stress.

© 2021 Elsevier Inc. All rights reserved.

Introduction

Undergraduate pharmacy education in Nigeria is currently a five-year program of ten semesters.¹ This duration is for students who gained admission directly from high school via entrance examination (Unified Tertiary Matriculation Examination [UTME]). On the other hand, the duration of study for those with prior higher degrees that are eligible for direct entry (DE) is four years of eight semesters. However, it is noteworthy that a six-year doctor of pharmacy (PharmD) program received recent approval from the National Universities Commission.² In view of this recent development, all Nigerian universities offering pharmacy degrees are now required to gradually phase out the five-year bachelor of pharmacy program for a more patient-centered PharmD program. As tenable in other parts of the world, pharmacy education in Nigeria can be challenging, time-demanding, and stressful. Therefore, commitment and dedication are needed for students to be successful in the program.

* Corresponding author.

E-mail address: orolandn@gmail.com (R.N. Okoro).

According to the World Health Organization, mental health is defined as “a state of wellbeing in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully and is able to contribute towards the community.”³ Conversely, stress is an imbalance between demands and the perceived ability to thrive in the midst of these demands.⁴ In other words, stress is a mental or emotional state of an individual that results from an unfriendly and taxing environment and causes a threat to an individual's mental wellbeing and overall quality of life (QoL).^{5–7} Stress among students has greatly increased over the past few decades, with those in higher institutions of learning being more susceptible compared to other student groups.^{8–10} Generally, critical education in addition to the self-decision of the students as they fully mature are linked to the occurrence of a high level of stress.^{11,12} Against this background, a higher incidence of mental health problems such as stress, anxiety, and depression have been reported among students in healthcare fields compared to the general population.^{13,14} The most frequently documented causes of stress, and specific stressors among pharmacy students, are academic overload, prolonged lecture periods, absence of leisure time, and hard coursework, among others.¹⁵ Similarly, academics, gender, marital status, and age have been identified as potential independent predictors of stress.^{16–19} Others predictors are religion, especially among the younger population,²⁰ being a freshman,^{21,22} lack of funds,²³ and poor academic performance.^{24,25} A minor level of stress, otherwise referred to as “favorable stress,” is beneficial and enables students to become more dynamic learners and performers.²⁶ On the contrary, excessive and persistent stress are associated with reduced self-esteem, impaired QoL, poor academic performance, negative future personal or professional development, anxiety, and depression.^{24,27–36} Stress can be compounded by external factors such as accidental major events or environmental changes or by internal factors such as self-expectations, feelings, or attitudes.³⁷

Students in healthcare fields may experience an excessive amount of stress, occurring at different time points of a semester or years in training, during the transition from undergraduate to professional or graduate programs, or upon graduation.¹⁵ In an effort to cushion these negative effects, some students adopt several coping strategies. These strategies may improve or deteriorate their QoL.³⁸ In light of this, pharmacy education regulatory boards of some developed countries, especially the United States of America (USA), have prescribed assessment of student achievement and readiness,³⁹ including screening students for stress and providing stress mitigation measures.⁴⁰ Therefore, screening, early identification of modifiable stressors, provision of enabling social environments, and counseling services may help mitigate stressful academic life and improve the academic performance of pharmacy students. Despite these data, there is underrepresentation of mental health data, especially stress data, in the literature examining African undergraduate pharmacy students. This current study was informed by a previous study conducted among undergraduate pharmacy students in northern Nigeria that reported stress as a major cause of impaired QoL of the participants.¹ Thus, exploring stress in pharmacy students was of particular interest to the authors in order to better recommend mitigating interventions. The objectives of this study were to measure the stress level of undergraduate pharmacy students in northern Nigeria, to compare stress levels across two-time points, to investigate significant independent predictors of stress, and to identify specific stressors and coping strategies employed by students.

Methods

This was a longitudinal study conducted at three randomly selected pharmacy schools in northern Nigeria. Currently, northern Nigeria has eight accredited pharmacy schools spread across three geopolitical zones. Pharmacy schools in each zone were pooled together to select one for the study through ballot selection by a non-pharmacy student. At the end of this exercise, pharmacy schools at the University of Maiduguri (UNIX) from the North-East, University of Ilorin (UNIY) from the North-Central, and Usmanu Danfodiyo University (UNIZ) from the North-West were selected for the study. The study population included all registered bachelor of pharmacy students from the first- to fifth-year of study during the 2018–2019 academic year. An online sample size calculator was used to calculate the minimum sample size required for the study. The overall undergraduate pharmacy student population of 1220 in the three schools, a 5% margin of error, and a 95% confidence interval were used to calculate a minimum sample size of 293. The study was approved by the research and ethics committees of the selected pharmacy schools. Only willing students took part in the study and written informed consent was obtained from willing participants after they carefully reviewed the study objectives.

Survey instrument

The survey instrument was the Perceived Stress Scale (PSS-10).^{41,42} The questionnaire also included additional open-ended questions for the specific stressors and the mitigating strategies adapted from a previous study.⁴³ PSS-10 items responses were on a 5-point Likert scale (0 = never to 4 = very often). The positively worded items 4, 5, 7, and 8 were reverse scored. Individual scores of the PSS-10 were summed to produce a score ranging from 0 to 40, with higher scores indicating higher perceived stress. Scores ranging from 0 to 13, 14 to 26, and 27 to 40 are considered to be low stress, moderate stress, and high stress, respectively. Demographic and school characteristics including age, sex, marital status, religion, pharmacy school, year of study, admission mode (UTME or DE), prior higher degree, access to education funds (financial support through scholarships, loans, or family members), and cumulative grade point average (CGPA) (0–5 points where 5 is excellent academic performance) were collected.

Data collection

The instrument used for data collection was self-administered in the English language to participants twice during the first semester of the 2018–2019 academic year, at Time₁ (semester beginning) and Time₂ (mid-semester). Time₁ was one day during the first four weeks of the semester while Time₂ was eight weeks from Time₁ to rule out the effects of examination on the study findings.⁴⁴ These time points were chosen by the authors because they considered the beginning and middle of semesters as a better period for assessing

usual stress in students. During this period, acute stress due to examinations can be successfully ruled out because evidence has shown that academic examination is a cause of greater stress.^{18,45} On each occasion of the survey, the paper-questionnaires were shared in the lecture halls and retrieved immediately by one of the authors. It took approximately 20 min to complete.

Statistical analysis

Descriptive statistics (means and standard deviations, frequencies, and percentages) were used to highlight the study results. Respondents who did not complete any of the 10-item PSS were excluded from the study. Missing data on any stress items were excluded in the mean calculation. A paired-sample *t*-test was used to measure the differences in participants' stress scores across the two-time points. The point-biserial correlations (r_{pb}) were used to investigate the strength of association between independent variables and overall PSS-10 score (Time₁ and Time₂ average). For correlation analysis, categorical variables were coded as follows: age (< 25 years = 0, ≥ 25 years = 1), gender (male = 0, female = 1), marital status (married = 0, single = 1), religion (Islam = 0, Christianity = 1), admission mode (DE = 0, UTME = 1), prior degree (yes = 0, no = 1), study year (3 to 5 = 0, 1 to 2 = 1), access to education funding (easy = 0, difficult = 1), and CGPA (≥ 3.1 = 0, < 3.1 = 1).

All variables with significant correlation were fed into the multivariate linear regression analysis as the final model using the enter method to investigate significant independent predictors of overall stress scores. The significance level was considered at $P < .05$. Responses on the most encountered stressors and the coping strategies employed by the participants were structured, coded, and content analyzed. The codes were derived from the summary of the responses that were carefully selected and subsequently organized into categories. These responses were summarized descriptively as frequencies and percentages. SPSS for Windows, version 21 (IBM Corporation) was used to perform the statistical analyses.

Results

Of the 1220 eligible students across the three pharmacy schools, 902 participated at Time₁ while 871 completed both survey administrations. Of the number that participated at Time₁, 8 were excluded due to incomplete data while 23 were lost at Time₂. Overall, questionnaires of 13 respondents were excluded from the study due to incomplete data. At the end of Time₂, valid questionnaires of 866 respondents were recorded. The response rate for each university was 75.1% (358/477) for UNIZ, 68.1% (226/332) for UNYI, and 68.6% (282/411) for UNIZ. The overall response rate was 71% (866/1220). The age range of the majority (65.8%) of the participants was 20 to 25 years. The average age of the participants was 23.2 ± 3.5 years. A majority of the participants were male (58.0%) and of Islamic religion (64.0%). Table 1 presents a summary of the participants' socio-demographic and academic characteristics according to pharmacy school.

The average PSS-10 scores of the participants at Time₁ and Time₂ were observed to be 18.30 ± 5.99 and 19.32 ± 5.35 , respectively. Categorization of the mean PSS-10 scores revealed that moderate stress level was dominant, followed by low stress levels at both time points and across pharmacy schools as shown in Fig. 1.

Across the time points, the average PSS-10 scores were significantly increased at Time₂ by 1.02 ± 7.72 ($P < .001$). Participants' socio-demographic characteristics affected their stress score at Time₂ (from Time₁). Accordingly, significantly increased stress scores at Time₂ were observed in participants aged ≤ 25, males, singles, adherents of Islam and Christianity, those who gained admission through UTME, and those without a prior degree. Others include participants from all pharmacy schools, those in the first- and second-year of study, those that had difficult access to education funds, and those with CGPA ranging from 3.1 to 5.0 points (Table 2).

The overall stress scores (Time₁ and Time₂ average) were significantly positively correlated with gender ($r_{pb} = 0.157$, $P < .001$), marital status ($r_{pb} = 0.071$, $P = .038$), and access to education funds ($r_{pb} = 0.109$, $P = .002$). On the other hand, there was a significant negative correlation between the overall stress scores and the year of study ($r_{pb} = -0.085$, $P = .012$). The multivariate linear regression analyses still revealed gender, marital status, year of study, and access to education funds as significant independent predictors of overall stress scores (Table 3).

The participants' reported sources of stress, stressors, and coping strategies from the two time points revealed major sources of stress as academic (76.3%, $n = 661/866$) and environment-related (24.6%, $n = 213/866$). An overwhelming proportion of the participants (83.1%, $n = 720/866$) agreed that pharmacy education in Nigeria is stressful, while 65.8% ($n = 570/866$) reported that stress impacted their educational success. Top individual stressors revealed by our study were too many tests/assignments/practicals (38.9%, $n = 337/866$) and harsh weather/heat (18%, $n = 156/866$). The most common coping strategies utilized by the participants were time management (69.6%, $n = 603/866$) and regular relaxation (46.1%, $n = 399/866$) as shown in Table 4.

Discussion

The current study adds to the literature regarding stress in undergraduate pharmacy students in Africa. While previous studies on African undergraduate pharmacy stress were limited to the use of generic stress instruments, cross-sectional designs, and/or one or a few pharmacy schools,^{46,47} the present study used a specific stress instrument (PSS-10) as well as a longitudinal study design with larger and more varied participants from more pharmacy schools.

Overall, the lower average stress score found by our study compared to that reported in the USA and Indonesia suggest that Nigerian pharmacy students are less stressed than their peers in these countries.^{27,31,48} Differences in environments, facilities, and curricula could be responsible for this observation. On the other hand, the higher average stress scores recorded in our study compared to that of the USA general population,⁴⁹ suggesting that the undergraduate pharmacy program is stressful. Categorically, a majority of our study

Table 1

Social, demographic, and academic characteristics of participants (N = 866).

Variable	n (%)			
	Total (N = 866)	UNIX (n = 358)	UNIJ (n = 226)	UNIZ (n = 282)
Age (years) ^a				
<20	107 (12.4)	20 (5.6)	64 (28.3)	23 (8.2)
20–25	570 (65.8)	226 (63.1)	152 (67.3)	192 (68)
>25	177 (20.4)	111 (31)	10 (4.4)	56 (19.9)
Sex ^a				
Male	502 (58)	232 (64.8)	89 (39.4)	181 (64.2)
Female	354 (40.8)	124 (34.6)	137 (60.6)	93 (33)
Marital status ^a				
Single	814 (94)	321 (89.7)	218 (96.5)	275 (97.5)
Married	51 (5.9)	37 (10.3)	8 (3.5)	6 (2.1)
Religion ^a				
Islam	554 (64)	223 (62.3)	105 (46.5)	226 (80.1)
Christianity	311 (35.9)	134 (37.4)	121 (53.5)	56 (19.9)
Year of study				
First	128 (14.8)	46 (12.8)	34 (15)	48 (17)
Second	235 (27.1)	74 (20.7)	82 (36.3)	79 (28)
Third	185 (21.4)	99 (27.7)	41 (18.1)	45 (16)
Fourth	157 (18.1)	80 (22.3)	28 (12.4)	49 (17.4)
Fifth	161 (18.6)	59 (16.5)	41 (18.1)	61 (21.6)
Admission mode ^a				
DE	76 (8.8)	32 (8.9)	43 (19)	1 (0.4)
UTME	788 (91)	326 (91.1)	183 (81)	279 (98.9)
Prior degree ^a				
No	784 (90.5)	341 (95.2)	179 (79.2)	264 (93.6)
Yes	72 (8.3)	16 (4.5)	47 (20.8)	9 (3.2)
Access to education funds ^a				
Easy	439 (50.7)	169 (47.2)	141 (62.4)	129 (45.8)
Difficult	402 (46.4)	181 (50.6)	83 (36.7)	138 (48.9)
CGPA ^a				
<3.1	106 (12.2)	48 (13.4)	38 (16.8)	20 (7.1)
3.1–4.0	402 (46.4)	207 (57.8)	86 (38.1)	109 (38.7)
>4.0	228 (26.3)	50 (14)	68 (30.1)	110 (39)

CGPA = cumulative grade point average; DE = direct entry; UTME = Unified Tertiary Matriculation Examination; UNIX = University of Maiduguri; UNIJ = University of Ilorin; UNIZ = Usmanu Danfodiyo University.

^a These data had missing values.

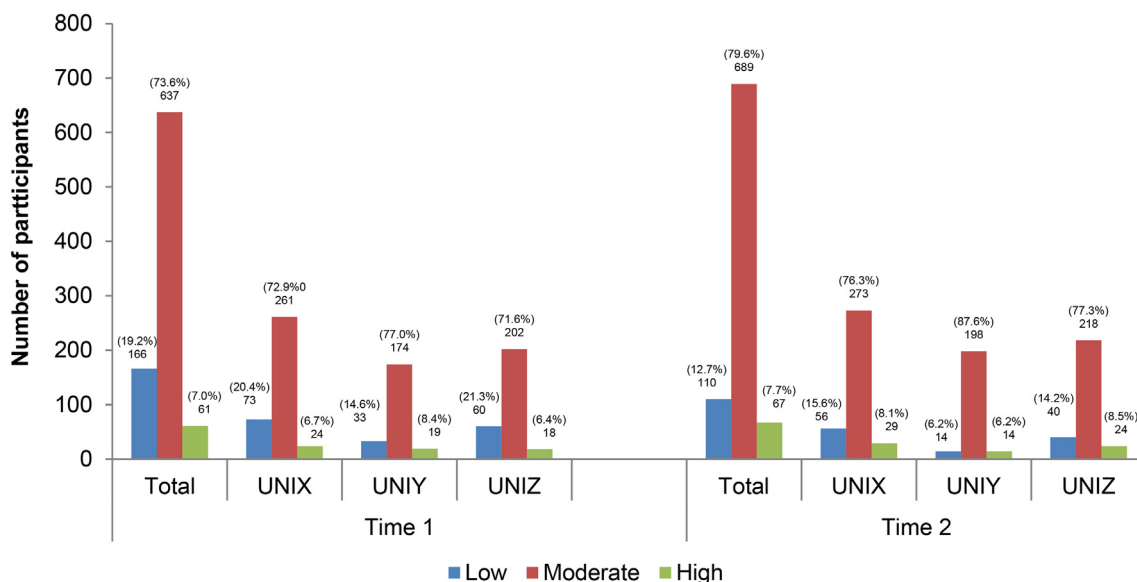
**Fig. 1.** Overall participants' stress levels by pharmacy school (N = 866).

Table 2

Comparative results of the participant stress scores at two time points of the semester.

Variable	PSS-10 score		Time ₁ – Time ₂ Mean difference (SD)	<i>t</i>	df	<i>P</i> value
	Time ₁	Time ₂				
	Mean (SD)	Mean (SD)				
PSS-10 scores	18.30 (5.99)	19.32 (5.35)	–1.02 (7.72)	–3.88	863	< 0.001
Age (years)						
< 20	18.56 (6.01)	19.99 (4.86)	–1.43 (7.28)	–2.03	106	0.05
20–25	18.21 (6.19)	19.31 (5.21)	–1.10 (7.67)	–3.42	567	0.001
>25	18.36 (5.36)	18.85 (6.04)	–0.49 (8.20)	–0.79	176	0.43
Gender						
Male	17.50 (5.87)	19.01 (5.57)	–1.50 (7.97)	–4.22	499	< 0.001
Female	19.38 (6.04)	19.77 (4.99)	–0.39 (7.35)	–1.00	353	0.32
Marital status						
Single	18.40 (5.95)	19.37 (5.32)	–0.98 (7.68)	–3.62	811	< 0.001
Married	16.71 (6.39)	18.55 (5.87)	–1.84 (8.35)	–1.58	50	0.12
Religion						
Islam	18.31 (5.95)	19.21 (5.22)	–0.89 (7.64)	–2.74	551	0.006
Christianity	18.30 (6.04)	19.49 (5.59)	–1.19 (7.83)	–2.69	310	0.008
Mode of admission						
DE	18.91 (6.54)	19.15 (5.93)	–0.24 (8.56)	–0.24	75	0.81
UTME	18.24 (5.94)	19.34 (5.30)	–1.10 (7.64)	–4.03	785	< 0.001
Prior degree						
No	18.24 (5.92)	19.27 (5.30)	–1.03 (7.64)	–3.76	781	< 0.001
Yes	18.96 (6.65)	19.72 (5.75)	–0.76 (8.16)	–0.79	71	0.43
Pharmacy school						
UNIX	18.01 (6.09)	18.93 (5.68)	–0.93 (8.26)	–2.12	357	0.04
UNY	18.99 (5.72)	20.23 (4.52)	–1.24 (6.69)	–2.79	225	0.006
UNIZ	18.11 (6.04)	19.07 (5.48)	–0.96 (7.79)	–2.06	279	0.04
Year of study						
First	17.47 (6.17)	19.00 (5.28)	–1.53 (7.78)	–2.21	125	0.03
Second	17.87 (6.01)	19.10 (5.59)	–1.23 (7.82)	–2.41	234	0.02
Third	19.02 (6.11)	19.91 (5.03)	–0.90 (7.53)	–1.62	184	0.11
Fourth	18.19 (5.81)	18.93 (5.82)	–0.74 (7.91)	–1.17	156	0.24
Fifth	18.85 (5.70)	19.57 (4.93)	–0.72 (7.60)	–1.20	160	0.23
Access to education funds						
Easy	18.27 (5.74)	18.62 (5.66)	–0.35 (0.36)	–0.97	454	0.33
Difficult	18.48 (6.32)	20.21 (4.70)	–1.73 (7.61)	–4.41	377	< 0.001
CGPA						
< 3.1	19.33 (5.81)	18.80 (5.92)	0.53 (8.20)	0.66	105	0.51
3.1–4.0	18.68 (5.82)	19.67 (5.21)	–0.99 (7.77)	–2.55	401	0.01
>4.0	17.53 (6.23)	19.05 (5.34)	–1.52 (7.35)	–3.13	227	0.002

CGPA = cumulative grade point average; DE = direct entry; PSS = Perceived Stress Scale; UTME = Unified Tertiary Matriculation Examination; UNIX = University of Maiduguri; UNY = University of Ilorin; UNIZ = Usmanu Danfodiyo University.

Table 3

Multivariate linear regression model for the predictors of stress among pharmacy students.

Independent variable ^a	Unstandardized Coefficients		Standardized Coefficients	<i>t</i>	<i>P</i> value	95% CI for B	
	B	Standard Error				Lower Bound	Upper Bound
(Constant)	16.618	0.603		27.539	<0.001	15.434	17.820
Gender	1.399	0.289	0.166	4.845	<0.001	0.832	1.965
Marital status	1.661	0.597	0.095	2.782	0.006	0.489	2.833
Year of study	–0.799	0.290	–0.095	–2.754	0.006	–1.369	–0.230
Access to education funds	0.951	0.284	0.114	3.347	0.001	0.393	1.509

PSS = Perceived Stress Score.

^a The dependent variable was overall PSS-10 score.

participants reported moderate stress, followed by mild stress consistent with that noted in the Indian medical students.⁵⁰ These findings suggest that the magnitude of stress encountered in Nigerian pharmacy schools is comparable with that of Indian medical schools.

The evaluation of stress levels across the two time points revealed a significantly increased overall average stress score at mid-semester. This finding demonstrates that pharmacy students' stress levels vary with time throughout an academic year. As expected, mid-semester academic activities are usually greater in number and more and demanding since students in all study years have more academic work such as lectures, practical classes/reporting, assignments/tests, and are also gradually preparing for the end of semester examinations. Our findings corroborate that of other previous studies that reported that pharmacy students' stress levels significantly differed with time.^{28,44} On the contrary, some previous studies did not find any significant stress difference with time.^{43,44} It is

Table 4

Various sources of stress and most common stressors and coping strategies of pharmacy students.

Variable ^a	n (%)
Stress source	
Academic	661 (76.3)
Environment	213 (24.6)
Finance	211 (24.4)
Personal	165 (19.1)
Family	72 (8.3)
Specific Stressors	
Too many test/assignments/practical	337 (38.9)
Harsh weather/heat	156 (18)
Long daily lecture period	138 (15.9)
Too many and bulky courses/congested lecture schedules	128 (14.8)
Long distance from home/to lecture halls	101 (11.7)
Erratic power supply	67 (7.7)
Inadequate time for study	63 (7.3)
Coping strategies	
Time management	603 (69.6)
Regular relaxation	399 (46.1)
Time with family/friends	294 (34)
Listening to music	195 (22.5)
Regular exercise	176 (20.3)
Emotional eating	93 (10.7)
Watching movies	62 (7.2)
Dancing	58 (6.7)

UNIX = University of Maiduguri; UNII = University of Ilorin; UNIZ = Usmanu Danfodiyo University.

^a Multiple responses were allowed.

noteworthy that male stress increased significantly across the two time points while that of females did not. No clear reason could be attributed to this result; nevertheless, further study may be needed to explore this difference.

The correlation and multivariate analyses of the overall study data revealed female gender, single marital status, lower years of study, and difficult access to education funds as significant independent predictors of higher stress. The gender-specific finding is congruent with the results of some previous studies among pharmacy students in Indonesia⁴⁸ and the USA⁵¹ and medical students in Pakistan¹⁸ and Egypt.⁵² The difference in the genetic make-up of both genders could explain this finding. It has since been noted that the cyclical fluctuations of estrogens and progesterone in females enhance the response to stress.⁵³ Similarly, single marital status being predictive of higher stress could partly be due to lack of a couple's social support, which is stress inhibiting. One study suggests that having a long-term bond alters hormones in a way that reduces stress, indicating that unmarried students are more responsive to psychological stress than their married counterparts.⁵⁴ This finding underscores the need for pharmacy educators to offer support, especially social support, to students with single marital status. Furthermore, the first- and second-years of the study predicted higher stress in our study population consistent with the result of a previous study.⁵¹ Our study finding is comparable with that of a Malaysian study that reported only the first-year of study as a significant predictor of higher stress in pharmacy students.⁵⁵ Freshmen often lack independence, transition directly from high school to university, move away from home, and are cut-off from social support from family and childhood friends; this could be very stressful. Therefore, there is a need for senior student-led support programs to promote the mentorship of freshmen to help them acclimatize to the new pharmacy school environment. On the other hand, the significant highest stress in students in the second-year of the study could be due to the transition from the first-year basic science courses to more demanding professional pharmacy courses. This finding underscores the need for the Nigerian pharmacy educators to routinely conduct stress personality assessment and offer stress reduction measures, such as guided visualization/visual imagery exercise,^{56,57} cognitive-behavioral stress management,⁵⁸ among others for students in the second-year of study. In addition, programs on academic work-life balance, sleep hygiene, and personal relationships are also of priority to this category of students. In contrast, a previous Indonesian pharmacy student study reported that students in the upper study years were more likely to experience higher stress.⁴⁸ A plausible reason for this difference could be variations in undergraduate pharmacy education curricula.

Difficult access to education funds as a significant predictor of higher stress in our study population may be due to financial constraints experienced by most students in the developing nations, including Nigeria. This is because a majority of the population of the developing nations lives below the poverty line and student loans are non-existent or inefficient in these countries.^{23,59} In good agreement with our result, a previous study identified financial barriers as a significant determinant of stress in university students in developing nations.²³ Therefore, the provision of financial support in form of scholarships and loans by the government, corporate organizations, and wealthy individuals for these categories of students could help mitigate their stress, improve their mental wellbeing, and improve academic performance. In addition, the provision of financial opportunities such as school tailored study and work programs by university management could also be of tremendous assistance to the affected students.

The most predominant source of stress in our study participants was academics, with too many assignments/tests/practicals as the highest-ranked stressor. This is in line with the results of some previous studies that studied pharmacy and nursing students in other countries.^{44,45,60,61} In contrast, bulky materials were ranked highest among pharmacy students in Ghana.⁴³ Differences in environments, students' characteristics, and curricula could account for this observation. The most common coping or stress mitigating measure

adopted by our study participants was time management, consistent with the finding of a previous study conducted in Ghana.⁴³ Comparable to our result, exercising was reported as the top stress-relieving strategy among pharmacy students in the USA.²⁷ These findings imply that most pharmacy students adopt positive coping strategies to mitigate stress. Despite the high level of positive coping strategies noted in our study, there is still a need for holistic intervention programs at the level of students, parents, and pharmacy educators. Interventions that would provide a conducive learning environment, offer psychological support, and help pharmacy students cope more effectively with stressors, especially the academic ones, are warranted.

Limitations

This study had limitations that need to be considered in the interpretation of the study findings. The main limitation of the study was that information bias cannot be ruled out due to the use of a self-administered questionnaire. The use of self-reported academic scores is another limitation. Our study findings may not be generalizable to pharmacy schools in southern Nigeria. Despite voluntary and anonymous participation in the study, the authors were privileged to meet the non-respondents to elicit the reasons for not participating in the survey. The most common reasons given were personal, sensitive nature of the study, and lack of interest and time. Absenteeism due to illness or travel on the day of the survey was another reason gathered. Furthermore, relatively low representations of some study categories such as the married, DE admission mode, and prior degree participants could introduce bias and was another limitation. Therefore, it is recommended that further studies should strategize to enhance representations of these categories of students. The study instrument, though previously validated, was not pilot-tested among our study respondents. Lastly, the paucity of undergraduate pharmacy students' PSS-10 studies in Africa made an exhaustive comparison of our study findings with others of African origin impossible.

Conclusions

This study showed that the majority of our participants were moderately stressed, while the overall stress level was significantly increased at mid-semester. Being a female, unmarried, in the first- and second-study years, and having difficult access to education funds were significant independent predictors of higher stress in our study population. The most common reported stressors were academic-related and environment-related, whereas time management and relaxation were the top stress mitigating measures employed by the participants. Therefore, pharmacy educators should adopt holistic initiatives to help students reduce their stress. These initiatives include the provision of counseling services, social support programs, regular student peer-meetings, and extracurricular activities. These measures in the long term have the capacity to improve the quality of life and academic performance of the students.

Acknowledgement

The authors wish to express their profound gratitude to all the students who participated in the study.

References

- Okoro RN, Muslim JO, Biambo AA. Quality of life of pharmacy students in Northern Nigeria. *Int J Pharm Pract* 2020;28(4):395-404. <http://dx.doi.org/10.1111/ijpp.12624>.
- Now that PharmD has been approved. *Pharmanews*, 27. ; October 2016..Accessed 30 July 2020. <https://www.pharmanewsonline.com/now-that-pharmd-has-been-approved/>.
- World Health Organization. *Promoting mental health: concepts, emerging evidence, practice (Summary Report)*. Geneva: World Health Organization. 2004.
- Moore DA, Truscott ML, Clair LS, et al. Effects of a veterinary student leadership program on measures of stress and academic performance. *J Vet Med Educ* 2007;34(2):112. <http://dx.doi.org/10.3138/jvme.34.2.112>.
- Salam A, Yousuf R, Bakar SA, et al. Stress among medical students in Malaysia: A systematic review of literatures. *Int Med J* 2013;20:649-55.
- Yusoff MB, Rahim AA, Baba AA, et al. Prevalence and associated factors of stress, anxiety and depression among prospective medical students. *Asian J Psychiatr* 2013;6:128-33.
- Wilbert C. *The relationship between stress and mental health among students at the University of Twente (undergraduate project)*. Netherlands: University of Twente. 2012.
- Behere SP, Yadav R, Behere PB. A comparative study of stress among students of medicine, engineering and nursing. *Indian J Psychol Med* 2011;33(2):145-8. <http://dx.doi.org/10.4103/0253-7176.92064>.
- Hamaideh SH. Stressors and reactions to stressors among university students. *Int J Soc Psychiatry* 2011;57(1):69-80. <http://dx.doi.org/10.1177/0020764009348442>.
- Dessie Y, Ebrahin J, Awoke T. Mental distress among university students in Ethiopia: a cross-sectional survey. *Pan Afr Med J* 2013;15:95-9. <http://dx.doi.org/10.11604/pamj.2013.15.95.2173>.
- Bhandari P. Stress and health related quality of life of Nepalese students studying in South Korea: a cross-sectional study. *BMC Psychol* 2012;10:26-35. <http://dx.doi.org/10.1186/1477-7525-10-26>.
- Chen L, Wang L, Qiu XH, et al. Depression among Chinese students: prevalence and socio demographic correlates. *PLoS ONE* 2013;8(3):e58379. <http://dx.doi.org/10.1371/journal.pone.0058379>.
- Shamsuddin K, Fadzil F, Ismail WSW, et al. Correlates of depression, anxiety and stress among Malaysian university students. *Asian J Psychiatry* 2013;6(4):318-23. <http://dx.doi.org/10.1016/j.ajp.2013.01.014>.
- Teh CK, Ngo CW, Zulkifli RA, et al. Depression, anxiety and stress among undergraduate students: a cross sectional study. *Open J Epidemiol* 2015;5:260-8. <http://dx.doi.org/10.4236/ojepi.2015.54030>.
- Beck DL, Hackett MB, Srivastava R, et al. Perceived level and sources of stress in university professional schools. *J Nurs Educ* 1997;36(4):180-6.
- Robotham D, Julian C. Stress and the higher education student: a critical review of the literature. *J Fur High Edu* 2006;30(2):107-17. <http://dx.doi.org/10.1080/03098770600617513>.
- Yussuf AD, Issa BA, Ajiboye PO, et al. The correlates of stress, coping styles and psychiatric morbidity in the first year of medical education at a Nigerian university. *Afr J Psychiatry* 2013;16(3):206-15. <http://dx.doi.org/10.4314/ajpsy.v16i3.28>.

18. Shah M, Hasan S, Malik S, et al. Perceived stress, sources and severity of stress among medical undergraduates in a Pakistani medical school. *BMC Med Educ* 2010;10(2). <http://dx.doi.org/10.1186/1472-6920-10-2>.
19. Brahmabhatt KR, Nadeera VP, Prasanna KS, et al. Perceived stress and sources of stress among medical undergraduates in a private medical college in Mangalore. *India Int J Biomed Adv Res* 2013;4(2):128-36.
20. Senanayake B, Wickramasinghe SI, Edirippulige S, et al. Stress and its Social Determinants – A Qualitative Study Reflecting the Perceptions of a Select Small Group of the Public in Sri Lanka. *Indian J Psychol Med* 2020;42(1):69-79.
21. Ekpenyong CE, Daniel NE, Aribio E. Associations between academic stressors, reaction to stress, coping strategies and musculoskeletal disorders among college students. *Ethiopian Journal of Health Sciences* 2013;23(2):98-112.
22. Esawi AS, Radi S, Yousri H. Stress/stressors as perceived by baccalaureate Saudi nursing students. *Middle East J Sci Res* 2013;14(2):193-202. <http://dx.doi.org/10.5829/idosi.mejsr.2013.14.2.734>.
23. James BO, Thomas IF, Omoaregba JO, et al. Psychological correlates of perceived stress among undergraduate medical students in Nigeria. *Int J Med Educ* 2017;8:382-8. <http://dx.doi.org/10.5116/ijme.59c6.3075>.
24. Sohail N. Stress and academic performance among medical students. *J Coll Physicians Surg Pak* 2013;23(1):67-71.
25. Taylor MF, Owusi-Banahana NO. Stress among part-time Business students. A study in a Ghanaian university campus. *IFE Psychologia: An International Journal of Psychology* 2010;18(1):137-57.
26. Kaplan HI, Saddock BJ. *Synopsis of Psychiatry: Behavioral Sciences/ Clinical Psychiatry. Learning Theory*. 8th ed. Philadelphia: Lippincott Williams & Wilkins; 2000. p. 148-54.
27. Marshall LL, Allison A, Nykamp D, et al. Perceived stress and quality of life among doctor of pharmacy students. *Am J Pharm Educ* 2008;72(6):137. <http://dx.doi.org/10.5688/aj7206137>.
28. Hirsch JD, Do AH, Hollenbach KA, et al. Students' health-related quality of life across the preclinical pharmacy curriculum. *Am J Pharm Educ* 2009;73(8):147. <http://dx.doi.org/10.5688/aj7308147>.
29. Rafidah K, Azizah A, Norzaidi MD, et al. The impact of perceived stress and stress factors on academic performance of pre-diploma science students: a Malaysian study. *IJSRE* 2009;2(1):13-26.
30. Al-Dubai SAR, Al-Naggar RA, Alshagga MA, et al. Stress and coping strategies of students in a medical faculty in Malaysia. *Malays J Med Sci* 2011;18(3):57-64.
31. Gallagher CT, Mehta AN, Selvan R, et al. Perceived stress levels among undergraduate pharmacy students in the UK. *Curr Pharm Teach Learn* 2014;6(3):437-41.
32. Edwards D, Burnard P, Bennett K, et al. A longitudinal study of stress and self-esteem in student nurses. *Nurse Educ Today* 2010;30(1):78-84. <http://dx.doi.org/10.1016/j.nedt.2009.06.008>.
33. Gomathi KG, Ahmed S, Sreedharan J. Psychological health of first-year health professional students in a medical university in the United Arab Emirates. *Sultan Qaboos Uni Med J* 2012;12(2):206-13. <http://dx.doi.org/10.12816/0003114>.
34. Sohail N. Stress and academic performance among medical students. *J Coll Physicians Surg Pak* 2013;23(1):67-71.
35. Dafaalla M, Farah A, Bashir S, et al. Depression, anxiety, and stress in Sudanese medical students: a cross sectional study on role of quality of life and social support. *Am J Educ Res* 2016;26(13):937-42. <http://dx.doi.org/10.12691/education-4-13-4>.
36. Jahan F, Siddiqui MA, Mitwally M, et al. Perception of stress, anxiety, depression and coping strategies among medical students at Oman medical college. *Middle East J Family Med* 2016;14(7):16-23. <http://dx.doi.org/10.5742/MEWFM.2016.92856>.
37. Oken BS, Chamine I, Wakeland W. A systems approach to stress, stressors and resilience in humans. *Behav Brain Res* 2015;282:144-54. <http://dx.doi.org/10.1016/j.bbr.2014.12.047>.
38. Assaf AM. Stress-induced immune-related diseases and health outcomes of pharmacy students: a pilot study. *Saudi Pharm J* 2013;21(1):35-44. <http://dx.doi.org/10.1016/j.jsps.2012.02.006>.
39. Accreditation Council for Pharmacy Education. *Accreditation standards and guidelines for the professional program in pharmacy leading to the doctor of pharmacy degree* Chicago. 2006. Accessed 30 July 2020. <http://www.acpe-accredit.org>.
40. Accreditation Council for Pharmacy Education. Accreditation standards and guidelines for the professional program in pharmacy leading to the doctor of pharmacy degree. Accessed date: 30 July 2020. <https://www.acpeaccredit.org/pdf/Standards2016FINAL.pdf>.
41. Cohen S, Williamson G. Perceived stress in a probability sample of the United States. In: Spacapan S, Oskamp S, eds. *The social psychology of health: claremont symposium on applied social psychology*. Sage; 1988. p. 31-67.
42. Roberti JW, Harrington LN, Storch EA. Further psychometric support for the 10-item version of the perceived stress scale. *J Coll Couns* 2006;9(2):135-47. <http://dx.doi.org/10.1002/j.2161-1882.2006.tb00100.x>.
43. Opoku-Acheampong A, Kretschy IA, Acheampong F, et al. Perceived stress and quality of life of pharmacy students in University of Ghana. *BMC Res Notes* 2017;10(115). <http://dx.doi.org/10.1186/s13104-017-2439-6>.
44. Sun SH, Zorah A. Assessing stress among undergraduate pharmacy students in University of Malaya. *Indian J Pharm Educ* 2015;49(2):99-105. <http://dx.doi.org/10.5530/ijper.49.2.4>.
45. O'Reilly E, McNeill KG, Mavor KI, et al. Looking beyond personal stressors: An examination of how academic stressors contribute to depression in Australian graduate medical students. *Teach Learn Med* 2014;26(1):56-63. <http://dx.doi.org/10.1080/10401332.2013.857330>.
46. Usifoh SF, Aika IN, Soni JS, et al. Stress among pharmacy and medical students of university of Benin. *Nigeria Asian J Pharm Hea Sci* 2019;9(2):2073-7.
47. Aluh DO, Abba A, Afosi AB. Prevalence and correlates of depression, anxiety and stress among undergraduate pharmacy students in Nigeria. *Pharm Educ*. 20(1):236-248. doi: 10.46542/pe.2020.201.236248.
48. Kristina SA, Widayanti AW, Puspita K, et al. Investigating perceived stress among final-year pharmacy students in Indonesia. *Int J Pharm Res* 2020;12(2):439-44. <http://dx.doi.org/10.31838/ijpr/2020.12.02.0067>.
49. Cohen S, Janicki-Deverts D. Who's stressed? Distributions of psychological stress in the United States in probability samples from 1983, 2006 and 2009. *J Appl Soc Psychol* 2012;42(6):1320-34. <http://dx.doi.org/10.1111/j.1559-1816.2012.00900.x>.
50. Bhavani NM, Ahmed M, Prashantha B. Perceived stress and source of stress among undergraduate medical students of Government Medical College, Mysore. *Int J Community Med Public Health* 2018;5(8):3513-8. <http://dx.doi.org/10.18203/2394-6040.ijcmph20183090>.
51. Votta RJ, Benau EM. Predictors of stress in doctor of pharmacy students: Results from a nationwide survey. *Curr Pharm Teach Learn* 2013;5:365-72. <http://dx.doi.org/10.1016/j.cptl.2013.06.014>.
52. Seedhom AE, Kamel EG, Mohammed ES, et al. Predictors of perceived stress among medical and nonmedical college students, Minia. *Egypt Int J Prev Med* 2019;10(1):107-12. http://dx.doi.org/10.4103/ijpvm.IJPVM_6_18.
53. Seeman MV. Psychopathology in women and men: Focus on female hormones. *Am J Psychiatry* 1997;154(12):1641-7. <http://dx.doi.org/10.1176/ajp.154.12.1641>.
54. Maestripieri D, Baran NM, Sapiezna P, et al. Between- and within-sex variation in hormonal responses to psychological stress in a large sample of college students. *Stress* 2010;13(5):413-42. <http://dx.doi.org/10.3109/10253891003681137>.
55. Kalaithasan A, Tye SC, Fatimatuzzahra AA, et al. Prevalence, factors associated and coping strategies of stress among pharmacy students in a public university in Malaysia. *Pharm Pharmacol Int J* 2020;8(2):64-71. <http://dx.doi.org/10.15406/ppij.2020.08.00281>.
56. Charlesworth E, Murphy S, Beutler L. Stress management Skill for nursing students. *J Clin Psychol* 1981;37(2):284-90.
57. Martin I. Guided visualization: A way to relax, reduce stress, and more Last updated. 17 January 2020. Available at: <https://www.psychcentral.com/lib/guided-visualization-a-way-to-relax-reduce-stress-and-more/>. (Access date: 15 December 2020).
58. Hammerfeld K, Eberle C, Grau M, et al. Persistent effects of cognitive-behavioral stress management on cortisol responses to acute stress in healthy subjects- a randomized controlled trial. *Psychoneuroendocrinology* 2006;31(3):333-9. <http://dx.doi.org/10.1016/j.psyneune.2005.08.007>.
59. UNDP (United Nations Development Program). *The 2020 global multidimensional poverty index (MPI)*. 2020 <https://hdr.undp.org/en/2020-MPI>. Accessed July 30, 2020.
60. Garber MC. Exercise as a stress coping mechanism in a pharmacy student population. *Am J Pharm Educ* 2017;81(3):50. <http://dx.doi.org/10.5688/ajpe81350>.
61. Kumar MA, Sudha M, Aravind KR, et al. Prevalence of stress among paramedical students in Cuddalore District. *Int Arch Integr Med* 2018;5(11):28-31.