Perceived stress, sources of stress and coping strategies among undergraduate medical students of Nepal: a cross-sectional study [version 3; peer review: 2 approved, 1 approved with reservations]

Ujjawal Paudel, Anima Parajuli, Rashmi Shrestha, Shivanee Kumari, Saroj Adhikari Yadav, Kedar Marahatta

School of Medicine, Patan Academy of Health Sciences, Kathmandu, Nepal

Abstract

**Background:** Medical students are subjected to various stressors throughout their training, which has a considerable impact on their physical and mental health. Some students have positive ways of coping, while others take to maladaptive coping measures. This study aims to assess severity, sources of stress, and coping strategies among medical students of a non-Western low-income country from South Asia.

**Methods:** A self-administered questionnaire-based cross-sectional study was carried out. Demographic variables were collected and stress level was assessed using PSS 14 (Perceived Stress Scale 14). The sources of stress were assessed using MSSQ (Medical Student Stressor Questionnaire) and coping strategies were evaluated using the Brief-Coping Orientation to Problems Experienced 28.

**Results:** The response rate was 95%. The mean PSS score was 27.85. Overall, 55% of students were stressed (male 52%, female 60%), the difference among gender was not significant. Basic science students perceived higher levels of stress than clinical clerkship students. Academic related stressors caused higher stress, whereas other variables caused moderate stress. The major stressors were examinations, inadequate time to study, poor marks, extensive amount of learning content, and the need to performing well in the...
exam. The five most common coping strategies used were active coping, acceptance, planning, self-distraction, and instrumental support. The least common coping mechanism was substance use. All MSSQ domains positively correlated with the total PSS score. Students with higher PSS scores were likely to use behavioral disengagement, venting, and self-blame as the primary coping strategies.

**Conclusions:** Stress level among the medical students is high and mainly in relation to academia. Inadequate guidance from teachers contributed significantly. Stressed students were likely to use maladaptive coping strategies. Strategies to enhance teacher-student communication and adaptive coping measures should be implemented. Further studies should be done to evaluate the effects of stress on the academic outcomes of students.

**Keywords**
stress, coping stress, medical students, medical education, mental health.

**Corresponding author:** Saroj Adhikari Yadav (drsarojpahs@gmail.com)

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Introduction
Stress is a state of mental or emotional strain or tension resulting from adverse or demanding circumstances. Medical students are subjected to various stressors throughout their training, which can have profound effects on their well-being. A systematic review by Liselotte et al. showed overall psychological distress consistently higher in medical students than in the general population. Studies that have examined sources of stress among medical students generally point to three key areas: academic pressures, social issues, and financial problems. These stress and the various ways in which students cope with them are of vital importance as they can have a considerable impact on their physical and mental health, necessitating an exploration of their origin and the coping mechanism employed in response. While some students adopt positive ways of coping with stressors like positive reframing, planning, and recreational activities like sports and music, while others may opt for maladaptive coping measures like substance abuse. Similarly, a study among medical students in North India, which is quite similar to Nepal, showed significant stress among medical students. Worrying about the future was rated the highest by the final year students, faculty shortcomings and insufficient feedback were rated highest by the second-year students, and financial concerns the highest by the first-year students. Previous studies investigating the link between stress and academic performance in medical students have shown a negative correlation between the high level of stress and academic performance.

In the context of medical education, research on the psychological distress experienced by medical students in Nepal remains sparse. While a few studies have been done into this terrain, the scope has been limited. A study was done in Manipal College of Medical Science, Pokhara, Nepal, using the General Health Questionnaire (GHQ). It showed a prevalence of psychological morbidity among medical students of 20.9%. The most common causes of stress identified by the students were quality of food in mess, dissatisfaction with lecture classes, and vastness of academic curriculum, and frequency of examinations. Another study done in Universal College of Medical Sciences, Bhairahawa, Nepal showed that stress during exams and preparation phase stood out as the stressful period among medical students. A high prevalence of depression, anxiety, and burnout was found among medical students and residents in another study in Nepal, the academic-related factors being the main stressor identified in the study. These studies, though valuable, fall short of providing a comprehensive exploration of the magnitude of stressors and coping mechanism adopted by medical schools in Nepal.

To address this gap, our study ventures into the domain of Patan Academy of Health Sciences (PAHS), a distinguished medical school adopting innovative teaching-learning approaches. Furthermore, there has been no study on psychological stress among medical students of PAHS. Therefore, we wanted to identify the severity of stress, recognize the sources of stress and explore the coping strategies used, among undergraduate medical students of PAHS, Kathmandu, Nepal. By delving into the unique context of PAHS and its innovative teaching methods, our research not only contributes to the understanding of stress in medical education but also offers valuable insights into the broader spectrum of medical education in Nepal.

Methods
Study design, participants, and sample size
This is a cross-sectional study conducted from 15 November 2019 to 14 December 2019 among undergraduate medical students of PAHS, a government medical school of a non-Western low-income country, Nepal. PAHS has adopted several new and innovative approaches in its medical curriculum. These include Problem-Based Learning (PBL) in the first two years of integrated basic science study, and the Clinical Presentation Curriculum (CPC) in third to final years of clinical clerkship.

The study is based on self-administered questionnaires. Written informed consent was obtained from the participants. The study included all medical students of the four batches currently in School of Medicine of PAHS. These batches consist of two groups in initial basic sciences years of medical school and two groups in later clinical clerkship years of medical school. Consenting students were asked to fill out the questionnaire together in class. Students not giving consent and
students among the researcher team were excluded from the study. A total of 231 students from four batches were initially considered for inclusion in this study.

As there were no previous estimates of the prevalence of stress among medical students in Nepal, a conservative assumption of a prevalence of 50% was made, with a 10% margin of error, and a 5% level of significance. After adding a 10% non-response rate, the final sample size targeted for the study came out to be 106. To select study participants, a two-stage stratified random sampling method was employed. Stratification was based on the year of study and gender. Within each stratum, students were randomly selected using the lottery method. Out of the 106 sample of randomly selected students, 101 completed the questionnaire and provided consent.

The questionnaires administered to the students consisted of four parts: Demographics, Medical Student Stressor Questionnaire (MSSQ), Perceived Stress Scale (PSS), and Brief-COPE (Coping Orientation to Problems Experienced). All questionnaires were in English language. Ethical approval was taken from the institutional research committee of the Patan Academy of Health Sciences [Ref no: std1506111071] and research was carried out per relevant guidelines and regulations.

Description of tools

Demographic questionnaire

A demographics questionnaire was developed for this study. It comprised of questions pertaining to various demographic details such as age, gender, address, year of study, weather the participant resided in PAHS hostel or not, etc. These questionnaires were compiled in Microsoft Word (Microsoft Office Professional Plus 2019 version 2112) and discussed in the research group and reviewed by the research advisors to establish content validity. Finalized questionnaire were distributed among all respondents.

Perceived Stress Scale questionnaire

Perceived stress level was measured using the PSS-14. PSS-14 is a pretested and pre-validated questionnaire designed to assess an individual’s perception of stress. This questionnaire comprises 14 questions with responses varying from “never,” “almost never,” “sometimes,” “fairly often,” and “very often” labeled as 0-4 respectively. It is designed to assess the degree to which participants evaluate the stress levels in their lives over the previous month. PSS-14 scores were obtained by reversing the scores on positive items, following a pattern where 0 was converted to 4, 1 to 3, 2 to 2, and so on, and then summing across all 14 items. The scale yields a single score where high scores meant higher perceived levels of stress and lower scores meant lower perceived levels of stress. The PSS-14 has a range of scores from 0 to 56. A cut-off value of 28 (equivalent to 50%) was used, and the scores were labeled as “stressed” or “not stressed” depending on whether their scores exceeded or fell below this threshold, respectively. This specific cut-off value was selected from a similar study done in Pakistan.

Medical Student Stress questionnaire

In this study, the MSSQ was used to assess sources of stress and their severity. The MSSQ as well is a pretested and pre-validated questionnaire. It comprises 40 questions. Respondents were asked to rate this set of forty items or stressors using a scale of 0 to 4 where 0 = causing no stress at all, 1 = causing mild stress, 2 = causing moderate stress, 3 = causing high stress, and 4 = causing severe stress. These stressors encompass a wide array of challenges commonly faced by medical students, including examinations, heavy workload, lack of time to review what has been learned, etc.

The MSSQ grouped stressors in six domains based on an underlying theme. The six domains are: 1. Academic Related stressors (ARS), 2. Intrapersonal and interpersonal Related Stressors (IRS), 3. Teaching and Learning-related stressors (TLRS), 4. Social Related Stressors (SRS), 5. Drive and desire Related Stressors (DRS), and 6. Group Activities Related Stressors (GARS). Total scores in individual domains were calculated by using weighted means. Stressors with scores of 0 – 1.00, 1.01 – 2.00, 2.01 – 3.00, and 3.01 – 4.00 were graded as mild, moderate, high, and severe respectively.

Brief-COPE questionnaire

The Brief-COPE-28 scale, a pretested pre-validated questionnaire, was used to assess coping strategies used by students in response to their stress. It contains 28 items and is rated on a four-point Likert scale; 1 = I haven’t been doing this at all, 2 = I’ve been doing this a little bit, 3 = I’ve been doing this a medium amount, 4 = I’ve been doing this a lot. In total,
this scale covers 14 dimensions. These are grouped into maladaptive coping strategies denial, self-distraction, behavioral disengagement, venting, self-blame, and substance use and adaptive coping strategies active coping, instrumental support, planning, acceptance, emotional support, humor, positive reframing, and religion.

Data collection and analysis
A total of 106 students were randomly selected from the sample using two-stage stratified random sampling based on the year of study and gender, followed by the lottery method for each stratum to ensure a representative sample. The selected students were given questionnaires with written instructions. Informed consent was taken from all the participants in written form. The questionnaire was distributed amongst students and the researchers collected the completed questionnaires for analysis.

Data were entered into Microsoft Excel (Microsoft Corporation, 2018, Microsoft Excel) (RRID: SCR_016137). It was analyzed using Statistical Package for Social Sciences (SPSS) 13.0 (SPSS Inc. Released 2005. SPSS for Windows, Version 13.0. Chicago) (RRID: SCR_002865).

To assess the perceived stress levels, the mean score of perceived stress was calculated and the number and percentage of stressed cases were determined according to demographic variables. We used Pearson’s Chi-Square tests to examine associations between categorical variables like gender and stress or phases of study and stress levels. Six different domains of MSSQ, namely, ARS, IRS, TLRS, SRS, DRS and GARS, were calculated, and we used descriptive statistics to measure the severity of stressors within these domains. Spearman’s correlation was applied to test the correlation between perceived stress (PSS score) and coping strategies among students. When comparing means across different groups, such as stress levels across academic years, we employed ANOVA. Furthermore, we utilized t-tests to compare the stress levels between students in initial basic science years and later clinical clerkship years. The p-value<0.05 was considered significant.

Results
Out of initial pool of randomly selected 106 students, one didn’t give consent for the study and four didn’t complete the questionnaire. 101(95%) of original sample filled and submitted the questionnaire which was used for further analysis. The demographic characteristics of students are shown in Table 1. Since four of the students did not fill in the address on the questionnaire, they were omitted from the analysis of this specific question and the remaining 97 were used to analyze the address.

The medical students at PAHS come from two different academic backgrounds: an academic science background where they complete two years of study of science after school level, and from a paramedic background where they must complete three years of study of paramedical health after school level. The academic background of the students is taken in account for this study as shown in Table 1.

Table 1. Demographic characteristics of respondents.

| Respondent characteristic | Frequency | Percentage |
|---------------------------|-----------|------------|
| Age                       |           |            |
| Less or equal to 22 years | 49        | 48.5       |
| More than 22 years        | 52        | 51.5       |
| Gender                    |           |            |
| Male                      | 66        | 65.3       |
| Female                    | 35        | 34.7       |
| Address                   |           |            |
| Within Kathmandu Valley   | 19        | 18.8       |
| Outside Kathmandu Valley  | 78        | 77.2       |
| Year of study             |           |            |
| Basic science Year 1      | 23        | 22.8       |
| Basic science Year 2      | 27        | 26.7       |
| Clinical clerkship year 1 | 24        | 23.8       |
| Clinical clerkship year 2 | 27        | 26.7       |
| Stay at hostel            |           |            |
| Yes                       | 63        | 62.4       |
| No                        | 38        | 37.6       |
| Study background          |           |            |
| Health science (Paramedics)| 7         | 6.9        |
| Intermediate in science (I. Sc.) /A Level | 94 | 93.1 |
Perceived Stress Scale (PSS)

As shown in Table 2, among 101 students, 55 of them were stressed based on a cut-off score of 28, while 46 of them were not stressed. Consequently, the prevalence of stress in among our study participants was found to be 55%. Notably, female students exhibited a slightly higher prevalence of stress compared to their male counterparts (60% vs 52%) but the difference was not statistically significant (p < 0.05).

Similarly, an analysis of stress levels across different academic years reviled a trend with decreasing stress in senior years. However, the difference among different years was not significant (p > 0.05). In contrast, as shown in Table 2, on regrouping students by the phase of study, a notable finding emerged. Students in initial basic science years were significantly more stressed compared to students in later clinical clerkship years (66.7% vs 42%, with p-value < 0.05).

When considering the accommodation status of students, it was observed that 33 (52.4%) students staying at the PAHS hostel were stressed, while only 22 (57.9%) students not staying in the hostel were stressed. Despite this the difference was not statistically significant (p = 0.10). There was also no significant difference in the presence of stress among local students from within Kathmandu or outside Kathmandu (p > 0.05).

Medical Student Stressor Questionnaire (MSSQ)

The mean and standard deviation of stressors score are shown in Table 3 below.

Academic Related Stressors (ARS) scores were present amongst both male and female students as seen in Table 3. Social Related Stressors (SRS) was higher among male students, while other stressors were higher among female. When

### Table 2. Stress level.

|                      | Not stressed, n (%) | Stressed, n (%) | Total, n | Pearson's Chi Square test |
|----------------------|---------------------|-----------------|----------|---------------------------|
| **Gender**           |                     |                 |          |                           |
| Male                 | 32(48)              | 34(52)          | 66       | p = 0.42                  |
| Female               | 14(40)              | 21(60)          | 35       |                           |
| **Level of study**   |                     |                 |          |                           |
| Basic Science Year 1 | 8(30)               | 19(73)          | 27       | p = 0.06                  |
| Basic Science Year 2 | 9(38)               | 15(63)          | 24       |                           |
| Clinical Clerkship Year 1 | 14(52)     | 13(48)          | 27       |                           |
| Clinical Clerkship Year 2 | 15(65)    | 8(35)           | 23       |                           |
| **Phase of study**   |                     |                 |          |                           |
| Basic Science        | 17(33)              | 34(67)          | 51       | p = 0.017                 |
| Clinical Science     | 29(58)              | 21(42)          | 50       |                           |
| **Staying at hostel of medical school** |       |                 |          |                           |
| Yes                  | 30(48)              | 33(52)          | 63       | p = 0.084                 |
| No                   | 16(42)              | 22(58)          | 38       |                           |
| **Total**            | 46(46)              | 55(54)          | 101(100) |                           |

### Table 3. Mean and inference of different domains of stressors.

| Stressor                                | Mean   | Standard deviation | Inference           |
|-----------------------------------------|--------|--------------------|---------------------|
| ARS (Academic related stressors)        | 2.18   | 0.57               | Cause high stress   |
| IRS (Intrapersonal and interpersonal related stressors) | 1.88   | 0.85               | Cause moderate stress |
| TLRS (Teaching and learning-related stressors) | 1.85   | 0.69               | Cause moderate stress |
| SRS (Social related stressors)          | 1.63   | 0.66               | Cause moderate stress |
| DRS (Drive and desire related stressors) | 1.42   | 0.8                | Cause moderate stress |
| GARS (Group activities related stressors) | 1.72   | 0.65               | Cause moderate stress |
| **Total**                               | **10.68** |                    |                     |
analyzing students’ accommodation status, it was observed that, apart from Intrapersonal and interpersonal Related Stressors (IRS) scores, other stressors were higher in those students staying outside the hostel. However, none of these differences were statistically significant.

The top ten stressors with their mean values are presented in Table 4. Eight of the top ten stressors are ARS. The most common stressors are test examinations, lack of time to review what has been learned, getting poor marks, an extensive amount of content to be learned, and the need to do well (self-expectation).

ARS scores (2.22 vs. 2.14) and GRS scores (1.82 vs. 1.61) were higher in basic science students but other domains were higher in clinical clerkship. Stressors were highest in basic science first-year students while lowest in clinical clerkship second-year students. However, the differences were not statistically significant.

**Brief-COPE**

In this study, we observed that the five most common coping strategies used by students during the event of stress were active coping, acceptance, planning, self-distraction, and instrumental support, with mean scores of 5.86, 5.67, 5.64, 5.05, and 4.85 respectively among all students. However, when we focused on stressed students, we noted slightly lower mean scores for these strategies compared to their non-stressed counterparts. Conversely, the least common coping mechanism was substance use. The mean scores of coping mechanisms used by students are presented in Table 5.

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**Table 4. Top ten stressors.**

| Stressors                                           | Mean values | S.D. | Domain |
|-----------------------------------------------------|-------------|------|--------|
| 1 Test examinations                                 | 2.74        | 0.82 | ARS    |
| 2 Lack of time to review what has been learnt       | 2.46        | 0.96 | ARS    |
| 3 Getting poor marks                                | 2.37        | 1.11 | ARS    |
| 4 Large amount of content to be learnt              | 2.37        | 1.0  | ARS    |
| 5 Need to do well (self-expectation)                | 2.36        | 1.03 | ARS    |
| 6 Heavy workload                                    | 2.33        | 0.89 | ARS    |
| 7 Falling behind in reading schedule                | 2.19        | 0.93 | ARS    |
| 8 Unable to answer the questions from the teachers   | 2.14        | 1.07 | ARS    |
| 9 Lack of guidance from teacher(s)                  | 2.09        | 1.10 | TLRS   |
| 10 Verbal or physical abuse by teachers(s)          | 2.05        | 1.23 | IRS    |

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**Table 5. Coping strategies adopted by students during stressful events.**

| Coping mechanism          | Overall mean (SD) | Stressed students mean (SD) | Not-stressed students mean (SD) |
|---------------------------|-------------------|-----------------------------|---------------------------------|
| Active coping             | 5.86(1.29)        | 5.69(1.51)                  | 6.06(1.35)                      |
| Acceptance                | 5.67(1.32)        | 5.61(1.4)                   | 5.73(1.51)                      |
| Planning                  | 5.64(1.33)        | 5.58(1.16)                  | 5.71(1.51)                      |
| Self-distraction          | 5.05(1.37)        | 5.09(1.41)                  | 5.06(1.33)                      |
| Instrumental support      | 4.85(1.48)        | 4.87(1.45)                  | 4.82(1.53)                      |
| Emotional support         | 4.76(1.26)        | 4.8(1.43)                   | 4.7(1.02)                       |
| Positive reframing        | 4.75(1.31)        | 4.7(1.28)                   | 4.8(1.36)                       |
| Venting                   | 4.3(1.31)         | 4.61(1.23)                  | 3.9(1.29)                       |
| Religion                  | 4.29(1.56)        | 4.27(1.71)                  | 4.391(1.44)                     |
| Self-blame                | 4.01(1.53)        | 4.41(1.53)                  | 3.52(1.39)                      |
| Humor                     | 3.72(1.59)        | 3.76(1.76)                  | 3.67(1.38)                      |
| Behavioral disengagement  | 3.53(1.4)         | 3.9(1.45)                   | 3.08(1.36)                      |
| Denial                    | 3.42(1.3)         | 3.49(1.43)                  | 3.329(1.33)                     |
| Substance use             | 2.72(1.3)         | 2.89(1.46)                  | 2.52(1.27)                      |
There were significant differences in coping strategies used according to gender, phase of the study i.e. basic science or clinical clerkship (p < 0.05), location of accommodation i.e. hostel or outside hostel (p < 0.05), and stress. Interestingly, substance abuse, a maladaptive strategy for coping was significantly more prevalent among male (mean score 3.07) compared to their female counterparts (mean score 2.05), and the difference was statistically significant (p < 0.05).

Coping strategies varied based on the phase of study as well. Positive reframing, planning, religion, and self-blame as a coping mechanism was significantly more prevalent among basic science students compared to clinical clerkship students and the difference were statistically significant. Furthermore, when we considered the year of study, we found that planning decreased significantly (p < 0.05) over the years of medical school, mean score being 6.11, 5.66, 5.66, and 5.04 in basic science year 1, basic science year 2, clinical clerkship year 1, and clinical clerkship year 2 respectively. The strategies that were significant among different groups of respondents are presented in Table 6.

These results highlight the diversity in coping strategies among students, shedding light on how different factors such as gender, academic phase, and academic year influence their choices in handling stress.

Discussion

We found that 55% of the medical students demonstrated stress above the cut-off value. The prevalence of stress is more among the initial first two years (basic science years) compared to the latter part of the clinical years (66.7% vs. 42.0%). Students reported academic and related stressors as the major sources of stress. In addition, the primary coping strategies used by students during stressful events were active coping, acceptance, planning, self-distraction, and instrumental support. Male students were also using alcohol and substances more frequently than females (p < 0.01) to cope with a stressful situation.

A similar study from Pakistan, which also used PSS to evaluate stress, reported a higher mean PSS score when compared to our study (30.84, SD = 7.01 vs. 27.85 SD = 6.25). In a similar study in Manipal, which used GHQ to assess stress, psychological morbidity was 20.9% and it was higher among basic science students. A study from Agha Khan University reported that over 90% of the students felt stressed at one time or another during their course.

Table 6. Specific coping strategies among subgroups of respondents.

| Coping strategy | Respondent characteristics | Mean value | p-value |
|-----------------|---------------------------|------------|---------|
| Substance use   | Gender                    |            |         |
| Active coping   | Hosteller                 | 6.06       | 0.043*  |
| Positive reframing | Clinical Clerkship    | 4.42       |         |
| Planning        | Clinical Clerkship        | 4.42       |         |
| Religion        | Clinical Clerkship        | 3.96       |         |
| Self-blame      | Clinical Clerkship        | 3.70       |         |
| Active coping   | Basic science year 1      | 5.88       | 0.034** |
| Planning        | Basic science year 1      | 6.11       | 0.043** |
|                 | Basic science year 2      | 5.66       |         |
|                 | Clinical Clerkship year 1 | 6.25       |         |
|                 | Clinical Clerkship year 2 | 5.21       |         |
|                 | Basic science year 2      | 5.66       |         |
|                 | Clinical Clerkship year 1 | 5.66       |         |
|                 | Clinical Clerkship year 2 | 5.04       |         |

*Student’s Independent Sample T-Test.
**One-Way ANOVA.
study from India reported that 73% of the students had perceived stress at one time or another during their medical training.\textsuperscript{14} Saipanish reported that 61.4% of students in Thai Medical School had experienced some degree of stress as measured by the Thai stress test.\textsuperscript{19} The amount and severity of stress experienced by medical students appears to vary according to their curriculum, settings of medical schools, and more importantly, the type of psychometric tests used.

In this study female students perceived a slightly higher but statistically insignificant level of stress as compared to male students. Similarly another study by Cohen \textit{et al.} in the USA as well showed no significant difference in stress between male and female students.\textsuperscript{13} However, a similar study in Pakistan reported significantly higher stress among female students compared to their male counterparts.\textsuperscript{5} More students in basic science years were stressed as compared to clinical years (66.7% vs. 42.0%) which was statistically significant (p = 0.017). It might be because they have adapted to the system and setting of PAHS. A study done at Manipal, another Nepali medical school, showed the highest level of stress in the first-year basic science students. At PAHS, stress levels decreased with the increase in the year of study. At Manipal, however, there was less stress in the second year of basic science but higher stress in the clinical years of study.\textsuperscript{9} Similar results were reported in studies from Pakistan, Thailand, and India.\textsuperscript{13,17,18} We do not have tools to evaluate this discrepancy, but a plausible explanation might be different academic settings between these institutions.

A study that evaluated the correlation between stress and academic performance in the first two years of medical school showed a negative correlation between stress and academic performance.\textsuperscript{8} Though we did not evaluate academic performance in our study, we expect it might be similar here as well.

The mean score of MSSQ at our institution was 1.88 (moderate stress) whereas it was 3.9 (severe stress) at Taibah University, Saudi Arabia.\textsuperscript{20} The major source of high stress among the students in our studies was ARS, which was similar to a study done in Xavier University School of Medicine, Netherlands, that showed high ARS and GRS.\textsuperscript{21} In Saudi Arabia, ARS and IRS were high.\textsuperscript{20} Though the overall TLRS and IRS score caused moderate stress, lack of guidance from teachers and verbal abuse from teachers caused high stress in PAHS. The major stressors at the Pakistani Medical School were also of the academic and psychosocial domains.\textsuperscript{5}

Our study showed that academic stress is higher among basic science students. However, other studies done in Pakistan, Saudi Arabia, Netherlands, and Manipal have shown that academic stress is higher in the students in their clinical years.\textsuperscript{3,4,9,20}

This study shows test examinations, lack of time to review what has been learned, and, a large amount of content as main academic stressors. This was similar to a study done in Manipal, where the most common causes of stress were dissatisfaction with lecture classes, the vastness of the academic curriculum, and the frequency of examinations.\textsuperscript{9} A study conducted in the United Arab Emirates (UAE) also showed that the major stressors among the students were the frequency of examinations, time management, and academic workload.\textsuperscript{22}

Coping strategies are behavioral and psychological efforts that apply to master, tolerate, reduce, or minimize stressful events.\textsuperscript{23} The primary coping strategies used by students during stressful events were active coping, acceptance, planning, self-distraction, and instrumental support. Students from Manipal also used similar coping strategies along with positive reframing and emotional support.\textsuperscript{9} Similar studies from UAE, India, Netherlands, and UK also showed similar results.\textsuperscript{21–25} Although the coping strategies were different among males and females, the only significant difference in strategy was substance use, which was higher in males (p < 0.01): a finding similar to a study in Glasgow University, UK.\textsuperscript{25} In India, another statistically significant difference was observed, females used meditation as a coping strategy.\textsuperscript{24}

We saw that stressed students used active coping, planning, and positive reframing, similar to the study done in Manipal.\textsuperscript{9} The medical students from Brazil who were stressed used escape-avoidance tactics more than non-stressed students.\textsuperscript{26} Pakistani post graduate students who were using maladaptive coping styles were more likely to be stressed.\textsuperscript{7} However, it is not clear whether there is a cause-effect relation between avoidant coping strategies and stress.

Substance use was the least used coping mechanism by students, which may have been under-reported despite confidentiality and anonymity of the response was assured. There were low incidences of alcohol/substance use in Manipal as well as in Pakistan, which may be due to the social stigmata associated with alcohol use in these societies.\textsuperscript{9,27} But studies from the UK suggest the use of alcohol, tobacco, and drugs as common strategies.\textsuperscript{7,8,20} The cultural variation between the two societies may have contributed to the difference.
All stressor domains of MSSQ and total MSSQ positively correlated with the PSS score, which was significant, except for DRS, as shown in Table 3. It suggests that students with more stressors in (most of the domains) MSSQ are also likely to perceive more stress. The correlation was moderate between total PSS score and ARS, GRS, and total MSSQ while it was weak within total PSS, IRS, SRS, DRS, and TLRS.

Our study also showed that students with high stress were likely to have maladaptive coping strategies. The correlation was moderate. Though the difference was not statistically significant, the total PSS scores negatively correlated with adaptive coping strategies. This indicates that students might have decreased stress due to adaptive coping.

Limitations
Our findings may not be generalizable to other medical schools in Nepal since PAHS has a unique teaching-learning strategy. The cross-sectional design of our study is another limitation since associations could not be calculated. Prospective studies are necessary to study the associations between stressors and the incidence of stress. Since we did not evaluate the level of stress with academic performance, we cannot comment on the association between the two. The questionnaires were used as it is in the English language, potentially causing issues with students as this may not be their first language. The systematic translation, cultural validation, and adaptation in the local language of Nepalese medical students was not done.

Conclusion
Stress level among PAHS students was high, with academic stress being the predominant factor. Further studies can be done to evaluate the effects of stress on the academic outcomes of students. Notably the stress level was highest among the first-year students. This has a strong implication to provide a support mechanism for the first-year students. Strategies to enhance teacher-student communication could be implemented in addressing the issue. Additionally, since stressed students were more likely to use maladaptive coping strategies like behavioral disengagement, substance use, venting, denial, and self-blame, measures should be taken to support students to adopt a more positive and healthy coping approach.

Data availability
Underlying data
Figshare: Underlying data of “Perceived Stress, Sources of Stress and Coping Strategies among Undergraduate Medical Students of Nepal”. https://doi.org/10.6084/m9.figshare.c.5757833.v1.25

The project contains the following underlying data:
- Raw data of Stress.xlsx

Extended data
Figshare: Underlying data of “Perceived Stress, Sources of Stress and Coping Strategies among Undergraduate Medical Students of Nepal”. https://doi.org/10.6084/m9.figshare.c.5757833.v1.25

The project contains the following extended data:
- Questionnaire of Stress.docx

Data are available under the terms of the Creative Commons Attribution 4.0 International license (CC-BY 4.0).

Ethics approval and consent to participate
This study was approved by the Institutional Review Committee (Ethical Committee) of Patan Academy of Health Sciences (PAHS), Kathmandu, Nepal with ref no: std1506111071. Written informed consent was obtained from all participants.

Consent for publication
Written informed consent was obtained from the participants.

Authors’ contributions
UP, AP, RS, and SK first planned conception and designed this research. UP, AP, RS, and SK did the data collection. All six authors, UP, AP, RS, SK, SAY, and KM worked for data analysis and interpretation. UP, AP, RS, and SK wrote the
first draft of the manuscript. SAY and KM did further revision and editing of the manuscript. All six authors, SAY, SP, UP, AP, RS, SK, and KM critically revised the article. And final approval of the version to be published was also done by all six authors.

Acknowledgments
We would like to acknowledge the faculties of the Department of Community Health Science for helping us and mentoring throughout the conduct of this research. A sincere thanks go to Prof. (Associate) Shitai Bhandary for his supervision and guidance on data analysis. We would like to acknowledge all our participants with much appreciation for giving their valuable time for filling up the questionnaires.

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Open Peer Review

Current Peer Review Status: ✔️ ? ✔️

Version 3

Reviewer Report 09 September 2024

https://doi.org/10.5256/f1000research.156923.r277561

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Prakash Banjade
Manipal College of Medical Sciences, Pokhara, Nepal

The authors have revised the manuscript, addressing statistical explanations and clarifying results. These improvements have strengthened the study’s validity and clarity of presentation. Overall, this manuscript offers significant contributions to understanding stress and coping mechanisms among medical students in Nepal. Its findings are relevant to the audience interested in medical education and student mental health.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
I cannot comment. A qualified statistician is required.

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Pulmonology, Cardiovascular diseases
I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

**Version 2**

Reviewer Report 29 September 2023

https://doi.org/10.5256/f1000research.155814.r206199

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Alicia Fournier

Université de Bourgogne, Dijon, Bourgogne-Franche-Comté, France

I would like to thank the authors for the revisions made to their manuscripts. Unfortunately, these revisions are not sufficient. Further revisions are required for indexing.

1. In the abstract

1.1 The authors should mention the number of participants included in the analyses.

1.2 In the results section, the authors mention a difference in perceived stress between first-year students and trainees. It is not clear whether the results are for the whole sample or just the first-year students. To be reworded.

1.3. In the conclusion, the authors mention that the most stressed students use maladaptive coping, but there is nothing to this effect in the results section.

1.4. I would remove the response rate.

The introduction has been improved. My thanks to the authors.

2. In the material section, how did the authors categorise the MSSQ scores? Do the classes come from the literature? If so, mention the reference.

3. The statistical analysis section needs to be greatly improved. The authors only mention having carried out descriptive tests and Pearson correlations, which is not the case. In fact, the authors performed chi² tests, ANOVAs and t-tests in addition to correlation analyses. I would also like to point out that the results of these correlation analyses never appear in the results section, despite a discussion of these correlations in the discussion section.

4. In the results section,
4.1. Do not refer to prevalence for the PSS scale. It is a question of frequency, given the size of your sample. To talk about prevalence, the authors would have had to survey virtually all the university's students.

4.2. The authors should reword the sentence "Similarly, an analysis of stress levels across different academic years reviled a trend with lower stress in senior years." Indeed, it is confusing; it could suggest that statistical analyses have been carried out revealing significant differences between each time.

4.3. In the paper as a whole, the authors cannot report differences between individuals if, statistically, there are none. For example "Academic Related Stressors (ARS) scores were significant amongst both male and female students as seen in Table 3. Meanwhile, Social Related Stressors (SRS) was higher among male students, while other stressors were higher among females. When analyzing students' accommodation status, it was observed that, apart from Intrapersonal and interpersonal Related Stressors (IRS) scores, other stressors were higher in those students staying outside the hostel. However, none of these differences were statistically significant." Everything mentioned is wrong because the authors mention an absence of significance for these differences between the groups. This occurs numerous times in the paper and should be corrected. Furthermore, Table 3 shows absolutely no comparison between the groups. This same table is referred to in the discussion as a correlation table. The authors should correct this problem.

4.4. Remove the "s" from male in the above paragraph.

4.5. The authors did not compare stressed and unstressed students on the MSSQ stress factors, which is a pity because it would be very informative about the associations between stress factors and perceived stress.

4.6. The section on Brief-COPE needs to be revised. The paragraph "There were significant differences in coping strategies used according to gender, phase of the study i.e. basic science or clinical clerkship (p < 0.05), location of accommodation i.e. hostel or outside hostel (p < 0.05), and stress. Male students appear to cope with stress by substance use (p < 0.05). The strategies that were significant among different groups of respondents are presented in Table 6." is not clear. What were the authors trying to achieve? What do the different groups correspond to? Table 6 is not at all helpful. The authors have carried out a whole host of analyses and only report the significant ones? Honestly, I don't understand this table at all.

4.7. It should be mentioned that compared to women "Male students appear to cope with stress by substance use (p < 0.05)".

4.8. In the abstract, the authors say that stressed students use more maladaptive strategies, but I don't see this in the results section. Moreover, according to Table 5, stressed students mainly use the active coping, acceptance, planning, self-distraction, and instrumental support. Are these maladaptive strategies? Did the authors compare the strategy scores of the stressed and unstressed groups?

Moreover, the authors don't mention maladaptive and adaptive strategies, which is normal because a strategy can be adapted in certain circumstances and maladaptive in others. The authors should review this concept.
5. In the discussion section,

5.1. Authors should not mention statistical results.

5.2. As mentioned earlier, if the authors do not find statistical differences, they cannot mention differences, even if the numbers might suggest it. What matters are the statistical results!

5.3. I cannot find this result in the "results" section. « We saw that stressed students used venting and self-blame”.

5.4. “All stressor domains of MSSQ and total MSSQ positively correlated with the PSS score, which was significant, except for DRS, as shown in Table 3. It suggests that students with more stressors in (most of the domains) MSSQ are also likely to perceive more stress. The correlation was moderate between total PSS score and ARS, GRS, and total MSSQ while it was weak within total PSS, IRS, SRS, DRS, and TLRS.” Idem, I cannot find this result in the "results" section. Once again, Table 3 does not correspond to what the authors indicate.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Stress, Emotion regulation, Quality of life at work, Interception

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 02 Oct 2023
Saroj Adhikari Yadav
Dear Reviewer,

We would like to express our gratitude for your thoughtful and comprehensive review of our manuscript. Your feedback has been invaluable in improving the quality and clarity of our work. We have addressed each of your concerns and also incorporated other reviewers' and study mentors' feedback in the revised version of the manuscript.

In the abstract: The number of participants included in the analyses has been mentioned. The reference group in the results section has been clarified. Statements in the conclusion now align with the corresponding results.

In the Method section: Information on the categorization of the MSSQ scores has been done in a standard manner, and relevant references have been included. The manuscript now accurately reflects the statistical tests we performed, and the results of these analyses have been appropriately presented in the results section.

In the results section: The Brief-COPE section has been revised to provide a clearer explanation of our goals, and the Table 6 explanation has been rewritten for better clarity. The wording has been adjusted and rephrased for clarity. References to statistical significance have been corrected. We have compared stressed and unstressed students on the MSSQ stress factors and reported the findings as relevant. We have clarified our use of the terms "maladaptive" and "adaptive" strategies and reviewed the concept as suggested.

In the discussion section: Statistical results have been kept only in necessary sentences of the discussion for clarity of the readers. Differences are only mentioned when statistical significance is found or is required to be mentioned due to statistically significant differences in other studies but not ours (like stressed based on gender). The mentioned result and its presence in the results section have been reviewed.

We can see your review has significantly improved the manuscript's overall quality and accuracy. Your detailed and meticulous feedback has been instrumental in this process, and we genuinely appreciate your time and effort in reviewing our work. Thank you for your help and support.

Sincerely,
Dr Adhikari Yadav, MD.

*Competing Interests:* None.
The objective of this paper was to identify the perceived intensity of stress and its sources among medical students in Nepal and to identify coping strategies used to deal with this stress. This exploratory cross-sectional study was conducted on 101 Nepalese students and provides new
information on the origin of perceived stress.

Although it is important to take care of the health of medical students, this study remains too descriptive. The authors could have used moderation analyses to study the effects of coping strategies on the stressor/perceived stress factor relationship.

Regarding the introduction, the authors do not sufficiently develop the innovative aspect of their study. For example, the authors highlight an innovative approach to teaching and learning in the school where the study was conducted. The authors should develop this approach and compare their results with schools in Nepal where there is no such teaching.

Also, the authors should further develop what the first cycle is. Throughout the paper, I did not understand the difference between students in basic sciences and those in clinical placement. It was only thanks to the first line of the discussion that I understood the difference. Additionally, mixing early and late cycle students in the analyses is not relevant. Stress factors are not the same, so wouldn't it be beneficial for the authors to compare these two groups of students throughout the paper? Furthermore, Table 1 confuses me: what is the context of the study? Are they all medical students or are there also paramedical students?

Moreover, the statistical analyses are not sufficiently developed and well reported. For example, the analyses carried out to compare the participants are only mentioned in a table note. The authors should mention this in the statistical section. Additionally, they do not explain why they performed t-tests in some cases and ANOVAs in others. The result section needs to be rewritten. This part remains too vague and difficult to understand. There is a lack of a guiding thread so that the reader doesn't get lost. Descriptive tables of all variables are also missing.

I also draw the authors' attention to the choice of the 28 cutoff for the PSS-14. I would like to remind them that this tool is not a diagnostic tool and that it would be preferable to use it as a continuous score. The cutoff of 28 is an arbitrary score used in papers but remains unvalidated. The authors should be cautious in their interpretation.

**Is the work clearly and accurately presented and does it cite the current literature?**
Partly

**Is the study design appropriate and is the work technically sound?**
Partly

**Are sufficient details of methods and analysis provided to allow replication by others?**
No

**If applicable, is the statistical analysis and its interpretation appropriate?**
Partly

**Are all the source data underlying the results available to ensure full reproducibility?**
Yes

**Are the conclusions drawn adequately supported by the results?**
Yes

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Stress, Emotion regulation, Quality of life at work, Interoception

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 08 Sep 2023

Saroj Adhikari Yadav

Dear Reviewer,

Thank you for your comprehensive review and invaluable feedback on our manuscript. We greatly appreciate your time and insights, which have been instrumental in refining our work.

We are pleased to inform you that we have diligently addressed your suggestions and made the required edits to enhance the manuscript's quality and clarity. Here's a brief overview of how we incorporated your valuable input:

1. **Statistical Analysis:** We have provided a more detailed explanation of the statistical analyses used in the methods section, including the rationale for choosing specific tests. Additionally, we've included a table summarizing the descriptive statistics of all variables.

2. **Introduction:** We have expanded on the innovative aspects of our study, particularly the unique teaching and learning approach at the school where the research was conducted. We've also clarified the distinctions between students in basic sciences and those in clinical placement.

3. **Comparison of Student Groups:** We now focus our analyses on early and late-cycle students, recognizing the differences in stress factors. This change will provide more meaningful insights. Your further recommendations can be meaningful for us when we plan our next research project.

4. **PSS-14 Cutoff:** We acknowledge your concern regarding the PSS-14 cutoff and have revised our interpretation accordingly, emphasizing its use as a continuous score, though 50% cutoff is used in other similar articles as well and is a norm in biostat.

These revisions, guided by your feedback, and our mentors' suggestions, have significantly improved the manuscript. We remain committed to ensuring that our research meets the highest standards, and your feedback has been invaluable in achieving this goal. We look forward to your continued evaluation and input as we work towards producing a more robust and insightful contribution to the field.

Once again, thank you for your dedication to improving our research. Your efforts are sincerely appreciated.

Warm regards,
The study was aimed at assessing severity, sources of stress, and coping strategies among medical students of a non-Western low-income country in South Asia. The article has several major issues, especially in the methodology.

Abstract
1. In the abstract please avoid terms like "non-Western low-income country from South Asia", be specific (i.e, Nepal)

2. Please add statistical findings in the abstract (i.e, correlation coefficient with p values) along with text to enrich it.

Introduction:
1. Avoid 2-3 sentence paragraphs

2. No previous study is not a sufficient rationale. Kindly state other causes.

Methods:
1. Why was 50% prevalence assumed for sample size calculation? If no prior study on this topic in Nepal author may cite other studies conducted in the sub-continent or region for sample size calculation.

2. Kindly elaborate on 2 stages of stratified random sampling used in the study. preferably add a flowchart.

3. If 106 was the minimum sample size then how could statistical tests be done in a lower sample (i.e, 101)?

4. Report validity and reliability measures used for the tools used in the study (i.e, Cronbach's alpha).
5. Was the questionnaire administered in English or the local language? If local language authors had to prevalidate translation before using them for the study.

6. Statistical analysis portion did not state the exact tests used for the study in some cases (i.e, ANOVA)

Results, Discussion, and Conclusion seem ok.

References did not follow any particular style (i.e, Vancouver)

The article cited very old references (>10 years) which might not be relevant now.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Partly

Are sufficient details of methods and analysis provided to allow replication by others?
Partly

If applicable, is the statistical analysis and its interpretation appropriate?
Partly

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Chronic Disease Epidemiology, Mental Health, Occupational Health

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.

Author Response 08 Sep 2023
Saroj Adhikari Yadav

Dear Reviewer,

We extend our sincere gratitude for your meticulous review of our manuscript. Your insightful feedback, alongside the contributions from fellow reviewers and our esteemed mentors, has been instrumental in enhancing the quality of our work.
Addressing your suggestions, we have diligently incorporated the following revisions into the abstract:

- In response to your recommendation, we have included the specific name of the country in the abstract, thereby providing a more comprehensive contextualization of our study.
- We have pruned the abstract to exclude insignificant findings, ensuring that it now succinctly encapsulates the essence of our research.
- The logical merging of smaller paragraphs has been executed, enhancing the abstract's coherence and flow.
- We have redefined the rationale, offering readers a clearer understanding of the motivations behind our study.
- Furthermore, we have elaborated on the two stages of stratified random sampling, with the aim of facilitating easier comprehension for our readers.
- The administration of the questionnaire in English has been more comprehensively explained, providing essential context to our methodology.
- We have ensured that the appropriate statistical analysis methods employed are adequately mentioned.

Regarding the prevalence assumption and sample size, we appreciate your consideration of the statistical norms of using 50% as a baseline, and the 10% non-response rate was added while calculating a sample size of 106. Following a thorough review of the biostatistical recommendations, we have decided to retain these aspects as they are.

Once again, we would like to express our gratitude for your invaluable input, which has undoubtedly enriched our research. Your dedication to the peer review process is greatly appreciated.

Best regards,
Dr. Adhikari Yadav

**Competing Interests:** No competing interests were disclosed.
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