

# Assessing Post-Traumatic Stress Symptoms in Medical Students of Larkana Using The PCL-5 Scale: A Cross-Sectional Study

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## ABSTRACT

**Background:** Post-traumatic stress symptoms may impair psychological well-being, academic functioning, sleep, concentration, and clinical performance among healthcare students, yet local evidence from resource-limited medical education settings in Pakistan remains limited. **Objective:** To assess the distribution and severity of post-traumatic stress symptoms among healthcare students in Larkana using the DSM-5-aligned PTSD Checklist for DSM-5 and to examine their association with gender, academic department, and age group. **Methods:** This cross-sectional descriptive-analytical study was conducted from March to May 2025 at a public sector medical university in Larkana, Sindh, Pakistan. A total of 324 students from MBBS, BDS, DPT, Nursing, and Pharmacy programs completed the 20-item PCL-5, rated on a five-point Likert scale. Associations between demographic variables and item-level symptom severity were analyzed using chi-square tests with Monte Carlo exact significance; effect sizes were estimated using Cramér's V, and post-hoc column proportion tests were applied where appropriate. **Results:** Complete PCL-5 data were available for all participants. Females showed consistently higher symptom severity across PCL-5 items, with large gender-associated effects (Cramér's  $V=0.708-0.720$ ). Departmental differences were moderate, with MBBS students showing greater symptom burden across several domains (Cramér's  $V=0.454-0.469$ ). Students aged 18–21 years accounted for the highest proportion of severe intrusion, concentration difficulty, and sleep disturbance, although ordinal age trends were non-significant. **Conclusion:** Post-traumatic stress symptoms were common and unevenly distributed among healthcare students, with greater symptom concentration among female students, MBBS students, and those aged 18–21 years. Institution-based confidential screening, early counseling, and targeted support for cognitive-emotional and hyperarousal symptoms are warranted. **Keywords:** PTSD; PCL-5; Healthcare Students; Medical Students; Gender Differences; Pakistan.

## INTRODUCTION

Post-traumatic stress disorder is a clinically significant psychiatric condition that may develop after exposure to traumatic or highly threatening experiences and is characterized by intrusive recollections, avoidance of trauma-related cues, negative alterations in cognition and mood, and heightened arousal or reactivity (1,2). Although exposure to trauma is common across populations, only a proportion of exposed individuals develop clinically significant post-traumatic stress symptoms, suggesting that symptom expression is shaped by the interaction of individual vulnerability, perceived threat, environmental adversity, and social context (3). Contemporary evidence further indicates that post-traumatic stress is not limited to psychological distress alone, but may involve neuroendocrine, inflammatory, immune, sleep-related, and neurocognitive dysregulation, all of which can worsen

functional capacity and quality of life (4). These multidimensional effects are particularly relevant in educational environments where sustained cognitive performance, emotional regulation, interpersonal functioning, and professional development are essential.

Health sciences students represent a population at increased psychological vulnerability because their training combines demanding academic workloads, high-stakes examinations, competitive learning environments, exposure to illness and death, emotionally charged clinical encounters, and pressure to maintain professional competence despite limited coping resources. In medical and allied health education, trauma-related symptoms may not always follow a single catastrophic event; instead, they may emerge from repeated exposure to distressing clinical experiences, cumulative academic stress, perceived lack of control, and personal or community-level adversity (5,6). Such symptoms can impair attention, sleep, emotional stability, motivation, and academic functioning, thereby affecting not only student well-being but also future clinical performance and patient care. Despite this relevance, post-traumatic stress symptoms in healthcare students often remain under-recognized because they may be misattributed to ordinary academic stress, burnout, anxiety, or depression (7).

Reliable screening is therefore important for identifying students with clinically meaningful post-traumatic stress symptom burden. The PTSD Checklist for DSM-5 is a widely used 20-item self-report measure aligned with DSM-5 symptom clusters, including intrusion, avoidance, negative alterations in cognition and mood, and hyperarousal (8,9). Its item-level structure allows researchers to examine not only overall symptom severity but also the distribution of specific symptom domains across demographic and academic subgroups. This is particularly useful in student populations because patterns of distress may differ by gender, age, level of training, and academic discipline. Previous literature suggests that females may report higher post-traumatic stress symptom burden, potentially reflecting differences in stress exposure, appraisal, biological stress responsivity, social vulnerability, or help-seeking patterns (10). Similarly, younger students and those entering demanding professional programs may face adjustment-related stressors that increase vulnerability during early training.

In low- and middle-income settings, the burden of student mental health problems may be intensified by stigma, limited institutional screening, insufficient counseling services, and reduced access to specialized mental healthcare. Pakistan has a large and growing healthcare student population, yet evidence on post-traumatic stress symptoms among medical and allied health students remains limited, especially in semi-urban and resource-constrained regions such as Larkana. This gap is important because students in such settings may face overlapping academic, clinical, socioeconomic, and community-level stressors while having fewer structured psychological support systems. Local evidence is needed to determine whether post-traumatic stress symptoms are common in this population and whether symptom severity differs meaningfully across gender, academic department, and age groups.

The present cross-sectional study was therefore designed to assess post-traumatic stress symptoms among healthcare students enrolled in MBBS, BDS, DPT, Nursing, and Pharmacy programs at a public sector medical university in Larkana, Pakistan, using the DSM-5-aligned PCL-5 scale. Using a PICO framework, the population comprised healthcare students in Larkana; the exposures or comparison variables were gender, academic department, and age group; the comparator groups were the corresponding demographic and academic subgroups; and the outcomes were PCL-5 item-level symptom severity and overall patterns of post-traumatic stress symptoms. The objective of the study was to determine the distribution and severity of post-traumatic stress symptoms in this student population and to examine their association with gender, academic department, and age, thereby generating context-specific evidence to guide student mental health screening, counseling, and preventive interventions in resource-limited healthcare education settings.

## MATERIALS AND METHODS

A cross-sectional descriptive-analytical study was conducted from March to May 2025 at a public sector medical university in Larkana, Sindh, Pakistan, to assess post-traumatic stress symptoms among undergraduate healthcare students. The cross-sectional design was selected because it allowed estimation of symptom burden and examination of associations between post-traumatic stress symptom severity and key demographic or academic characteristics at a single point in time. The study setting included students enrolled in Bachelor of Medicine and Bachelor of Surgery, Bachelor of Dental Surgery, Doctor of Physical Therapy, Bachelor of Science in Nursing, and Doctor of Pharmacy programs. The semi-urban and resource-limited educational context was relevant because students in this setting are exposed to demanding academic training, early clinical experiences, and limited structured mental health screening services.

The target population comprised currently enrolled healthcare students aged 18 years or older who were studying in one of the five eligible academic programs and were willing to provide written informed consent. Students were excluded if they were on official leave during the data collection period, had a previously diagnosed psychotic disorder that could interfere with valid self-reporting, or were unable to complete the English-language questionnaire. English was considered appropriate for questionnaire administration because it is the medium of instruction across the included academic programs. Participants were recruited using a nonprobability consecutive sampling approach. Eligible students were approached during regular academic hours in lecture halls, libraries, common areas, and clinical posting sites, and those fulfilling the eligibility criteria were invited to participate after receiving an explanation of the study purpose, voluntary nature of participation, confidentiality procedures, and right to withdraw without academic or personal consequences.

The final sample included 324 healthcare students. This sample size was considered adequate for the planned descriptive and exploratory inferential analyses of post-traumatic stress symptom distributions across gender, department, and age groups. Because the study aimed to evaluate item-level symptom patterns using the PTSD Checklist for DSM-5, the achieved sample provided sufficient observations for estimating response distributions across the 20 symptom items and for testing associations using exact significance procedures where sparse cells were present. Participants provided anonymous responses, and no personally identifying information was collected.

Post-traumatic stress symptoms were assessed using the PTSD Checklist for DSM-5, a 20-item self-report instrument aligned with DSM-5 post-traumatic stress symptom clusters: intrusion, avoidance, negative alterations in cognition and mood, and alterations in arousal and reactivity (11,12). Each item was rated on a five-point Likert scale from 0 to 4, where 0 indicated “Not at all,” 1 indicated “A little bit,” 2 indicated “Moderately,” 3 indicated “Quite a bit,” and 4 indicated “Extremely.” The 20 items permit calculation of a total symptom severity score ranging from 0 to 80, with higher scores indicating greater post-traumatic stress symptom burden. For the present analysis, individual PCL-5 item responses were treated as ordinal variables to examine the distribution of specific symptoms and their severity across participant subgroups. Symptom clusters were interpreted according to the DSM-5-aligned structure of the PCL-5, including intrusion symptoms, avoidance symptoms, negative cognition and mood symptoms, and hyperarousal symptoms.

A demographic questionnaire was administered with the PCL-5 to record gender, academic department, and age group. Gender was categorized as female, male, or other/not specified according to participant response. Academic department was categorized as MBBS, BDS, DPT, Nursing, or Pharmacy. Age was recorded in predefined categories, including less than 18 years, 18–21 years, 22–25 years, and above 25 years. For gender-specific comparative analyses, only female and male categories were included where the number of participants in other or unspecified gender categories was insufficient for stable inference.

Age and department categories with very small counts were retained descriptively, while inferential interpretation was made cautiously within the ordinal and categorical analytical framework.

Data were collected using paper-based questionnaires administered by trained research assistants. Before data collection, participants were informed that their responses would remain anonymous and would not affect their academic assessment or relationship with the institution. Questionnaires were completed in quiet and well-lit locations near academic or clinical teaching areas. The average completion time was approximately 15–20 minutes. Research assistants remained available to clarify procedural questions but did not influence responses. Completed questionnaires were placed in sealed envelopes immediately after completion and later entered into a password-protected database. To reduce information bias, the same questionnaire format and instructions were used for all participants, and anonymity was emphasized to encourage accurate reporting of sensitive psychological symptoms.

The primary outcome was post-traumatic stress symptom severity measured through individual PCL-5 item responses and symptom cluster patterns. Secondary outcomes included subgroup differences in symptom severity by gender, academic department, and age group. The main explanatory variables were gender, academic department, and age category.

Operationally, higher symptom severity was defined by increasing ordinal PCL-5 response categories, while high symptom endorsement was interpreted according to higher response levels such as “Quite a bit” and “Extremely.” The total PCL-5 score was calculated by summing all 20 item scores when required for overall severity assessment. The four DSM-5 symptom clusters were derived from the standard PCL-5 item grouping: items 1–5 for intrusion, items 6–7 for avoidance, items 8–14 for negative alterations in cognition and mood, and items 15–20 for alterations in arousal and reactivity.

Data were analyzed using IBM SPSS Statistics for Windows, Version 27.0. All variables were screened for missing values, out-of-range responses, duplicate patterns, and logical inconsistencies before analysis. Frequencies and percentages were calculated for categorical variables, including gender, academic department, age group, and each PCL-5 response category. Descriptive statistics were used to summarize the distribution of post-traumatic stress symptoms overall and within demographic and academic subgroups. Because PCL-5 item responses were ordinal and subgroup comparisons involved categorical variables, cross-tabulations were used to examine response distributions by gender, department, and age group.

Associations between demographic or academic variables and individual PCL-5 item severity were tested using Pearson’s chi-square test of independence. Because several contingency tables contained low expected cell counts, Monte Carlo exact significance testing with 10,000 samples was used to obtain robust p-value estimates. Statistical significance was assessed using a two-sided alpha level of 0.05. When an overall chi-square test was statistically significant, post-hoc column proportion z-tests with Bonferroni adjustment were used to identify subgroup differences across response categories.

The strength of association was quantified using Cramér’s  $V$  for nominal-by-ordinal or nominal-by-nominal comparisons, with values interpreted as small, moderate, or large according to conventional benchmarks. Contingency coefficients were calculated as supplementary measures of association. For age-based ordinal analyses, Gamma coefficients were used to assess monotonic trends between age category and symptom severity.

Directional measures, including Lambda and Goodman and Kruskal’s tau, were used as supplementary indices to describe proportional reduction in prediction error, but primary inference was based on chi-square tests, Monte Carlo significance values, and Cramér’s  $V$ .

Bias and confounding were addressed through standardized data collection procedures, anonymous self-administration, uniform eligibility criteria, and stratified reporting by gender, department, and age group. Selection bias was minimized by approaching students across multiple academic and clinical

locations during regular academic hours. Information bias was reduced by using a standardized validated symptom checklist and by ensuring that participants completed questionnaires privately. Confounding was evaluated analytically by examining symptom distributions across major demographic and academic variables. Subgroup analyses were planned for gender, department, and age groups because these variables were considered clinically and educationally relevant to post-traumatic stress symptom burden.

Ethical principles for human participant research were followed throughout the study. Written informed consent was obtained from all participants before questionnaire completion. Participation was voluntary, and students were informed that they could decline participation, skip any item, or withdraw at any stage without penalty.

Confidentiality was maintained by collecting anonymous data and storing completed forms and electronic files securely. A distress protocol was applied during data collection; if a participant experienced discomfort while completing the questionnaire, the process was paused and support information was provided. Participants were also informed about available mental health support services. No adverse events were reported during data collection.

Data integrity was maintained through secure handling of paper questionnaires, password-protected electronic data entry, and systematic checking of the dataset before analysis. A random subset of questionnaires was double-entered to assess entry accuracy, and discrepancies were corrected by comparison with source forms. The final dataset was reviewed for missing values, implausible entries, and repetitive response patterns before statistical analysis. All analytical decisions, including variable coding, subgroup definitions, significance thresholds, exact testing procedures, and effect size measures, were prespecified to ensure reproducibility and transparent reporting.

## RESULTS

A total of 324 healthcare students completed the survey, with complete data available for all 20 PCL-5 items and the core demographic variables. The sample had an almost equal gender distribution, with 162 females (50.0%), 161 males (49.7%), and one participant recorded in an other/unspecified gender category. Most participants were enrolled in MBBS (n=284, 87.7%), followed by DPT (n=15, 4.6%), Nursing (n=11, 3.4%), Pharmacy (n=10, 3.1%), and BDS (n=3, 0.9%). The mean age was 20.4 years (SD=2.1), and the majority of students were aged 18–21 years (n=238, 73.5%).

*Table 1. Socio-Demographic Characteristics of Participants*

Variable	Category	Frequency, n	Percentage, %
<b>Total sample</b>	Healthcare students	324	100.0
<b>Gender</b>	Female	162	50.0
	Male	161	49.7
	Other/unspecified	1	0.3
<b>Academic department</b>	MBBS	284	87.7
	BDS	3	0.9
	DPT	15	4.6
	Nursing	11	3.4
	Pharmacy	10	3.1
<b>Age group</b>	18–21 years	238	73.5
	22–25 years	85	26.2
	>25 years	1	0.3
<b>Age</b>	Mean ± SD	20.4 ± 2.1 years	—
<b>Core PCL-5 data completion</b>	Complete responses	324	100.0

Item-level analysis showed a broad distribution of post-traumatic stress symptoms across the PCL-5 domains. Seventeen of the 20 PCL-5 items had at least half of participants selecting “A little bit,” indicating frequent low-grade symptom endorsement. Overall symptom endorsement, defined as responses from at least minimal endorsement to higher severity, ranged from 75.3% for “Taking too many risks” to 99.7% for “Intrusive memories.” High-severity endorsement was most prominent for intrusive memories (54.6%), followed by avoidance symptoms (41.4%) and hypervigilance (36.7%).

Among symptoms endorsed at the “Extremely” level, difficulty concentrating was reported by 11.4% of participants, while feeling distant or cut off from others was reported by 14.8%.

**Table 2. Distribution and Severity of Key PCL-5 Symptoms**

PCL-5 Symptom or Indicator	Symptom Domain	Quantitative Finding
Intrusive memories	Intrusion	99.7% overall endorsement
Taking too many risks	Hyperarousal/risk behavior	75.3% overall endorsement
Intrusive memories	Intrusion	54.6% high severity
Avoidance	Avoidance	41.4% high severity
Hypervigilance	Hyperarousal	36.7% high severity
Difficulty concentrating	Hyperarousal/cognitive	11.4% “Extremely”
Feeling distant or cut off from others	Negative cognition/mood	14.8% “Extremely”
PCL-5 items with ≥50% reporting “A little bit”	Overall PCL-5	17 of 20 items

Significant associations were observed between PCL-5 symptom severity and each of the three main grouping variables. Gender showed a statistically significant association with PTSD symptom severity ( $\chi^2=334.75, p<0.001$ ), department also showed a statistically significant association ( $\chi^2=355.90, p<0.001$ ), and age group was significantly associated with symptom severity ( $\chi^2=325.72, p=0.005$ ). Monte Carlo exact chi-square testing showed significant gender differences across all 20 PCL-5 items, with all item-level p-values below 0.005 and 16 of 20 items below 0.001.

**Table 3. Association Between Demographic Variables and PCL-5 Symptom Severity**

Comparison	Chi-Square Statistic, $\chi^2$	p-Value	Inferential Statistic
Gender vs PTSD symptom severity	334.75	<0.001	Cramér’s V range: 0.708–0.720
Department vs PTSD symptom severity	355.90	<0.001	Cramér’s V range: 0.454–0.469
Age group vs PTSD symptom severity	325.72	0.005	Cramér’s V range: 0.505–0.523
Gender differences across all 20 PCL-5 items	Item-level tests	All p<0.005	16/20 items p<0.001
Department differences across PCL-5 items	Item-level tests	18/20 items p<0.05	Cramér’s V 0.454–0.469
Age trend across symptom severity	Ordinal Gamma tests	All p>0.05	Gamma values small

Effect-size analysis showed that gender had the strongest association with symptom severity. Cramér’s V for gender comparisons ranged from 0.708 for being supernalert to 0.720 for difficulty concentrating, with a median value of 0.713. The strongest gender-associated items were difficulty concentrating ( $\chi^2=335.82, V=0.720$ ), blaming oneself or someone else ( $\chi^2=334.75, V=0.719$ ), and feeling distant or cut off from others ( $\chi^2=333.02, V=0.717$ ). Department-related effects were moderate, with the strongest associations observed for trouble experiencing positive feelings ( $\chi^2=355.90, V=0.469$ ), feeling distant or cut off ( $\chi^2=350.03, V=0.465$ ), and blaming oneself ( $\chi^2=345.95, V=0.462$ ).

**Table 4. Effect Size and Item-Level Association Findings**

Comparison or Symptom Item	Domain	$\chi^2$	p-Value	Cramér’s V
Female vs male overall comparison	Overall PCL-5	—	<0.001	0.719
MBBS vs other departments	Overall PCL-5	—	<0.001	0.469
18–21 years vs older age groups	Overall PCL-5	—	0.005	0.513
Difficulty concentrating	Hyperarousal	335.82	<0.001	0.720
Blaming oneself or someone else	Negative cognition/mood	334.75	<0.001	0.719
Feeling distant or cut off from others	Negative cognition/mood	333.02	<0.001	0.717
Being supernalert	Hyperarousal	324.60	<0.001	0.708
Trouble experiencing positive feelings	Negative cognition/mood	355.90	<0.001	0.469
Feeling distant or cut off	Negative cognition/mood	350.03	<0.001	0.465
Blaming oneself	Negative cognition/mood	345.95	<0.001	0.462

Cluster-level findings showed consistently large gender effects across all four DSM-5-aligned PCL-5 domains. Hyperarousal had the largest mean Cramér’s V (0.720), followed by negative cognition/mood (0.714), avoidance (0.713), and intrusion (0.712). Females represented 63.6% of those with extreme intrusive memories, 58.7% of those with extreme avoidance, 64.9% of those with extreme concentration difficulty, and 70.3% of those with extreme sleep disturbance.

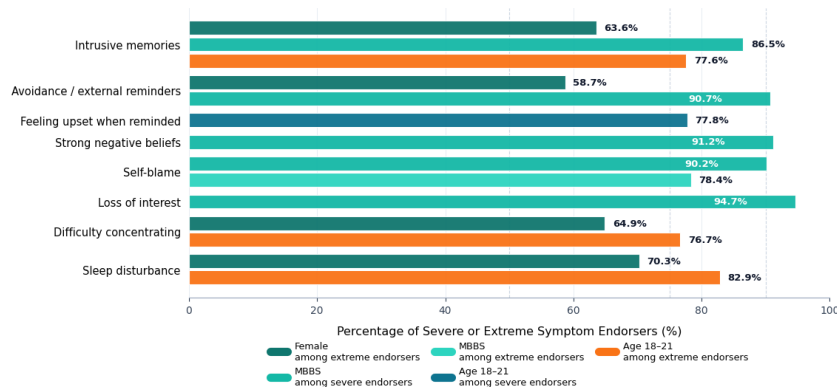
In the hyperarousal domain, difficulty concentrating had the highest reported gender association ( $\chi^2=335.82, V=0.720$ ), followed by taking too many risks ( $\chi^2=331.06, V=0.715$ ), trouble sleeping ( $\chi^2=325.72, V=0.709$ ), and being supernalert ( $\chi^2=324.60, V=0.708$ ). In the intrusion domain, repeated disturbing

memories ( $\chi^2=328.69$ ,  $V=0.712$ ) and suddenly feeling or acting as if the event were recurring ( $\chi^2=326.88$ ,  $V=0.710$ ) were the most prominent gender-associated symptoms.

**Table 5. Cluster-Level, Gender, Department, and Age Pattern Findings**

Analysis Area	Quantitative Finding	p-Value / Trend
Intrusion cluster	Mean Cramér's $V=0.712$	$p<0.001$
Avoidance cluster	Mean Cramér's $V=0.713$	$p<0.001$
Negative cognition/mood cluster	Mean Cramér's $V=0.714$	$p<0.001$
Hyperarousal cluster	Mean Cramér's $V=0.720$	$p<0.001$
Extreme intrusive memories among females	63.6%	Significant gender pattern
Extreme avoidance among females	58.7%	Significant gender pattern
Extreme concentration difficulty among females	64.9%	Significant gender pattern
Extreme sleep disturbance among females	70.3%	Significant gender pattern
MBBS students endorsing "Quite a bit" repeated disturbing memories	86.5%	Significant column-proportion pattern
MBBS students endorsing "Quite a bit" avoiding external reminders	90.7%	Significant column-proportion pattern
MBBS students endorsing "Quite a bit" strong negative beliefs	91.2%	Significant column-proportion pattern
MBBS students endorsing "Quite a bit" self-blame	90.2%	Significant department pattern
MBBS students endorsing "Extremely" self-blame	78.4%	Significant department pattern
"Quite a bit" loss of interest reported by MBBS students	94.7%	Significant department pattern
Extreme intrusive memories in age 18–21 years	77.6%	Nonlinear age pattern
Extreme intrusive memories in age 22–25 years	22.4%	Nonlinear age pattern
Extreme intrusive memories in age >25 years	0.0%	Nonlinear age pattern
"Quite a bit" feeling very upset when reminded in age 18–21 years	77.8%	Nonlinear age pattern
Extreme concentration difficulty in age 18–21 years	76.7%	Nonlinear age pattern
Extreme sleep disturbance in age 18–21 years	82.9%	Nonlinear age pattern
Age vs intrusion	Gamma=0.12	$p>0.05$
Age vs hyperarousal	Gamma=0.09	$p>0.05$
Age vs avoidance	Gamma=0.11	$p>0.05$

Age-stratified findings showed that the 18–21-year group accounted for the largest proportion of severe symptom endorsement across multiple symptom domains. This group represented 77.6% of extreme intrusive memory responses, 77.8% of "Quite a bit" responses for feeling very upset when reminded, 76.7% of extreme concentration difficulty responses, and 82.9% of extreme sleep disturbance responses. Although chi-square testing showed statistically significant age-group differences in PCL-5 symptom distributions, ordinal Gamma coefficients for intrusion ( $\gamma=0.12$ ), hyperarousal ( $\gamma=0.09$ ), and avoidance ( $\gamma=0.11$ ) were small and non-significant, indicating that symptom severity differed by age category without a linear increase across older age groups.



**Figure 1. Concentration of Severe PCL-5 Symptom Endorsement Across High-Risk Healthcare Student Strata**

Figure description: The figure shows that severe or extreme PCL-5 symptom endorsement clustered most strongly among MBBS students, with the highest concentrations observed for loss of interest (94.7%), strong negative beliefs (91.2%), avoidance/external reminders (90.7%), and self-blame (90.2%). Younger students aged 18–21 years also accounted for a high proportion of severe symptom endorsement, particularly sleep disturbance (82.9%), feeling upset when reminded (77.8%), intrusive memories (77.6%), and difficulty concentrating (76.7%). Female students represented a greater share of

extreme symptom endorsement across key domains, including sleep disturbance (70.3%), difficulty concentrating (64.9%), intrusive memories (63.6%), and avoidance/external reminders (58.7%), indicating a clinically meaningful concentration of symptom burden across gender, academic program, and early training stage.

## DISCUSSION

This cross-sectional study identified a substantial burden of post-traumatic stress symptoms among healthcare students in Larkana, with symptom endorsement distributed across all DSM-5-aligned PCL-5 domains, including intrusion, avoidance, negative alterations in cognition and mood, and hyperarousal. The findings are clinically important because the sample comprised young students in health professional training, a group expected to maintain sustained academic performance, emotional regulation, and early professional competence while navigating demanding educational and clinical environments. The high frequency of symptom endorsement suggests that post-traumatic stress symptoms in this setting may not be limited to students exposed to a single major traumatic event, but may also reflect the cumulative psychological effects of academic pressure, perceived threat, clinical exposure, uncertainty, and limited access to structured mental health support. This interpretation is consistent with evidence showing that trauma-related symptoms may emerge in response to perceived danger, loss of control, and repeated stress exposure, rather than only after conventionally defined catastrophic events (13,14). The study's context is especially relevant because semi-urban and resource-limited educational settings may intensify psychological distress through stigma, reduced help-seeking, and limited availability of confidential counseling services. The study population and analytic approach were based on 324 healthcare students from MBBS, BDS, DPT, Nursing, and Pharmacy programs, with complete PCL-5 item data and subgroup comparisons by gender, department, and age (15,16).

A major finding was the consistent gender difference in PCL-5 symptom severity. Female students showed higher symptom burden across all four symptom clusters, with large effect sizes reported for gender-based comparisons. The Cramér's V values for gender-associated item-level effects ranged from 0.708 to 0.720, with the strongest associations observed for difficulty concentrating, self-blame, and feeling distant or cut off from others. This pattern indicates that gender-related differences were not confined to a single symptom domain but extended across cognitive, emotional, intrusion-related, avoidance-related, and arousal-related symptoms. Previous studies have similarly reported greater vulnerability to post-traumatic stress symptoms among females, which may reflect differences in trauma exposure, stress appraisal, biological stress responsivity, social vulnerability, and reporting patterns (17,18). In the present context, the particularly strong gender differences in self-blame, detachment, impaired concentration, and sleep disturbance suggest that female students may experience trauma-related distress through both internalizing cognitive-emotional pathways and arousal-related functional impairment. These findings support the need for gender-responsive mental health services that address not only overt anxiety or distress but also maladaptive guilt, emotional numbing, concentration difficulties, and sleep problems (19,20).

The prominence of negative cognition and mood symptoms is an important clinical observation. Items such as self-blame, strong negative beliefs, detachment from others, and reduced positive affect showed strong subgroup differentiation, particularly by gender and academic department. Cognitive models of post-traumatic stress emphasize that maladaptive appraisals, persistent guilt, negative self-beliefs, and perceived personal responsibility can maintain trauma-related distress and interfere with recovery (21). In student populations, these symptoms may be expressed as excessive fear of academic failure, harsh self-judgment, reduced confidence, emotional withdrawal, and diminished motivation. This is especially relevant in medical education, where perfectionism, competition, hierarchical training environments, and fear of poor evaluation may intensify negative self-appraisal. The observed burden of difficulty concentrating and detachment is also educationally meaningful because these symptoms may directly impair learning, examination performance, clinical reasoning, and peer relationships. Prior work has

shown that post-traumatic stress symptoms are associated with functional impairment, somatic distress, anxiety, depression, and reduced social functioning, which may compound academic and personal difficulties among students (22, 23).

Hyperarousal symptoms also emerged as a central concern. Difficulty concentrating had the strongest gender-associated item-level effect, while sleep disturbance and hypervigilance were also frequently represented among severe or extreme symptom categories. Sleep disturbance is a core feature of post-traumatic stress and may operate bidirectionally, with poor sleep worsening emotional regulation, intrusive symptoms, attention, and physiological arousal, while trauma-related symptoms further disrupt sleep continuity (24, 25). In healthcare students, this pathway may be amplified by late-night studying, irregular schedules, examination stress, and clinical exposure. Concentration difficulty is particularly important because it links psychological distress to academic functioning. When impaired attention occurs alongside sleep disturbance, intrusive memories, and negative beliefs, students may enter a cycle in which psychological symptoms reduce academic performance, and academic difficulty then reinforces distress and self-blame. This pattern highlights the importance of interventions that combine trauma-informed counseling with practical academic support, sleep hygiene, stress management, and early referral pathways (26,27).

Academic department was also significantly associated with symptom severity, although the magnitude of association was lower than that observed for gender. MBBS students were highly represented among severe categories for repeated disturbing memories, avoidance of external reminders, strong negative beliefs, self-blame, and loss of interest. Department-related Cramér's V values were in the moderate range, with the strongest effects reported for trouble experiencing positive feelings, feeling distant or cut off, and blaming oneself. (28, 29). These findings suggest that academic environment and training structure may influence symptom expression. MBBS training is typically longer, more competitive, and more clinically intensive than many allied health programs, and students may encounter distressing patient experiences, high academic expectations, and performance pressure at earlier or more frequent intervals (30, 31). However, because the majority of participants were enrolled in MBBS, department-based interpretation should focus on the observed concentration of symptom burden rather than assuming causality. The findings still point toward the value of curriculum-sensitive mental health planning, especially in programs where clinical exposure, workload, and evaluative pressure are greatest. The manuscript's results showed that MBBS students accounted for 86.5% of "Quite a bit" repeated disturbing memories, 90.7% of "Quite a bit" avoidance of external reminders, and 91.2% of "Quite a bit" strong negative beliefs (32,33).

Age-related findings showed that students aged 18–21 years carried the largest share of severe symptom endorsement across several domains, including extreme intrusive memories, emotional reactivity when reminded, extreme concentration difficulty, and extreme sleep disturbance. This pattern suggests that the early phase of health professional education may be a psychologically vulnerable period. (34, 35). Transition into professional training often involves relocation, social adjustment, exposure to competitive academic norms, unfamiliar clinical environments, and uncertainty about future performance. Younger students may also have less developed coping strategies and less experience managing distressing clinical or academic encounters. At the same time, ordinal Gamma coefficients were small and non-significant, indicating that symptom severity did not increase linearly with age. The more appropriate interpretation is that symptom burden differed across age categories, with concentration among younger students, rather than showing a monotonic age gradient. This distinction is important because it suggests that preventive support may be most beneficial when introduced early in training, particularly during the first years of professional education. Age-stratified results showed that the 18–21-year group accounted for 77.6% of extreme intrusive memories, 76.7% of extreme concentration difficulty, and 82.9% of extreme sleep disturbance.(36-40).

The clustering of symptoms across gender, department, and age suggests that post-traumatic stress symptoms among healthcare students may reflect an interaction between personal vulnerability, academic context, and developmental stage. Female students in early training years and students in the MBBS program appeared to represent especially high-burden groups across several symptom domains. This does not imply that symptoms are caused by gender, department, or age alone; rather, these variables may mark different forms of exposure, stress appraisal, role expectation, social support, and coping capacity. The findings are compatible with broader literature showing that post-traumatic stress symptoms are heterogeneous and may be shaped by cumulative stress exposure, perceived threat, prior adversity, social support, and individual resilience (41-44). In health professional education, this heterogeneity is important because a uniform mental health strategy may fail to reach students with different symptom profiles. Item-level screening can help identify whether a student's distress is dominated by intrusive experiences, avoidance, cognitive guilt and negative beliefs, sleep disturbance, hypervigilance, or concentration difficulty, allowing support services to match interventions more closely to symptom patterns (45).

These findings have practical implications for medical universities in resource-limited settings. Routine confidential screening using validated instruments such as the PCL-5 may help identify students with clinically meaningful symptom burden, but screening should be embedded within a clear support pathway. Screening without accessible referral, counseling, confidentiality protection, and crisis response may increase distress or distrust. A feasible institutional approach would include confidential mental health assessment at entry and at key transition points, psychoeducation about trauma-related symptoms, faculty training to recognize distress, peer-support networks, and referral links with psychiatry or psychology services. Trauma-focused cognitive behavioral therapy, structured counseling, stress-management programs, sleep-focused interventions, and resilience-building approaches may be particularly useful when adapted to local cultural and institutional contexts (46,47). Because self-blame, detachment, concentration difficulty, and sleep disturbance were prominent in this sample, interventions should move beyond general wellness messaging and include targeted modules on cognitive restructuring, emotional regulation, sleep hygiene, academic coping, and safe disclosure (48).

The study has several limitations that should be considered when interpreting the findings. The cross-sectional design prevents causal inference, so the observed associations cannot determine whether academic stress, clinical exposure, or demographic factors caused post-traumatic stress symptoms. The use of self-reported PCL-5 responses may introduce reporting bias, recall bias, and social desirability bias, particularly in a setting where mental health stigma may affect disclosure. The study assessed symptom burden rather than clinician-diagnosed PTSD, and symptom interpretation depends on how participants understood and applied the PCL-5 items. The nonprobability consecutive sampling approach may limit generalizability beyond the participating institution. Department and age comparisons should be interpreted cautiously because some subgroups were small, particularly BDS and the above-25 age category. The study also did not fully measure potential explanatory variables such as specific trauma exposure, clinical year, socioeconomic stress, prior psychiatric history, family support, coping style, resilience, or social support. These unmeasured variables may partly explain subgroup differences and should be incorporated in future multi-center studies (49, 50).

Despite these limitations, the study provides context-specific evidence on post-traumatic stress symptom patterns among healthcare students in Larkana and highlights the value of item-level analysis. Rather than treating post-traumatic stress symptoms as a single undifferentiated construct, the findings show that cognitive-mood symptoms, hyperarousal, intrusion, and avoidance may cluster differently across gender, academic program, and age group. This has direct relevance for institutional mental health planning because it identifies specific symptom targets for early intervention. Future research should use longitudinal designs to examine symptom trajectories across academic years, include trauma exposure and protective factors, and apply multivariable models to clarify independent associations. Multi-institutional studies would also help determine whether the patterns observed in this semi-urban

Pakistani healthcare student population are consistent across other educational settings. Overall, the findings support early, confidential, and culturally responsive mental health screening and intervention as an essential component of healthcare education, particularly for students in early training years and those reporting cognitive-mood and hyperarousal symptoms (51).

## CONCLUSION

This cross-sectional study demonstrates that post-traumatic stress symptoms are common among healthcare students in Larkana and are distributed across all major PCL-5 symptom domains, including intrusion, avoidance, negative alterations in cognition and mood, and hyperarousal. Symptom severity showed meaningful variation by gender, academic department, and age group, with female students, MBBS students, and students aged 18–21 years showing the greatest concentration of severe or extreme symptom endorsement. The most clinically relevant symptom patterns involved intrusive memories, avoidance, self-blame, strong negative beliefs, emotional detachment, difficulty concentrating, and sleep disturbance, indicating that trauma-related distress in this population may affect both psychological well-being and academic functioning. These findings highlight the need for confidential, culturally responsive, and institutionally supported mental health screening within healthcare education settings, particularly during the early years of training. Targeted interventions addressing cognitive-emotional symptoms, sleep disturbance, concentration difficulties, and gender-sensitive support needs may help reduce symptom burden and improve student well-being. In resource-limited settings, integrating structured screening, early counseling access, peer support, faculty awareness, and referral pathways into medical and allied health curricula may strengthen both student mental health and the future quality of healthcare delivery.

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