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Effectiveness of mindfulness-based intervention on post-traumatic stress symptoms among emergency nursing students

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Abstract

Background: Clinical training stress may negatively affect nursing students' academic achievement, clinical performance, learning outcomes, well-being, general health, and quality of life. This study aimed to evaluate the effect of mindfulness-based intervention on post-traumatic stress symptoms among emergency nursing students. This study was conducted at the technical institute of nursing, Zagazig University. Three tools were used in the current study: the sociodemographic data sheet, the impact of event scale, and the 15-item Five-Facet Mindfulness Questionnaire.

Results: Emergency nursing students had a wide range of PTSS at the pre-intervention period. These symptoms significantly improved after the implementation of a mindfulness-based intervention. Mindfulness level also improved after the intervention. Post-traumatic stress symptoms were positively correlated with the number of training hours and negatively correlated with students' age, mother's occupation, and educational level.

Conclusions: Mindfulness-based intervention was effective in reducing post-traumatic stress symptoms among emergency nursing students.

Keywords: Emergency, Mindfulness, Nursing students, Post-traumatic stress symptoms

Background

Clinical practice is crucial in nursing students' education to promote different clinical experiences in various healthcare settings [1]. Nursing knowledge and skills learning in a clinical setting with real patients is significantly more valuable than learning them in a lab or classroom. Clinical practice allows nursing students to obtain and apply the information and psychomotor skills that are critical for their professional growth [2].

Although intensive care patients need more accurate and complicated nursing care, clinical practice in an intensive care unit (ICU) is very useful for nursing students. It provides them an opportunity to apply a variety of skills and to observe a multidisciplinary collaboration and a decision-making process. In addition, it allows students to organize their information, thus developing their clinical reasoning skills [3].

As nursing students practice in critical clinical settings, they may experience anxiety and stress, and the first clinical experience may be the most stressful. Undergraduate emergency nursing students are frequently exposed to stress when assisting patients in emergency circumstances. They are more likely to develop post-traumatic stress disorder (PTSD) symptoms [4]. It is caused by several factors, including seeing patients die; being involved with end-of-life care; patient aggression; massive bleeding; verbal abuse from either patients' families members, physicians, or other nurses; open surgical wounds; care futility; trauma-related injuries; performing cardiopulmonary resuscitation; feeling overworked due to inadequate nurse-to-patient ratios; and not being able to save a specific patient [5].

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A recurrent exposure to traumatic events and stressors can lead to serious behavioral and mental health problems among emergency personnel. These can include depression, anxiety, and post-traumatic stress symptoms (PTSS). It consists of avoidance of stimuli related to the trauma, intrusion symptoms such as nightmares and flashbacks, hyperarousal symptoms like insomnia, and symptoms of negative cognition and mood such as shame, low self-esteem, fear, and guilt [6, 7].

Post-traumatic stress reactions can impact the ability of many health professionals to work efficiently and result in reducing their work hours, increasing absenteeism, or switching jobs. They can also cause non-empathetic behavior toward patients. Moreover, social relationships are severely damaged, and withdrawal behavior becomes more prominent [8].

Mindfulness is the awareness that develops when one deliberately focuses nonjudgmental attention on the phenomena (feelings, thoughts, and sensations) moving through the present moment in order to gain wisdom, insight, and compassion [9]. Mindfulness influences stress in various ways. The first is that mindfulness, as a personal resource, assists nurses reduce their perception of professional demands, reducing the impact of their stress. Next, mindfulness training reduces stress by assisting nurses to maintain focus on the present moment, thus reducing attention to peripheral unpleasant thoughts. Lastly, mindfulness enables nurses to gain a greater sense of control by increasing their awareness of cause-and-effect sequences, which modulates emotional responses to stressors [10].

Mindfulness is considered a personal resource that can influence how people perceive their job demands and organize their job resources, thereby affecting how much stress they experience. More mindful individuals are better able to prioritize urgent job needs, filter out the unnecessary, and utilize meaningful work resources [11]. Mindfulness-based techniques include mindfulness-based cognitive therapy (MBCT) and mindfulness-based stress reduction (MBSR). These techniques target the main symptoms of PTSD, including hyperarousal, avoidance, emotional numbing, and negative feelings such as guilt, shame, and dissociation [12].

Lang et al. [13] discussed three components of mindfulness that may help people recover from PTSD, including a mindful cognitive style, attention, and nonjudgment. In detail, the authors explained how mindful and deliberate shifting of attention to the present moment increases attention control and might reduce attention bias to trauma-related events [13]. Furthermore, a mindful cognitive style may decrease ruminative tendencies, resulting in lower levels nervous arousal and anhedonia, and a nonjudgmental view may encourage people to confront fear-provoking situations, leading to fewer avoidance behaviors [14].

Significance of the study

Several studies have found that emergency services personnel have higher incidences of PTSD. The prevalence of PTSD among emergency nurses was 82.96%, which was higher among nurses with lower educational levels and shorter work experiences [15]. Similarly, an Egyptian study found that 39.6% of undergraduate emergency nursing students had high levels of post-traumatic stress, 4.0% had moderate levels, and 56.4% had low levels [4].

When PTSS persists for longer than 1 month, it can progress to PTSD. PTSD is a serious condition that can negatively impact health, leading to a number of physical and psychological comorbid conditions, including cardiovascular problems, metabolic and respiratory diseases, major depressive disorders, alcohol dependence or abuse, neurological disorders, and other anxiety disorders [16]. If emergency responders are educated about PTSD before being exposed to a critical incident, they may be better able to cope with it [17]. Therefore, the aim of this study was to evaluate the effectiveness of a mindfulness-based intervention on PTSS among emergency nursing students.

Aim of the study

The aim of this study was to evaluate the effects of a mindfulness-based intervention on post-traumatic stress symptoms among undergraduate emergency nursing students. This was achieved through the following objectives:

- Assess the symptoms of post-traumatic stress among undergraduate emergency nursing students.
- Develop and test the mindfulness-based intervention on undergraduate emergency nursing students.
- Evaluate the effect of the intervention on the symptoms of post-traumatic stress in emergency nursing students.

Methods

Research hypothesis

1. Students training in an emergency department for the first time may experience some PTSS.
2. The mindfulness-based intervention will reduce PTSS among undergraduate emergency nursing students.

Research design

This study was conducted using a quasi-experimental design.

Setting

This study was carried out at the Technical Institute of Nursing, Zagazig University, AL Sharkia Governorate, Egypt. The Technical Institute of Nursing is found in building number 62, above the dentistry college. The students in the Technical Institute of Nursing study subjects related to seven scientific departments, namely medical surgical nursing, geriatric nursing, pediatric nursing, maternal and neonatal health nursing, nursing administration, psychiatric mental health nursing, and community health nursing. Each theoretical course runs concurrently with each clinical course. Clinical training begins in the second semester of the first year and lasts 1 day (4 h) per week. The technical nursing program consists of two academic years and 6 months of internship training.

Subjects

A purposeful sample was selected from the 1st-year students at the Technical Institute of Nursing, Zagazig University, who were undergoing training at emergency departments at the time of data collection throughout the 2020–2021 academic year. They were selected based on the following inclusion criteria:

1. Students at the beginning of their training at the emergency department
2. Students have no prior experience dealing with emergency patients.
3. Students who have not participated in a stress management program prior to their training in emergency departments
4. Students without history of psychiatric disorders (by asking students if they treated for psychiatric disorders)
5. Males and females

The sample size

The Epi Info software version 7 of Stat Calc was used to compute the sample size. We assume during the academic years 2020–2021, 250 first-year students enrolled in the previously specified setting were trained in emergency departments, and that 39.6% of these students had PTSD [4]. Therefore, at a power of 80% and a confidence of 95%, a sample size of 149 students would be appropriate. To account for the dropout and nonresponse rates, the number was increased to 160.

Tools of data collection

In this study, a structured interview schedule was used. It consisted of three parts:

Part 1: sociodemographic data sheet

It was constructed by the researchers to assess the demographic and clinical characteristics of the students such as age, gender, residence, parents' educational level and occupation, number of practical training hours per week, and direct contact with patients.

Part II: the impact of event scale-revised (IES-R)

It was developed by Wilson and Keane [18] to assess PTSS and acute stress. It is a quick, easy-to-use self-report questionnaire. It includes 22-item based on three groups of symptoms recognized in the *Diagnostic and Statistical Manual of Mental Disorders*, third edition (DSM-III), as indicators of PTSD. Intrusion, avoidance, and hyperarousal are the three subscales of this scale. There are eight items assessing intrusion, eight items assessing avoidance, and six items assessing hyperarousal. This scale is a modified form of the original 15-item IES [19]. The IES-R is neither a screening nor a diagnostic tool for PTSD; rather, it is used to assess a patient's response 2 weeks after a traumatic event, as well as to evaluate their recovery, and it is based on a the patient's own description of their symptoms.

Scoring system Using a five-point rating scale ranging from 0 (not at all) to 4 (extremely), this scale measures the intensity of PTSD symptoms (intrusion, avoidance, and hyperarousal). An overall score is calculated by adding all items together (ranging from 0 to 88 points). Scores above 24 might be quite meaningful and correspond to the following characteristics:

- 24–32: PTSD is a clinical concern (have partial PTSD or at least some of its symptoms).
- 33–38: This is the ideal cutoff point for a possible PTSD diagnosis.
- 39 and above: This is high enough to suppress the immune system's ability (even 10 years after the traumatic event).

Part III: 15-item Five-Facet Mindfulness Questionnaire (FFMQ-15)

This is a short version of the 39-item scale [20] and includes the same five aspects as the long-form. The

15-item FFMQ (FFMQ-15) was developed by Gu et al. [21]. Each aspect consists of three items: observing (1, 6, 11), describing (2, 7, 12), acting with awareness (3, 8, 1), nonjudgment of inner experience (4, 9, 14), and nonreactivity to inner experience (5, 10, 15). The FFMQ-15's factor structure and psychometric qualities were studied by Gu et al. [22]. They revealed that the factor structure of the FFMQ-15 was similar to that of the FFMQ-39, and there were strong correlations between total facet scores of the short and long forms.

Scoring system The participants rated their responses on a 5-point scale ranging from one (never) to five (always). This scale has reversed items no (3, 4, 7, 8, 9, 13, and 14). There are two ways to score the test: either by summing up all 15 questions to get a full-scale mindfulness score or by summarizing three items of each facet individually to get more precise data. A higher score suggests a higher level of mindfulness.

Validity and reliability

Following tools translation, two other bilingual experts did a blind back-translation, in which they transformed the translated tools into the original English without seeing the originals. A comparison of the original and translated tools was then conducted to establish their equivalency. The translated Arabic measure was revised until the two versions were equivalent. The consistency of the translations as well as the structure and grammar of the Arabic language was examined by a panel of three individuals (two nursing faculty members and one medical doctor). This panel compared the English and the Arabic versions, item by item. A version of the tools in Arabic was created after a consensus was reached on the consistency of the scale's translations and back-translations, as well as modifications to the Arabic language grammar and structure.

Cronbach's test in SPSS V.20 (SPSS Inc., Chicago, Illinois, USA) was used to assess the reliability of the tools. They demonstrate high reliability as follows: impact of event scale ($\alpha = 0.894$), Five-Facet Mindfulness Questionnaire ($\alpha = 0.741$).

Pilot study

A pilot study was conducted with (16) students, representing 10% of the overall study population, to determine how long it would take to gather data and whether the tools were clear and relevant. Participants were instructed to complete the questionnaire and to make a note of any questions that were unclear or difficult to answer. Several modifications were made, including using a simplified semantic for the statements. The tool was completed based on the findings of the pilot study, and the students of this group were not included in the main study.

Data collection procedure

Stage 1: preparatory phase

The researchers analyzed current, previous, local, and international relevant literature to prepare for the intervention and gain a comprehensive overview of all aspects of the research topic. Upon submission of the letter of approval from the dean of the Faculty of Nursing to the director of the Technical Institute of Nursing at Zagazig University, the study was officially approved.

Stage 2: recruitment and group allocation

First-year students of the technical institute of nursing were contacted via in-class announcements. Based on the eligibility criteria, the researcher started recruiting a sample of the students. The researchers introduced themselves to the students and explained the purpose and procedure of the study. Those students were divided into 8 groups of 20 each. The researchers met with all groups once a week (two groups per day) for 3 months.

Stage 3: pre-test assessment

The students were asked to fill out the questionnaire sheet that took about 20 to 30 min. The data was primarily evaluated in order to lay a foundation for the intervention sessions. A 2-week phase preceded the intervention, which lasted from 15 February to 1 March 2021.

Stage 4: the planning phase

After reviewing relevant literature, the researcher prepared the contents of the intervention booklet based on the identified students' needs and the study goals, as well as the data acquired from the assessment phase. The identified needs were translated into objectives and goals for the intervention, which were later incorporated into a booklet. The booklet was delivered to students as a self-learning guide after being validated for content. In order to be able to provide this intervention, researchers received training on mindfulness-based stress reduction techniques at the psychiatric center of Zagazig University, 6 h per day over 3 days, which included theoretical and practical training.

Objectives of the intervention

1. Recognize the meaning of psychological trauma and the concept of stress.
2. Identify the precipitating causes of PTSS.
3. Recognize the signs and symptoms of post-traumatic stress.
4. Identify some coping methods (e.g., mindfulness) to relieve PTSS.

5. Practice mindfulness to overcome the symptoms of post-traumatic stress.
6. Understand the importance of stress management.

Implementation phase

Participants received the intervention over eight sessions, one session to each group per week and two groups per day. Each session had its own objectives and title according to its content. Each session lasted from 45 to 60 min, depending on the students' comprehension and assimilation of the knowledge, which varied depending on the time available and the content of each session. All students were exposed to the same content and taught using the same teaching methods, such as discussions, videos, and the booklet. The intervention lasted 3 months, from 15 February 2021 to 15 May 2021.

During the sessions, photos and posters were used through a data show and laptop to facilitate learning and demonstrate the intervention booklet. A summary of what was discussed in the previous session is provided at the beginning of each session, using simple language to accommodate the students' understanding level. During the session, motivation and reinforcement techniques, such as praise, were used to encourage active participation and foster learning.

The sessions were as follows:

- First sessions (45–60 min): The researchers presented an overview of the intervention in this session, including the goal of the intervention, the number of sessions, duration of each session, and benefits from applying it, as well as the meeting locations and timetables for each group. The pretest was then administered using the data collection sheet.
- The second session: In this session, we discussed the concept of stress, as well as the causes, nature, and effects of psychological trauma, and what the signs and symptoms of post-traumatic stress look like. Students were educated about homework assignments in the form of worksheets that contain information regarding PTSS, expression of negative feelings, and how to document them in the worksheet.
- The third session: After reviewing the previous session, students were provided with knowledge about signs and symptoms of post-traumatic stress and explain effective ways to cope with these symptoms such as breathing exercises, yoga, and meditation.
- Fourth session: During this session, the researchers provided information about mindfulness and its effect on the brain, as well as several types of mindfulness practices such as body scan (a process of moving attention through the body); mindful movement, sitting meditation; and walking meditation.
- Fifth session: The breathing exercises, yoga, muscle relaxation, and mindfulness practice were then taught by using a combination of watching video modeling and practice during the session. A homework assignment was created in collaboration with the students to allow them to practice these skills daily until the next session.
- Sixth session: A discussion of the previous session was followed by video presentations that clarified several kinds of meditation practice and trained students on rain and sea meditation.
- Seventh session: Any homework assignments completed were reviewed as a homework assignment. Information is then provided about common problems associated with PTSD, e.g., depression, guilt, and how to overcome them.
- Eight sessions: This session included a summary of all sessions, identification of the students' opinions, and comments on the sessions' benefits. It also included communication channels and thanking students for their recommendations and suggestions.

Stage 5: evaluation phase

The intervention's effectiveness in reducing PTSS was evaluated by comparing the results of the pretest and posttest. This phase lasted around 2 weeks from 1 May to 15 May 2021.

Statistical design

SPSS 20.0 for Windows (SPSS Inc., Chicago, IL, USA 2011) was used to collect, tabulate, and statistically analyze all data. The mean and standard deviation [23] were used to express quantitative data, while absolute and relative frequencies (number) were used to express qualitative data (percentage). To compare two dependent groups with normally distributed variables, the paired *t*-test was utilized. To compare two dependent groups of non-normally distributed data, the Wilcoxon signed-rank test was utilized. The chi-square test was used to compare the percentages of categorical variables. To compare two dependent groups of categorical data, the marginal homogeneity test was utilized. To analyze the link between various research variables, the Spearman correlation coefficient was determined. The (+) sign indicates a direct correlation, while the (−) sign indicates an inverse correlation. Values around 1 suggest a high correlation, while values near 0 indicate a weak correlation. The influence of the independent variable on the dependent variable was investigated using a stepwise multiple linear regression test. *p*-values of less than 0.05

Table 1 The sociodemographic and clinical characteristics of emergency nursing students ($n = 160$)

Characteristics	No.	%
Age		
18–20	4	2.4
21–23	122	76.3
24–26	34	21.3
Gender		
Male	37	23.1
Female	123	76.9
Residence		
Urban	126	78.7
Rural	34	21.3
Father's educational level		
Illiterate	12	7.5
Can read and write	24	15.0
Intermediate level of education	96	60.0
High education	28	17.5
Mother's educational level		
Illiterate	28	17.5
Read and write	24	15.0
Intermediate education	68	42.5
A high level of education	40	25.0
Father's occupation		
Government/private employee	62	38.7
Crafts	6	3.8
Free business	6	3.8
Not working/retired	86	53.7
Mother's occupation		
Employee	38	23.7
Housewife	122	76.3
Number of practical training hours/week		
< 5 h	97	60.6
> 5 h	63	39.4
Mean ± SD	4.96 ± 1.01	
Direct contact with the patient		
Yes	160	100.0
No	0	0.0

were considered statistically significant, p-values of < 0.001 were considered highly statistically significant, and a p-value of ≥ 0.05 was considered statistically insignificant (NS).

Results

Table 1 displays that more than three-fourth of studied students were female, and their ages ranged from 21 to 23 years, and they lived in an urban area (76.9%, 76.3%, and 78.8%, respectively). Education levels of their father and mother were intermediate among 60% and 42.5%, respectively. More than half (53.8%) of students' fathers were not working or retired, while 76.3% of students' mothers were housewives. More than half of studied students' (60%) spent less than 5 h in practical training per week. All studied students (100%) have direct contact with the patients.

Table 2 Distribution of traumatic events reported by emergency nursing students ($n = 160$)

Traumatic event	Yes		No	
	No.	%	No.	%
1. Seeing patients die	109	**68.1**	51	31.9
2. Having open wounds	112	**70.0**	48	30.0
3. Massive bleeding	84	**52.5**	76	47.5
4. Trauma-related injuries	79	49.4	81	50.6
5. Performing "futile" care to patients	73	45.6	87	54.4
6. Performing cardiopulmonary resuscitation	87	**54.4**	73	45.6
7. Overwork-related stress	64	40.0	96	60.0
8. Stress-related to not being able to save a specific patient life	101	**63.1**	59	36.9
9. Verbal abuse from family members	67	41.9	93	58.1
10. Verbal abuse from other nurses	67	41.9	93	58.1

Table 2 shows that in practical training, the most traumatic events were open wounds (70%) followed by seeing patients die (68.1%), not being able to save someone (63.1%), performing cardiopulmonary resuscitation (54.4%), and massive bleeding (52.5%).

Table 3 illustrates that the intrusion symptoms have the highest mean score followed by avoidance (12.01 ± 7.25, 11.71 ± 5.51, respectively) at the pre-intervention period. The same table also reveals that there was statistically significant difference in PTSS between pre- and post-intervention periods ($p < 0.001$). Moreover, the total mean score of PTSS decreased from (31.15 ± 14.05) at

Table 3 Mean scores of post-traumatic stress symptoms (PTSS) as reported by emergency nursing students throughout study phases ($n = 160$)

Items of PTSS	Study phases		*W*	*P*-value
	Pre-intervention	Post-intervention		
	Mean ± SD	Mean ± SD		
Intrusion	12.01 ± 7.25	5.69 ± 3.93	7.199	< 0.001**
Avoidance	11.71 ± 5.51	12.56 ± 7.37	0.801	< 0.001**
Hyperarousal	7.43 ± 5.18	3.89 ± 3.46	5.542	< 0.001**
Total mean score	31.15 ± 14.05 29 (0–68)	22.14 ± 10.63 22 (1–54)	6.233	< 0.001**

W Wilcoxon signed-ranks test

**Statistically highly significant ($p < 0.001$)

Table 4 Mean scores of mindfulness as reported by emergency nursing students throughout study phases ($n = 160$)

Items of mindfulness scale	Study phases		Paired *t*-test	*P*-value
	Pre-intervention	Post-intervention		
	Mean ± SD	Mean ± SD		
Observing	9.63 ± 3.13	11.30 ± 2.34	5.958	< 0.001**
Describing	9.50 ± 2.84	11.21 ± 2.61	5.370	< 0.001**
Acting with awareness	9.83 ± 2.98	11.31 ± 3.45	4.329	< 0.001**
Non-judging	9.10 ± 2.62	9.34 ± 3.06	0.816	0.415 NS
Non-reactivity	8.75 ± 2.44	10.28 ± 2.59	6.487	< 0.001**
Total mean score	46.81 ± 8.62	53.44 ± 7.39	7.147	< 0.001**
Median	46.5 (29–70)	54 (36–66)		

NS Statistically nonsignificant ($p > 0.05$)

**Highly statistically significant ($p < 0.001$)

Table 5 Correlation matrix between total score of PTSS and some study variables among emergency nursing students throughout study phases ($n = 160$)

Parameter	Total score PTSS			
	Pre-intervention		Post-intervention	
	(*r*)	*P*	(*r*)	*P*
Age (years)	0.002	0.976	−0.164	0.039*
Gender	−0.072	0.367	0.004	0.957
Residence	0.080	0.314	0.046	0.560
Number of practical training hours/week	0.197	0.012*	0.083	0.295
Father's educational level	0.028	0.721	0.023	0.776
Mother's educational level	−0.189	0.017*	0.088	0.268
Father's occupation	0.098	0.219	−0.080	0.314
Mother's occupation	−0.197	0.013*	0.023	0.774

r Correlation coefficient, *NS* Statistically nonsignificant ($p > 0.05$)

*Statistically significant ($p < 0.05$)

pre-intervention to (22.14 ± 10.6) at the post-intervention period.

Table 4 demonstrates that acting with awareness has the highest mean score followed by observing and describing (9.83 ± 2.98, 9.63 ± 3.13, and 9.50 ± 2.84, respectively) at the pre-intervention period. There was an improvement in all dimensions of mindfulness at the post-intervention period. The total mean score of mindfulness has improved from 46.81 ± 8.62 at the pre-intervention period to 53.44 ± 7.39 at the post-intervention period. The difference was statistically significant ($p < 0.001$).

Table 5 shows that PTSS has a statistically significant negative correlation with the mother's education and occupation and a positive correlation with the number of practical training hours per week at pre-intervention phase. While at post-intervention phase, it has a significant negative correlation with the students' age.

Table 6 Best fitting multiple linear regression model for total score of PTSS ($N = 160$)

Model	Unstandardized coefficients		Standardized coefficients	*t*	Sig.	95.0% confidence interval for *B*	
	B	Std. error	Beta			Lower bound	Upper bound
Constant	70.214	8.583		8.180	.000	53.259	87.169
Total mindfulness score	−0.639	0.109	−0.392	−5.837	< 0.001**	−0.855	−0.423
Number of practical training hours per week	3.358	0.917	0.242	3.662	< 0.001**	1.547	5.169
Mother's occupation	−8.954	2.464	−0.272	−3.633	< 0.001**	−13.822	−4.086
Mother's education level	−3.650	1.036	−0.265	−3.523	< 0.001**	−5.698	−1.603

**Highly significant ($p < 0.001$) *R*-square = 0.323. ANOVA: $F = 18.523$, $p < 0.001$. Variables entered and excluded: age, gender, residence, father educational level, and father's occupation

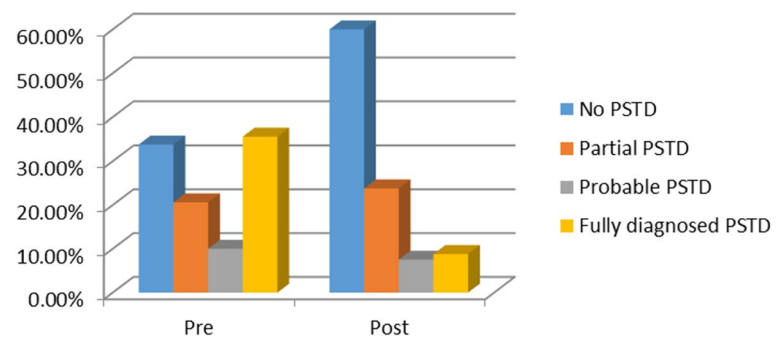

Fig. 1 Bar chart showing the total score of post-traumatic stress symptoms reported by emergency nursing students throughout study phases

Table 6 clarifies that the total mindfulness score and the mothers' occupation and education were statistically significant independent negative predictors of PTSS, while the number of practical training hours per week was a significant positive predictor. The model explains 32% of the variation in the PTSS scores.

Figure 1 clarifies that 35.6% of the studied students were fully diagnosed as having PTSS at pre-intervention, and this percentage was reduced to 8.8% at post-intervention period. Furthermore, the percentage of normal students without PTSS has increased from 33.8 to 60.0% at the post-intervention period.

Figure 2 shows that 15.6% of the study sample had poor mindfulness at pre-intervention, while 38.1% of them had good mindfulness at post-intervention. The difference was highly statistically significant ($p < 0.001$).

Discussion

Nursing students are constantly exposed to different stressors during their education and training, which may directly or indirectly hinder their education and performance. Clinical education has its own set of difficulties that might lead to stress among students [24]. Clinical training stress impairs psychological well-being, which interferes with students' learning, limits their academic performance and productivity, and increases suicidal thoughts and lowers their quality of life [25].

Many studies have shown that mindfulness reduces stress symptoms, enhances attention and cognitive skills, and promotes emotional balance [26, 27]. Therefore, utilizing a mindfulness-based approach to address the clinical and academic stressors of nursing students as they navigate the requirements of their nursing education may

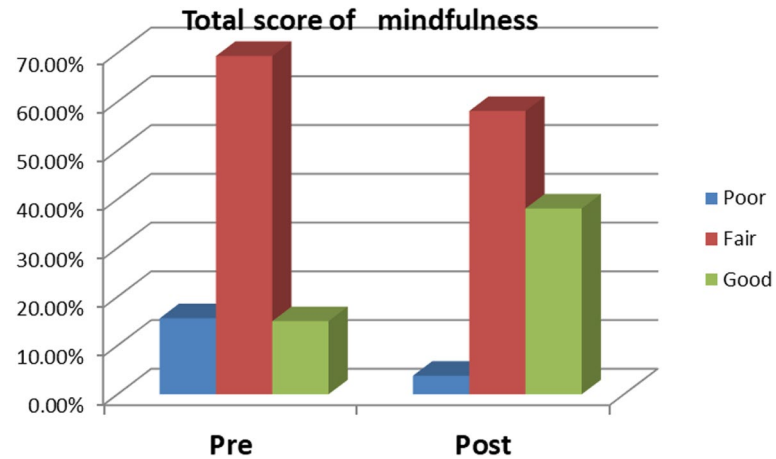

Fig. 2 Bar chart showing the total score of mindfulness reported by emergency nursing students throughout study phases

help them cope with stressors by improving their level of mindfulness awareness and attention.

According to the findings of the current study, more than three-quarters of the participants were female. This might be owing to due to Egyptians' belief that nursing is a female-dominated profession, resulting in the admission of more women to nursing schools and faculties. The age of studied students ranged from 21 to 23 years. This is because this study was carried out among first-year Technical Institute of Nursing students, and this is a suitable age for them. This goes online with Dhanpal and Paul who revealed that the majority of the nursing students were females (80%), and their average age was 21 years [28]. Also, an Egyptian study indicated that the majority of nursing students (81.2%) were female, and about two-thirds of them (66%) were between the ages of 21 and 23 [29].

The current study revealed that the most stressful events during clinical training among studied students were open wounds, seeing patients die, being unable to save specific patient lives, and performing cardiopulmonary resuscitation. It may be because students did not complete the prerequisite courses before beginning their clinical training, and they did not receive adequate preparation for clinical training. Additionally, those students are being exposed to a highly technological clinical environment for the first time. Their inexperience and limited professional skills prevent them from handling sophisticated technological equipment. In addition, they are afraid of making mistakes, and they lack confidence in their abilities to care for patients.

This is in agreement with an Egyptian study in which emergency undergraduate nursing students face a variety of stressors. They described seeing patients' deaths, feeling overworked, and suffering trauma-related injuries were the most stressful events in their clinical experience [4]. Similarly, Adriaenssens, de Gucht, and Maes's study in the Netherland indicated that emergency nurses are exposed to many traumatic events. These events are commonly related to patients presenting with severe injuries, suicide, violent behavior, death of a patient, particularly a child, abuse from physicians, patients or family members, and resource exhaustion. These events also contribute to the development of PTSD when combined with what one would consider being routine nursing care [30].

In the same context, a study by Han and Yoo that was conducted in South Korea revealed that the most common traumatic events reported by emergency nurses were resuscitation attempts, child death, and physical/verbal violence [31].

The findings of this study indicated that the highest mean score of PTSS according to the Impact of Event Scale was a symptom of intrusion or re-experienced trauma, followed by symptoms related to avoidance and hyperarousal at the pre-intervention period. This was supported by the study of nursing interventions for PTSD, which revealed that PTSS appear sequentially, with intrusion symptoms appearing first, followed by avoidance behavior symptoms. Avoidance behavior typically leads to hyperarousal symptoms, including angry outbursts, difficulty falling asleep, hypervigilance, concentration problems, irresponsible behavior and carelessness, and excessive reactivity to unexpected loud noises [32].

This partially goes online with a Chinese study which revealed that in the emergency room, approximately 53.0% of the healthcare professionals reported having at least one PTSD criterion. Re-experiencing a traumatic event was the most prevalent PTSD symptom (45.1%), followed by hyperarousal (37.8%) and avoidance (35.1%) [33]. This is contradictory with Machado's study of secondary traumatic stress among emergency department nurses who revealed that arousal symptoms had the highest mean score of PTSD symptoms, followed by avoidance, while intrusion symptoms had the lowest mean score [34]. Furthermore, an Egyptian study revealed that avoidance had the highest score in the three PTSS dimensions, followed by re-experiencing and hyperarousal [35].

The results of the current study confirmed the first hypothesis as more than one-third of the study sample experienced symptoms that suggested a diagnosis of PTSD, and about one-fifth of them had a partial diagnosis of PTSD at the pre-intervention period. This means that the level of PTSS was high among the study sample at the pre-intervention period. It might be because the studied students are still young and may be seeing critically ill patients for the first time. They lack the necessary experience to deal with these patients. Moreover, they may use highly technical equipment and may undertake procedures that could result in serious injury to their patients. Furthermore, discrepancies in stress perceptions across people are most likely due to differences in personal aspects such as coping abilities and level of companionship during clinical practice.

This is consistent with Asfour and Ramadan, who indicated that more than half of students they studied had a low (PTSS) score, while more than one-third had a high (PTSS) score. Nurse students might have a low (PTSS) score due to their clinical teachers closely observing, supervising, and supporting them in the clinical areas. The high (PTSS) scores of some students might be a result of individual differences among nursing students; students differ in their identification of stressors, particularly in the complex and rapidly changing healthcare environment of emergency departments and intensive care units [4].

Similarly, an Egyptian study indicated that the total PTSD score was high among 40% of the studied emergency medical trainees [36]. Similarly, Carmassi et al. [37] found that emergency care personnel trainees are more likely to develop PTSD as a result of being exposed to a new environment, their young age, the lack of expertise in their field, and the added strain of academic evaluation. Additionally, the emergency nurses who worked with more traumatized and emergency patients were more likely to develop anxiety disorders, including PTSD, and the prevalence of PTSD was higher among nurses with less education and less work experience [15].

The second hypothesis was confirmed after implementing the mindfulness-based intervention because PTSS improved among the studied students. These improvements appear to be attributed to changes in intrusive thoughts and hyperarousal symptoms, rather than avoidance. The difference between the pre- and post-intervention periods was statistically significant. Moreover, the number of students who do not have PTSS has increased, and those who are fully diagnosed with PTSS have decreased at the post-intervention period. This improvement could be attributed to the effect of the mindfulness intervention. Perhaps, this is due to the fact that mindfulness improves awareness of the present moment. Awareness allows one to be more sensitive to emotions and thoughts in different situations, which may help in the early identification of stress [38]. Early stress identification through improved self-awareness has been demonstrated to be effective for stress management in nursing students who practice mindfulness [27].

Increasing awareness predicts stronger perceived self-efficacy in dealing with daily stressful events since awareness expands the range of available responses. Furthermore, increasing awareness was claimed to improve an individual's executive control, reducing the impact of perceived stress on mental health [39].

In addition, the present study results are in harmony with another study conducted in Canada which revealed that increased attention control or the ability to shift attention away from trauma-related stimuli and to remain in the present moment is thought to improve intrusive and hyperarousal symptoms. Mindfulness-based approaches may also reduce avoidance symptoms (by encouraging openness to new experiences), negative mood states, and cognitive changes (e.g., negative beliefs about oneself, the world, and others by enhancing nonjudgmental acceptance of current and past experiences) [14].

This is congruent with Kim et al. [40] who demonstrated that participating in an 8-week mindfulness-based exercise program was associated with a significant reduction in PTSD symptoms. As well, educational programs on PTSD helped emergency medical personnel who treat critically ill patients to be better equipped to cope with environmental factors that might contribute to behavioral disorders and recover faster [41].

The findings of this study indicated that there was a statistically significant negative correlation between PTSS and students' age, which may be caused by inadequate clinical skills of young students to deal with critically ill patients. Increasing age may help students recognize their professional accountability for the job, and training for a long period helps them to predict possible circumstances that cause stress among nurses. This is in line with the Canadian study of Lavoie, Talbot, and Mathieu who showed that the prevalence of PTSD symptoms reduced with age, although exposure to traumatic experiences increased with years of nursing experience [42]. In the same context, d'Ettorre et al. [43] found that young age, female gender, little job experience, and insufficiency of training were found to be associated with a high risk of PTSS. Additionally, an Egyptian study by Madian, Abdelaziz, and Ahmed reported significant differences between perceived stress levels and demographic variables, such as age and gender, among nursing students [44].

The present study's multivariate analysis identified that the number of training hours was a positive predictor of PTSS. Perhaps this is because with an increasing number of clinical training, the students are more exposed to traumatic experiences. This is supported by Vance et al. [45] in the USA who showed that a higher number of working hours was the only work-related factor that associated significantly with trauma exposure. This is because working for longer hours causes more stress and presents a longer time for exposure to work-related trauma [45]. Similarly, Mitrović and Romić found that symptoms of PTSD vary according to educational level, working duration, job position, and gender [46]. Moreover, work experience and the number of working hours were predictors of secondary traumatic stress symptoms [47].

Mother occupation and education were negative predictors of PTSS as indicated in the multivariate analysis of this study. It may be because the educated mother is open-minded, uses a raising style that enhances coping skills in her children, provides them with social support, and teaches them how to cope with stressful situations. This is congruent with an Egyptian study in which education and occupation of the nursing students' mothers were strongly correlated with their stress level, as the students whose mothers are housewives and less educated experience more stress than those whose mothers are working and highly educated. Furthermore, it was shown that better education of mothers and their employment

outside the home, as well as good adaptability and management of stress, resulted in reduced stress on their daughters [48].

Similarly, Kalavathi, Indira, and Rejeswari showed that there was a statistically significant relationship between the stress level among first-year BSc nursing students and their sociodemographic characteristics, such as their father's and mother's educational backgrounds [49]. Clinical perceived stress was lower among students whose parents had an academic education, which is not surprising given that talking to parents can be beneficial for managing clinical stress. It is anticipated that educated parents provide better effective support than less educated parents [50].

The result of the current study indicated that there was an improvement in all dimensions of mindfulness at the post-intervention period. As well as, the total level of mindfulness has been improved as more than one-third of the study participants have good mindfulness after implementing the intervention. The difference was statistically significant in all areas except for non-judging. This finding was supported by a study in which a mindfulness-based meditation program was applied to nursing students, the mindfulness levels improved following the program [51]. In another study, students' levels of awareness and acceptance were positively improved by a mindfulness-based intervention [52].

In agreement with Dearholt's study of improving nurse well-being through a mindfulness-based education strategy, it is indicated that mindfulness-based education programs improve skills and knowledge for inexperienced nurses, enabling them to practice mindfulness in a short time. At the end of the program, all participants reported using meditation as a form of mindfulness practice [53]. In the same context, Yuksel and Bahadir Yilmaz's study in Turkey revealed that group mindfulness-based cognitive therapy programs had a positive effect on students' mindful attention awareness levels [54].

The results of this study contradict those of de Vibe et al. [55] in a study conducted with medical and psychology students who found that mindfulness-based stress reduction education had no effect on the students' levels of mindfulness [55].

The results of the present study demonstrated that mindfulness was a negative predictor of PTSS. This may be because the acting with awareness dimension of mindfulness allows for the identification of signs of stress, promotes self-regulation capacity, and supports adaptive responsiveness to distressing and negative situations. As a result, persons with a greater capability to behave with awareness may be able to raise the awareness of low-level stress-related symptoms, thereby increasing access to coping resources and buffering against the harmful effects of stress [39]. Similarly, this was supported by the study of Gibert et al. (2021) who found that higher levels of mindfulness were related to lower levels of PTSD symptoms [56, 57].

Conclusions

In light of the current study, it can be concluded that the emergency nursing students experience different levels of post-traumatic stress symptoms at the pre-intervention period, but that these symptoms significantly improved after mindfulness interventions were applied. Additionally, the level of mindfulness has improved after the intervention. Post-traumatic stress symptoms are positively correlated with the number of training hours and negatively correlated with student age, mother's occupation, and educational level.

Recommendations

- Stress management should be discussed in orientation sessions for first-year nursing students.
- Before beginning clinical training, nursing students should receive adequate preparation in dealing with emergency circumstances.
- Further intervention programs for all nursing students, not just emergency nursing students, are needed to assist them in developing effective coping mechanisms to reduce the feelings of stress and anxiety.
- Using emergency room simulators during clinical training can help reduce PTSS stress in nursing students.
- Mindfulness training can be incorporated into nursing curriculums as a stress-reduction strategy.
- Encourage nursing students to utilize mindfulness applications on their phones as calm and headspace that provide daily meditation guidance and reminders.

Limitations of the study

Due to their preoccupation with lectures and practical training in hospitals, students have difficulty finding times to apply mindfulness intervention.

Abbreviations

PTSD: Post traumatic stress disorder; PTSS: Post-traumatic stress symptoms; ICU: Intensive care unit; MBCT: Mindfulness-based cognitive therapy; MBSR: Mindfulness-based stress reduction; IES-R: Impact of event scale-revised; DSM: Diagnostic and Statistical Manual of Mental Disorders; FFMQ-15: 15-item Five-Facet Mindfulness Questionnaire.

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Authors' contributions
ME contributed to the study design, assessing, interviewing the sample, collecting, analyzing, interpreting the data, and revising the manuscript; also, she is the corresponding author. SM contributed to the study design, collecting, analyzing, and interpreting of the data, and preparing and revising the manuscript. All authors have read and approved the final manuscript.

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

Declarations

Ethics approval and consent to participate
An agreement for conducting this study was attained from the Human Research Ethics Committee at the Faculty of Nursing, Zagazig University. The committee's reference number is unavailable. Taking part in this study was voluntary. The study's participant signed informed consent for participation in this study. This research was not funded. The scales used in this study are freely accessible in the public domain for research purposes. Confidentiality was asserted using codes to assure anonymity, and that there were no personal identifiers.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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