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Knowledge, attitude, and practice regarding trauma-informed care among nursing students in Eastern China: A cross-sectional study

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Abstract

Background: Patients with a history of traumatic life events who enter the healthcare system are especially vulnerable, often posing greater challenges to care delivery. However, little is known about the capacity of nursing staff, especially nursing students, to deliver trauma-informed care (TIC).

Objective: This study aimed to assess the knowledge, attitude, and practice of trauma-informed care among Chinese nursing students.

Methods: A cross-sectional study was employed to survey undergraduate nursing students from a medical college in eastern China. Data were collected using an established self-administered questionnaire on TIC knowledge, attitude, and practice (KAP) consisting of 21 items. The content validity scale-level CVI was 0.950, and the reliability with Cronbach's α coefficient was 0.963.

Results: A total of 118 undergraduate nursing students, ranging from first to fourth year, participated in the survey, and ultimately, 117 students were included in the study, yielding an effective response rate of 99.15%. The average scores for KAP were 70.83±14.58, 77.78±11.11, and 66.67±16.67; however, the good levels of KAP accounted for 16.2%, 45.3% and 6.0%, respectively. Additional analysis showed a weak positive correlation between knowledge and attitude (r_s = 0.211, p = 0.022), while there was a moderate positive correlation between knowledge and practice, attitude and practice (r_s = 0.309, p < 0.001; r_s = 0.310, p < 0.001). Univariate analysis indicated that year of study and experience in caring for trauma patients were significantly related to practice (p = 0.039, p = 0.002).

Conclusion: The students' KAP on trauma-informed care was not at a good level, especially regarding practice and knowledge, and required further strengthening. The findings provide baseline information for further development of a KAP-TIC comprehensive course and exploration of practice ability-centered TIC education for nursing students. Assessing the effectiveness of the newly developed TIC course and learning outcomes in clinical practice is also recommended.

Keywords

nursing students; knowledge; attitude; practices; trauma-informed care; China

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Background

Trauma has become a major global public health concern, especially heightened after the COVID-19 pandemic. According to the report of International Council of Nurses [ICN] (2021), the proportion of nurses reporting mental health distress has risen from 60% to 80% in many countries. In addition, 67.05% of college students reported traumatic stress (Sun et al., 2021). Trauma is defined as the result of an event, series of events, or set of circumstances experienced by an individual as physically or emotionally harmful or life-threatening (Substance Abuse and Mental Health Services Administration [SAMHSA], 2014). Numerous studies indicate that the increasing prevalence of trauma is a serious health concern, raising the risk of mortality and disease (Cannon et al., 2020; Goddard, 2021; Lin et al., 2024). Trauma also imposes a significant economic burden on the individuals concerned, their families, and the broader society. For example, adverse childhood experiences (ACE) have been shown to contribute to the significant economic burden of ACE-related adult health conditions (Peterson et al., 2023).

Exposure to trauma can also lead to higher rates of health care utilization, with those who have experienced previous traumatic events being particularly vulnerable (Stene et al.,

2022). This is partly because repeated interactions with health care professionals can cause further distress or re-traumatization (Hennessy et al., 2023). The inclusion of trauma-informed care (TIC) in undergraduate and postgraduate nursing education is essential and strongly recommended (Hamby, 2025). This requires knowledge of the prevalence of traumatic experiences, the negative impacts of trauma, and the necessity of minimizing re-traumatization that takes place while providing services (Substance Abuse and Mental Health Services Administration [SAMHSA], 2014). Trauma-informed care approaches demand attention to each patient's unique requirements, which can reduce the potential for re-traumatization and improve care outcomes (Guest, 2021). Therefore, improving TIC knowledge, attitudes, and practices (KAP) among healthcare providers is crucial.

Research shows that educating healthcare professionals on trauma and the core principles of TIC enhances their knowledge, attitudes, and professional skills (Burns et al., 2023; Long et al., 2022; McNaughton et al., 2022; Nadeem et al., 2021). As frontline healthcare professionals, nurses are uniquely positioned to offer TIC (Rajeev et al., 2025). Their roles have a direct impact on the patients' care outcomes, in part due to having the most contact and interaction with trauma patients of all the allied health professionals (Rajeev et al., 2025). Developing workforce capabilities in trauma-informed care for nursing should be one of the core competencies of nursing students, as highlighted by National Academies of Sciences Engineering and Medicine (2021). Many institutions have incorporated the content of trauma-informed care into their nursing education courses (Cannon et al., 2020; Elliott et al., 2024). However, a collaborative and relational model with nursing students based on TIC is recommended.

Previous studies have found some factors which may be related to the ability to deliver TIC KAP such as students' backgrounds, whether they come from low-middle-income countries (LMICs), education level, clinical experience and experience working with individuals with a trauma history, and teaching and learning experience (Cannon et al., 2020; Kuzma et al., 2022; Nadeem et al., 2021). However, these studies took place before the COVID-19 pandemic, which resulted in a larger demand for TIC (Cannon et al., 2020; Kuzma et al., 2022; Pfeiffer & Grabbe, 2022).

In China, there are more than 5.63 million registered nurses employed in healthcare settings (The Central People's Government of the People's Republic of China, 2024). Every year, an estimated 100,000 undergraduate nursing students pursue clinical internships in their final academic year, when they are rotated through multiple clinical departments. Many learning outcomes related to trauma-informed care are expected, including interpersonal relationship skills, communication skills, and mutual support for one another.

To date, there is a need to gain insight into how policy decision makers in schools, universities, or hospitals can deliver on their responsibilities to support and strengthen the nursing workforce. Baseline data on students' current KAP regarding TIC, as well as the identification of gaps in KAP educational content, are needed to inform further improvements in contemporary nursing education. This study, therefore, aimed to assess the level of knowledge, attitudes, and practices related to TIC among Chinese nursing students. The findings were intended to serve as a basis for developing a specific educational model in trauma-informed nursing education in China.

Methods

Study Design

A cross-sectional study was conducted among undergraduate nursing students in Jiangsu Province, Eastern China.

Sample/Participants

The cluster sampling method was employed, and four classes of nursing undergraduates from different academic years (first, second, third, and fourth year) in the college were recruited. Nursing students surveyed in the third and fourth year had taken the course "Nursing Psychology," which was delivered through lectures and discussion forums. "Nursing Psychology" primarily encompasses basic psychological knowledge, the impact of psychological factors on health, psychological assessment, intervention methods, and psychological care for various types of clinical patients. All undergraduate nursing students in the college were eligible for recruitment. Students with severe mental and psychological disorders or those unwilling to participate in this survey were excluded. Previous studies had not included undergraduate nursing students as research subjects on TIC KAP; therefore, the calculation of the sample size could not be based on previous literature.

The sample size was estimated using the RaoSoft calculator (RaoSoft, 2004), which indicated that 120 nursing undergraduate students were needed to achieve a 95% confidence level and a 5% margin of error. The minimum required sample was 92. To account for potential non-responses and incomplete data, a 20% buffer (18 participants) was added, resulting in a final estimated sample size of 110.

Instruments

The questionnaire consisted of two sections.

1) The demographic characteristics, which comprised gender, age, grade, discussion of trauma in school courses, occurrence of TIC training, internships, and experiences of caring for trauma patients.

2) Knowledge, attitude, and practice towards TIC or KAP-TIC, as modified from the "Knowledge, Attitude, and Practice Related to Trauma Informed Practice" tool (King et al., 2019). This is a 21-item self-report scale consisting of three domains: knowledge (6 items), attitude (9 items), and practice (6 items), with Cronbach's α reliabilities of 0.84, 0.74, and 0.78, respectively (King et al., 2019). It was originally developed for interdisciplinary pediatric healthcare staff (King et al., 2019) and was adapted to be appropriate for nursing students with permission from the author. Two independent bilingual translators (one associate professor and one doctoral student) translated the original English language questionnaire into Chinese, and two Chinese teachers who had not been exposed to the original text before, were asked to translate it back into English, then the two versions were compared the original and the translated version after comparison and modification. The Chinese version was slightly modified to ensure the most accurate language expression and cultural understanding. Face validity and content validity were reviewed by three experts, one of whom was an expert in psychometrics and the other two experts in the field of trauma.

After expert review, the scale used in this study showed good face validity. The items were clearly related to the measurement content, and the expression was clear and understandable. The scale-level CVI (S-CVI/Ave) was 0.95, and those of knowledge, attitude, and practice were 1, 0.96, and 0.89, respectively. To assess the questionnaire's reliability, a pilot study involving 20 students, independent of the actual study, was carried out. Cronbach's α for KAP yielded an overall value of 0.963, with values of 0.885, 0.959, and 0.944 for Knowledge, Attitude, and Practice, respectively.

Knowledge was defined as the extent to which nursing students understood the principles, implications, and practicality of TIC in the healthcare setting (King et al., 2019). The knowledge subscale consisted of 6 items, which assessed knowledge about trauma exposure (1 item), impact of trauma (1 item), signs and manifestations of past traumatic experiences or ACEs (3 items), and re-traumatization (1 item).

Nursing students' feelings or thoughts on TIC were characterized as their attitudes (King et al., 2019). The attitude section included 9 items to assess the attitudes regarding TIC, including their thoughts on healing and recovery from trauma (4 items), the importance of trauma-informed practice, and their desire to learn relevant knowledge (5 items).

Practice was defined as the likelihood of nursing students applying their knowledge and attitudes toward TIC in their practice (King et al., 2019). This part was composed of 6 items focusing on trauma informed practice behavior, including transparency (1 item), empowerment, voice & choice (1 item), informed consent (1 item), peer support (1 item), collaboration & mutuality (1 item), and self-care (1 item).

Each part of KAP related to TIC adopted a 5-level Likert scoring method, where 1 represented 'strongly disagree,' 2 indicated 'disagree,' 3 indicated 'not sure/neutral,' 4 indicated 'agree,' and 5 indicated 'strongly agree.' The high scores of "K's" indicate adequate knowledge. The high scores of "A's" indicate a positive attitude. Higher scores of "P" indicate a higher likelihood that participants will perform TIC practices. The minimum and maximum total score ranges for the knowledge, attitude, and practice sections are 6-30, 9-45, and 6-30, respectively. The above total scores (raw scores) can be converted into standardized scores ranging from 0 to 100. The calculation formula for the standardized score is (rough score - minimum possible score) / (maximum possible score - minimum possible score) × 100 (Jin et al., 2022). Bloom's cut-off point of 80% was used to classify the participants' overall KAP-TIC, with scores between 80 and 100 % being regarded as "good" (Phuyal et al., 2022). In this study, KAP-TIC scores below 80 were categorized as general, while scores above 80 were categorized as good.

Data Collection

Data were collected in June 2024. This study is part of a larger project aimed at developing a culturally appropriate TIC course. All participants were adults over 18 years old and were able to decide whether to participate in the study. The participants were approached and invited by a research assistant (RA, non-teacher, non-researcher). A RA had undergraduate teaching experience and was trained to approach students after being briefed by the first author. The RA held meetings and thoroughly described the purpose and context of the survey, including the requirements, participants' privacy protection, and the time required. The four classes completed the questionnaires in independent and private spaces, in batches, taking about 30 minutes. The questionnaires were collected immediately after completion to avoid discussion. At the end, a bottle of soft drink (non-alcoholic) was provided for participants as an appreciation for their time. Data were anonymized, with personal information stored securely and separately.

Data Analysis

Data were checked for completeness before analysis using SPSS statistical software (version 27.0). A total of 118 students participated. However, one was excluded due to excessive alterations and missing options, so 117 complete questionnaires were analyzed using descriptive statistics. Due to the non-normally distributed data of KAP-TIC scores, medians and interquartile ranges (IQRs) were presented. Spearman correlation analysis was used to explore the correlation between KAP-TIC, and the Mann–Whitney U test and Kruskal-Wallis H test were performed to investigate the significant association between demographic characteristics and KAP-TIC. Post hoc pairwise comparisons were conducted using the Dunn-Bonferroni method to control for Type I error following a significant Kruskal-Wallis H test. With six comparisons performed among the four academic years, the significance threshold was adjusted to $\alpha = 0.0083$ (i.e., 0.05 / 6). Significant results were evaluated against this adjusted α level. Other statistical analyses were performed at a significant level of 0.05. Effect sizes were interpreted according to thresholds described by Tomczak and Tomczak (2014).

Ethical Consideration

This study was approved by the medical ethics committee of Suzhou Vocational Health College (Approval number: SWYXLL202408). Participants were provided with written information explaining the purpose of the study, its procedures, and the plans for maintaining confidentiality. Participants were also informed of their right to withdraw from the study at any time (until data collection was completed) without affecting their grade or nursing practice. Verbal and written consent were obtained before participation.

Results

Demographic Characteristics

In total, 117 nursing students participated in the study and completed all steps of data entry. Most responders were female (77.8%). The participants ranged in age from 19 to 23 years (20.63 ± 1.297). Almost half of them were aged 20 or below (47.0%). Students in the junior group (1st and 2nd academic year) accounted for 48.7%, and students in the senior group (3rd and 4th academic year) accounted for 51.3%. About one-third of participants had experienced discussion of psychological trauma in their nursing school courses (35.9%). Students in the 4th academic year (25.6%) reported having had an internship experience, yet only 19.7% had experience caring for trauma patients.

Knowledge, Attitude, and Practice of TIC

Overall, TIC KAP levels among nursing students were not a good level, with median scores of 70.83 (knowledge), 77.78

(attitude), and 66.67 (practice). Only 16.2% reached a good level in knowledge and 6.0% in practice (Table 1).

Table 1 The frequency and percentage of participants regarding KAP on TIC (*N* = 117)

Variables	Actual score Min-Max	Standardized score (Median ± IQR)	Level	
			General *n* (%)	Good *n* (%)
Knowledge	6-30	70.83 ± 14.58	98 (83.8)	19 (16.2)
Attitude	9-45	77.78 ± 11.11	64 (54.7)	53 (45.3)
Practice	6-30	66.67 ± 16.67	110 (94.0)	7 (6.0)

Table 2 shows that participants generally held positive KAP toward TIC. Most knowledge items had mean scores between 3.38 and 3.99, indicating moderate to high levels of understanding, particularly regarding the links between trauma, mental health, and behavior. Attitude items showed the highest levels of agreement, with means ranging from 3.68 to 4.39, reflecting strong support for the principles of TIC, belief in recovery, and a desire for further training. Practice items showed slightly lower agreement, with means ranging from 3.03 to 4.08, suggesting that while students value trauma-informed approaches, consistent application in practice—such as maintaining transparency and tailoring care—may require further support or training.

Table 2 Descriptive characteristics of KAP-TIC (*N* = 117)

Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean ± SD
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	
Knowledge						
1. Exposure to trauma is common.	4 (3.4)	22 (18.8)	20 (17.1)	67 (57.3)	4 (3.4)	3.38 ± 0.95
2. Trauma affects physical, emotional, and mental well-being.	1 (0.9)	7 (6.0)	18 (15.4)	72 (61.5)	19 (16.2)	3.86 ± 0.79
3. Substance use issues can be indicative of past traumatic experiences or adverse childhood events (ACE).	3 (2.6)	14 (12.0)	23 (19.7)	67 (57.3)	10 (8.5)	3.57 ± 0.90
4. There is a connection between mental health issues and past traumatic experiences or ACE.	7 (6.0)	0 (0)	23 (19.7)	68 (58.1)	19 (16.2)	3.85 ± 0.76
5. Distrusting behavior can be indicative of past traumatic experiences or ACE.	4 (3.4)	0 (0)	19 (16.2)	68 (58.1)	26 (22.2)	3.99 ± 0.72
6. Retraumatization can occur unintentionally.	0 (0)	11 (9.4)	25 (21.4)	64 (54.7)	17 (14.5)	3.74 ± 0.82
Attitude						
7. Recovery from trauma is possible.	3 (2.6)	10 (8.5)	23 (19.7)	67 (57.3)	14 (12.0)	3.68 ± 0.89
8. Paths to healing/recovery from trauma are different for everyone.	0 (0)	0 (0)	6 (5.1)	60 (51.3)	51 (43.6)	4.38 ± 0.58
9. People are experts in their own healing/recovery from trauma.	0 (0)	9 (7.7)	22 (18.8)	53 (45.3)	33 (28.2)	3.94 ± 0.88
10. Informed choice is essential in healing/recovery from trauma.	0 (0)	4 (3.4)	22 (18.8)	58 (49.6)	33 (28.2)	4.03 ± 0.78
11. Trauma-informed practice (TIP) is essential for working effectively with our patients and their families.	0 (0)	1 (0.9)	13 (11.1)	57 (48.7)	46 (39.3)	4.27 ± 0.69
12. I have a comprehensive understanding of TIP	1 (0.9)	6 (5.1)	16 (13.7)	64 (54.7)	30 (25.6)	3.99 ± 0.83
13. I believe in and support the principles of TIP.	0 (0)	1 (0.9)	22 (18.8)	65 (55.6)	29 (24.8)	4.04 ± 0.69
14. I share my expertise and collaborate effectively with colleagues regarding the use of TIP.	1 (0.9)	1 (0.9)	8 (6.8)	53 (45.3)	54 (46.2)	4.35 ± 0.72
15. I would like to receive more training on TIP.	0 (0)	0 (0)	7 (6.0)	57 (48.7)	53 (45.3)	4.39 ± 0.60
Practice						
16. I maintain transparency in all interactions with traumatic patients.	3 (2.6)	29 (24.8)	52 (44.4)	27 (23.1)	6 (5.1)	3.03 ± 0.89
17. I offer patients choices and respect their decisions.	0 (0)	2 (1.7)	14 (12.0)	74 (63.2)	27 (23.1)	4.08 ± 0.65
18. I help patients and peers to recognize their own strengths.	0 (0)	8 (6.8)	26 (22.2)	58 (49.6)	25 (21.4)	3.85 ± 0.83
19. I inform all patients of my actions before I perform them.	4 (3.4)	15 (12.8)	35 (29.9)	38 (32.5)	25 (21.4)	3.56 ± 1.07
20. My interaction with each patient is unique and tailored to their specific needs.	3 (2.6)	10 (8.5)	27 (23.1)	56 (47.9)	21 (17.9)	3.70 ± 0.95
21. I practice self-care.	2 (1.7)	13 (11.1)	27 (23.1)	49 (41.9)	26 (22.2)	3.72 ± 0.99

Correlation Between Knowledge, Attitude, and Practice

Table 3 shows the weak to moderate relationship between KAP variables (Spearman's correlation). There was a significant correlation between knowledge and attitude (r_s = 0.211, p = 0.022), knowledge and practice (r_s = 0.309, p < 0.001), also attitude and practice (r_s = 0.310, p < 0.001).

Table 3 KAP correlation (N = 117)

Variables	r_s	p	95% CI
Knowledge & attitude	0.211	0.022*	[0.025, 0.383]
Knowledge & practice	0.309	<0.001**	[0.129, 0.468]
Attitude & practice	0.310	<0.001**	[0.131, 0.469]

Note: $^{*}p < 0.05$, $^{**}p < 0.01$ | Correlation strength thresholds: r_s < 0.3 = weak, 0.3-0.5 = moderate, >0.5 = strong

KAP scores varied by demographic characteristics (Table 4). Students with trauma care experience scored higher in knowledge (25.0 vs. 22.0, p < 0.001) and practice (24.0 vs. 22.0, p = 0.002). Those with preliminary TIC training had more positive attitudes (40.0 vs. 36.5, p < 0.001). Older students (>20 years) outperformed younger ones in knowledge (p = 0.012) and attitude (p < 0.001). Higher academic year was linked to better KAP scores (p < 0.05). Discussing trauma in class improved knowledge (p = 0.015), and internship experience was associated with higher attitude scores (p = 0.033). Gender showed no significant differences (p > 0.05).

Table 4 Association of demographic characteristics and KAP based on univariate analysis (Mann–Whitney U and Kruskal-Wallis H tests)

Variables	Category (*n*)	Knowledge				Attitude				Practice			
		Mdn (IQR)	z/(*H*)	*p*	r/ε^2, Median diff. [95% CI]	Mdn (IQR)	z /(*H*)	*p*	r/ε^2, Median diff. [95% CI]	Mdn (IQR)	z/(*H*)	*p*	r/ε^2, Median diff. [95% CI]
Gender	Male (26)	22.50 (5.25)	-0.353	0.724	-0.033	36.00 (6.00)	-1.476	0.140	-0.136	22.00 (4.25)	-0.661	0.509	-0.061
	Female (91)	23.00 (3.00)			0.0 (-2.0, 1.0)	37.00 (4.00)			-1.0 (-3.0, 0.0)	22.00 (4.00)			0.0 (-2.0, 1.0)
Age	≤20 years (55)	22.00 (5.00)	-2.504	0.012*	-0.231	36.00 (5.00)	-3.645	<0.001**	-0.337	22.00 (2.00)	-0.892	0.373	-0.082
	>20 years (62)	23.00 (3.00)			-1.0 (-3.0, 0.0)	39.00 (5.00)			-3.0 (-4.0, -1.0)	22.00 (4.00)			0.0 (-.0, 1.0)
Year of study	1st year (29)	20.00 (5.00)	13.293	0.004*	0.091	36.00 (5.00)	10.280	0.016*	0.064	21.00 (4.00)	8.380	0.039*	0.048
	2nd year (28)	23.00 (3.75)				37.00 (4.75)				22.00 (2.50)			
	3rd year (30)	23.00 (3.25)#				37.00 (5.25)				23.50 (4.25)##			
	4th year (30)	23.00 (3.00)†				39.00 (4.25)††				22.00 (4.00)			
Discussion trauma in school course	Yes (42)	23.00 (3.00)	-2.425	0.015*	-0.224	39.00 (4.25)	-2.779	0.005*	-0.257	22.00 (4.25)	-1.429	0.153	-0.132
	No (75)	22.00 (4.00)			-1.0 (-3.0, 0.0)	36.00 (6.00)			-2.0 (-3.0, -1.0)	22.00 (4.00)			-1.0 (-2.0, 0.0)
Preliminary TIC training	Yes (17)	23.00 (3.50)	-1.020	0.308	-0.094	40.00 (3.00)	-3.355	<0.001**	-0.310	24.00 (4.00)	-1.844	0.065	-0.170
	No (100)	23.00 (4.00)			-1.0 (-3.0, 1.0)	36.50 (4.25)			-3.0(-5.0, -2.0)	22.00 (4.00)			-1.0 (-3.0, 1.0)
Internship experience	Yes (30)	23.00 (3.00)	-1.405	0.160	-0.130	39.00 (4.00)	-2.136	0.033*	-0.197	22.00 (4.00)	-0.878	0.380	-0.081
	No (87)	22.50 (4.00)			-1.0 (-2.0, 0.0)	36.50 (5.00)			-2.0 (-3.0, 0.0)	22.00 (3.25)			0.0 (-1.0, 2.0)
Experience caring for trauma patients	Yes (23)	25.00 (3.00)	-3.821	<0.001**	-0.353	38.00 (5.00)	-0.627	0.530	-0.058	24.00 (4.00)	-3.138	0.002*	-0.290
	No (94)	22.00 (4.00)			-3.0 (-4.0, -2.0)	37.00 (4.25)			0.0 (-2.0, 1.0)	22.00 (3.00)			-2.0 (-3.0, -1.0)

Note: $p < 0.0083$ (Bonferroni-adjusted for 6 pairwise comparisons); $p < 0.05$ for other tests, $^{*}p < 0.05$, $^{**}p < 0.01$

Mdn = median, IQR = interquartile range; Median diff. [95% CI] = Median difference [95% CI]

Explanation of effect size ε^2: 0.01 = small, 0.06 = medium, 0.14 = large

Explanation of effect size *r:* 0.1 = small, 0.3 = medium, 0.5 = large

The knowledge scores of the 3rd year were significantly higher than those of the 1st year ($p = 0.002$, < 0.0083)

†The knowledge scores of the 4th year were significantly higher than those of the 1st year ($p = 0.002$, < 0.0083)

††the attitude scores of the 4th year were significantly higher than those of the 1st year ($p = 0.002$, < 0.0083)

the practice scores of the 3rd year were significantly higher than those of the 1st year ($p = 0.007$, < 0.0083)

Discussion

This study found that participants' TIC knowledge and practice scores were relatively low, especially with practice scores being the lowest. This might be related to the lack of TIC courses in the nursing education system, disconnection from clinical practice, and the impact of cultural background on practical ability.

Knowledge, Attitude, and Practice of TIC

The knowledge level of nursing students was low. This may reflect in the fact that about 39.3% of participants were unaware of common trauma exposures, and 22.2% were unaware of the broad impact of trauma. In addition, 9.4% of participants disagreed that re-traumatization could occur unintentionally, and 21.4% were unsure that re-traumatization could occur unintentionally. This is consistent with previous studies (Kuzma et al., 2022; Pfeiffer & Grabbe, 2022). This highlights the gap in nursing students' knowledge of trauma care, which leads to a lack of preparation for contact with trauma survivors (Pfeiffer & Grabbe, 2022). In additional analysis, the findings showed that nursing students who were older than 20 years, and in the senior year (3rd year and 4th year), having experience discussing trauma topics and caring for trauma patients, had significantly higher knowledge scores than younger nursing students who were in the first year or had no relevant experience ($p < 0.05$) (Table 3).

The low level of knowledge may be due to the absence of structured TIC courses or education within their degree programs. TIC content was not included in the current nursing education system in China, which mainly follows "The National Standards for Teaching Quality in Nursing" (Ministry of Education Higher Education Teaching Guidance Committee of China, 2018). In addition, content on trauma only covered the topic of care for patients with trauma from crisis events, for one 80-minute class without TIC content. Therefore, trauma and TIC content are scattered in existing courses. This finding is consistent with previous studies (Elliott et al., 2024; Kuzma et al., 2022; Leng et al., 2022), which have pointed out that fragmented learning and dispersed resources may result in the poor application of TIC concepts to practice.

This study also found that senior students (third and fourth year) had significantly higher knowledge levels than first-year students. It might be related to trauma discussions in the third year or the experience of caring for trauma patients in the fourth year. Although experience may enhance knowledge through repeated clinical contact, there is the possibility that nursing students with higher basic knowledge will seek or retain more trauma-related experiences. In addition, other influencing factors (such as personal trauma history and TIC resources provided by the hospital) were not examined, and these may affect both experience and knowledge. Future research should further examine other influencing factors.

Concerning students' attitudes, the study findings showed a good level of positive attitudes, which was similar to a previous study (Cannon et al., 2020). However, there is a need for further improvement in some issues regarding the attitudes related to informed choices for trauma recovery, or whether the participants believed in and supported trauma-informed practices. The low percentage of these items might be partly due to a lack of knowledge about trauma and TIC, or having no internship experience, or lacking an intuitive understanding of the prevalence of trauma exposure and its multifaceted impacts. Trauma may be regarded as a distant issue, which makes nursing students' attitudes towards patients less optimistic about responsible universal trauma prevention. TIC approaches also help to reduce potential trauma factors in treatment and care to avoid patients being traumatized again (Guest, 2021). It is therefore essential to understand clinical psychosocial options to support future trauma recovery. Our study showed that the students who had discussed trauma, or had received preliminary TIC training, or had internship experience had significantly higher attitude scores. This suggests that attitude is related to increased exposure to trauma patients in clinical practice, thereby enhancing students' awareness of the importance of TIC.

However, only 6.0% of participants had a good overall practice score. Low practice scores might be related to academic year and experience in trauma patient care. In mainland China, the undergraduate nursing program is four years long (Lin et al., 2024), with the first three years devoted to theoretical knowledge learned in nursing school, and only in the fourth year does it include a clinical internship that lasts over 40 weeks (Chen et al., 2023). Fourth-year nursing students are required to rotate through departments with high trauma incidence. Half of the participants in this study were first- and second-year students, and their low practice scores may be related to the fact that they had not yet studied clinical nursing courses and had less exposure to trauma patient care. However, the continuous advancement of the learning process may enhance students' confidence in TIC practice.

In addition, students who had experience in caring for trauma patients had higher levels of practice, which could be related to the motivation of students to learn and practice when exposed to trauma patients. However, some factors limit nursing students' experience caring for trauma patients, which may also indirectly affect their level of TIC practice. There are three possible explanations. Firstly, the lack of any form of practical learning opportunities in initial TIC training may affect students' ability to implement TIC (Ozbay et al., 2023). This is consistent with previous studies (Kuzma et al., 2022; Ozbay et al., 2023; Pfeiffer & Grabbe, 2022), reporting that insufficient preparation for TIC practice leads students to worry about messages that inadvertently trigger patients or miss opportunities to provide TIC to them. These issues were significant as they made the participants feel uneasy and helpless in providing clinical care. This may limit their potential to provide more comprehensive, sensitive, and effective care to patients. Secondly, TIC practice may be affected by multiple barriers, such as clinical stress, time constraints, limited resources, organizational atmosphere, and relationships with patients (Huo et al., 2023; Qin et al., 2024). However, the current nursing internship assessment is mainly focused on nursing skills, which may reduce students' attention to TIC practice. Thirdly, it might be related to the expression and emotional appeal of trauma in traditional Chinese culture. Chinese culture emphasizes emotional restraint and introversion (Ip et al., 2021). In nursing practice, this cultural background may affect students' emotional expression towards trauma patients, thus limiting the experience of implementing TIC practice on patients to a certain extent.

Relationships between Knowledge, Attitude, and Practice of TIC

Based on the KAP model, this study explored the relationship between knowledge, attitude, and practice of trauma-informed care. A significant correlation was found between knowledge and attitude, suggesting that an improvement in knowledge level may be accompanied by a corresponding improvement in attitude. However, the direct impact of knowledge on attitude is limited, and other unmeasured factors (such as clinical experience and social culture) may play a more important role.

In addition, the correlation between knowledge and practice, as well as attitude and practice, was also significant and showed a moderate association. This suggests that improvements in knowledge or attitude may lead to more practical behavior. Thus, it is necessary to combine attitude cultivation with practical training (such as case discussion, role-playing, simulation), which may be more conducive to the improvement of clinical TIC practical behavior. The weak to moderate relationships of KAP in this study are possibly due to variability in characteristics of participants and experiences in caring for trauma patients, as mentioned above. Additionally, maintaining good or positive attitudes can motivate students to apply their knowledge and skills in practice, ultimately leading to improved patient care. However, the effect of these factors needs to be further examined in research, as the findings of previous studies have been inconsistent.

Limitations

This study has three limitations. Firstly, the single-institution sampling (of undergraduate nursing students from a college in Suzhou) may limit the generalizability of the findings to other regions or educational contexts. Secondly, self-report bias can affect data reliability, as the participants might have misinterpreted questionnaire items (particularly those who missed related coursework) or provided socially desirable responses. Moreover, the sample size constrained our ability to conduct comprehensive subgroup analyses. Nevertheless, this study provides the first systematic empirical evidence of TIC-KAP among Chinese nursing students, thus establishing critical baseline data for future multi-center studies. Most importantly, the identified knowledge-practice gaps directly inform the development of targeted courses.

Implications of the Study

For nursing education, the increasing trend of traumatic events, such as epidemics, climate change-related disasters, and geopolitical conflicts, highlights the relevance and urgency of educating nurses and ensuring their preparedness (Canavan & Ide, 2024; Nadeem et al., 2021). Nursing students should receive systematic, multidimensional trauma-informed care (TIC) courses or training before their fourth-year internship. This will help align their attitudes with their understanding of TIC and ensure they master the skills needed to address practical challenges. It is essential to incorporate concepts, methods, and practice principles corresponding to areas with lower scores into the curriculum, such as trauma recovery, the four assumptions of TIC, and its six core practice principles.

For nursing practice, cooperation with hospitals should be encouraged, including the development of practical TIC abilities through further in-service training. The conversion rate of knowledge to clinical application should also be strengthened. Additionally, given the traditional Chinese cultural background, cultural sensitivity training should be implemented to help students understand and adapt to trauma expressions and emotional appeals in diverse cultural contexts.

Conclusion

The findings demonstrate that undergraduate nursing students in a selected school scored lowest in the practice of trauma-informed care, followed by knowledge. These two components need to be strengthened in the education system. Additionally, this study found that certain factors, particularly the experience of caring for trauma patients, were associated with improved knowledge and clinical practice capabilities. The findings provide a baseline for developing a KAP-TIC course and exploring practice ability-centered TIC education for nursing students. Further research should focus on the development, implementation, and evaluation of a newly designed TIC course tailored to Chinese undergraduate nursing students, as well as on improving practice to achieve optimal patient health outcomes.

Declaration of Conflicting Interest

There is no conflict of interest to declare.

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Authors' Contributions

DZ designed the study, conducted the investigation, analyzed the data, wrote the initial draft of the manuscript, and revised it. PS had a supervision role in the study, contributed to the study's conception, design, and methodology, analyzed the data, and revised the manuscript. RV analyzed the data and revised the manuscript. EH revised and edited the manuscript. All authors contributed to the final version of the manuscript.

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Data Availability

Datasets analyzed for the current study results are available from the first and corresponding authors upon reasonable request.

Declaration of Use of AI in Scientific Writing

There is nothing to declare.

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