RESEARCH

The relationship between medical error tendency and mindfulness levels of nursing students in Turkey: a descriptive and cross-sectional study

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Abstract

Background   Given the nature of the health profession, medical errors are considered a common problem. Nursing students are inevitably likely to make medical errors due to the lack of adequate and safe learning environments during their clinical practice.

Aim   We aimed to investigate the relationship between the tendency to make medical errors and the level of mindfulness of senior nursing students.

Methods   Data were collected using the Malpractice Trend Scale (MTS) and the Mindful Attention Awareness Scale (MAAS). This study was reported following STROBE.

Results   The students' MAAS total score mean was 62.96 ± 1.64. The MTS total score mean was 79.91 ± 1.25. According to Pearson correlation analysis, there was a weak, positive ($r = 0.194$) and statistically insignificant ($p > 0.05$) relationship between the total scores of MTS and MAAS.

Conclusions   It was concluded that as the students' mindfulness levels increase, their tendency to make medical error decreases, but this result is not statistically significant.

Keywords   Nursing students, Medical errors, Mindfulness, Cross-sectional study, Nursing education

Introduction

Medical errors can be seen not only in healthcare professionals but also in students who are candidates for healthcare professionals. The most common error among medical errors, medication administration error, is defined as "a preventable event that may cause harm to the patient or inappropriate use of a medication while the medication is under the control of a healthcare professional, patient or consumer" according to the US Coordinating Council for Medication Errors Reporting and Prevention [1]. In light of the growing global concern regarding drug safety, the World Health Organization

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(WHO) has designated the theme for World Patient Safety Day 2022 as "Medication Safety," accompanied by the slogan "Medicine Without Harm." This initiative underscores the imperative for enhancing the safety of pharmaceuticals, a matter of paramount importance to international organizations and government agencies worldwide [2, 3]. Adverse events during hospitalization have been found to affect approximately one in ten patients, with a significant proportion of these events being preventable. Medical errors, a key factor in patient safety, are estimated to be the third leading cause of death in the United States, accounting for more than 250,000 deaths annually [4].

As the process of drug administration represents the final stage in the utilization of pharmaceuticals, the likelihood of errors being identified prior to the patient receiving the medication is minimal [5]. Medical errors have the potential to result in adverse outcomes, including elevated mortality rates, prolonged hospitalization and increased financial burden on healthcare systems. These errors occur with a high frequency in both developed and developing countries [6]. Despite their involvement in the process of drug administration, it is incumbent upon nurses to ensure that the preceding steps have been carried out correctly and that the administration of the drug is completed safely [7]. The management of medication is an integral component of nursing care, necessitating the expertise of registered nurses. The prevention of medical errors and the effective administration of medications represent pivotal aspects of nurses' daily routine responsibilities [8]. It is imperative to acknowledge that, while all these situations necessitate nurses to possess elevated levels of conscious awareness, nursing students, who represent the most pivotal element of nursing education, ought to be furnished with equivalent support in this regard.

Research undertaken with student nurses has highlighted the fact that medical errors for which students are responsible have the potential to cause significant harm to patients. Furthermore, students may experience feelings of anxiety and fear in practice areas, which can serve to increase the likelihood of errors being made [9]. In this regard, it is important for nursing students to receive good training on medical errors and patient safety during their education period. In the study conducted by Öztürk and colleagues with 1067 nursing students, it was determined that 28% of nursing students generally committed malpractice during clinical practice, and medical errors varied in rate, such as failure to comply with sterility and asepsis rules (32%), incorrect identification of the patient (19%) and administration of the wrong dose of medication (12%) [10]. The lack of active, effective and standardized training in nursing undergraduate programs regarding medical errors opens the way

for potential problems in terms of patient safety in the healthcare system [11]. In the face of a heavy workload in healthcare delivery, nursing students are vulnerable to anxiety and depression. This leads to high attrition rates, which can lead to students losing their love of nursing, burnout, or instability among nurses [12]. Therefore, in order to reduce the rate of medical errors made by nursing students after graduation or during internships while they are students, the awareness level of students regarding patient safety should be increased during nursing education [13].

Conscious awareness, otherwise known as mindfulness, is defined as the ability to be present and aware of one's experiences in the moment. It involves focusing on external and internal experiences without passing judgement [13]. Although the origin of Mindfulness is based on the concept of "Awareness" in Buddhism and Eastern Philosophy, it is actually a kind of spiritual skill. Awareness is the final step of enlightenment and maturing the soul, and people have been using this technique for thousands of years [14]. A concept analysis of mindfulness in nursing by White defined mindfulness as a "transformative process" in which a person develops an increasing ability to "experience being present" with "acceptance," "attention," and "awareness." [15]. In a study conducted to examine the effect of a mindfulness-based intervention on nursing students; It was found that mindfulness interventions significantly reduced the negative emotions of nursing students and helped them manage their stress and anxiety [16].

Chronic exposure to psychological stress resulting from an imbalance between occupational workload and an individual's ability to cope is known as "burnout" [17]. In light of these findings, it is imperative to recognize that occupations that demand high levels of attention, such as nursing, necessitate optimal mental well-being. Consequently, there is a crucial need to incorporate this aspect into nursing education curricula.

There are a limited number of studies in the literature on the development of awareness and present-moment skills of senior nursing students [18–21]. In the literature review, no study was found that examined the relationship between medical error tendencies and conscious awareness of senior nursing students. Therefore, this study was planned to examine the relationship between medical error tendencies and conscious awareness levels of senior nursing students.

Research questions;

a. What is the tendency of nursing students to make medical errors?
b. What is the level of mindfulness of nursing students?

c. Is there a relationship between the tendency of nursing students to make medical errors and their levels of mindfulness?

Methods

Study design

The study used a descriptive-cross-sectional study design because it was based on observational data on the competence of senior nursing students at the time of measurement. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist, guidelines for reporting observational studies, was used to validate the study design and methods and to increase the validity of the study findings [22].

Participants and setting

The research was conducted with senior undergraduate students of the Nursing Department of the Faculty of Health Sciences at a state university located in the Western Antalya Region of Türkiye. The universe of research consisted of sixty-five students studying in the 2023–2024 academic year. The sample of the research consists of volunteers who agreed to participate in the research. Sixty-two students who agreed to participate in the research voluntarily and attended the course during the data collection process were included in the research. Three of the students stated that they did not want to participate in the research. The sample selection method was not used in the research and an attempt was made to reach the entire universe. As a result, the research was conducted by reaching fifty-nine students.

Implementation of research

In order to reach the entire sample, the research data were collected in the main courses where nursing students participated the most. Before collecting the data, the researcher determined the main courses of the senior students and obtained permission from the instructor of the relevant course to collect data before starting the course. Before distributing the survey forms, the students were informed about the purpose of the study, the duration of the survey and the survey form, and the students who agreed to participate in the study were given a "Voluntary Informed Consent Form" and their written consent was obtained. Afterwards, the survey forms were distributed to the students who agreed to participate in the study and were taken back in the same environment. The survey forms were answered in an average of 15 min.

Measurement

The survey form to be used in the study consists of three sections. The first section includes a personal information form that defines the target audience. The second section includes scales to measure the levels of medical error tendency of senior nursing students, and the third section includes scales to measure the Mindful Attention Awareness levels of senior nursing students.

Personal information form

It was prepared by the researcher using relevant literature. This form consists of five questions regarding the students' age, gender, perceived economic status, whether they received training on patient safety, and whether they encountered medical errors during their internships.

Malpractice trend scale (MTS)

It was developed by Özata and Altunkan in 2010 to measure nurses' tendency to make medical errors. The scale has 49 items and 5 sub-dimensions. It has 5 Likert-type categories. It is evaluated as 1: never, 2: very rarely, 3: occasionally, 4: usually, 5: always. The highest score that can be obtained from the scale is 245, and the lowest score is 49. The scale consists of five sub-dimensions: drug and transfusion practices (18 items), falls (5 items), hospital infections (12 items), communication (5 items), patient monitoring and material safety (9 items). The mean score is used in the evaluation of the scale. As the mean score increases, it shows that nurses' tendency to make medical errors is low, and as the mean score decreases, it shows that nurses' tendency to make medical errors is high. The Cronbach's alpha value of the scale was determined as 0.93 by Özata and Altunkan [23]. In this study, the "Medication and Transfusion Practices" sub-dimension of the MTS was used to determine the relationship between the conscious awareness levels of senior nursing students and their medical error tendencies.

Mindful attention awareness scale (MAAS)

The data collection tool, Mindful Attention Awareness Scale (MAAS), addresses individual differences in the frequency of individuals' states of consciousness. The MAAS is a 15-item scale that measures the general tendency to be aware of and attentive to momentary experiences in daily life. On a six-point Likert-type scale (from "almost always" to "almost never"), respondents indicate how often they experience their experiences in an automatic manner without paying attention to the present moment. High scores on the scale indicate high levels of mindfulness. The MAAS has a single-factor structure and yields a single total score [14]. The internal consistency coefficient of the scale is 0.82. The adaptation study of MAAS to Turkish was conducted by Özyeşil et al. [14]. The item factor loadings for each item of MAAS ranged from 0.48 to 0.81, and the Cronbach Alpha internal consistency coefficient of the scale was calculated as 0.80 and the test-retest correlation was calculated as 0.86 [14].

Ethical considerations

Throughout this study, good scientific practices were followed in the search for honesty, transparency, accuracy and meticulousness in the research process [24]. Institutional permission was obtained for research from the Clinical Research Ethics Committee of Akdeniz University (Decision No: CRECAU- 743 Date: 27.09.2023) and from the chief physician of the hospital where the research was conducted. The purpose of the study and the requirements of the study were explained to the senior nursing students participating in the study, and verbally informed consent was obtained in accordance with ethical principles. Since the answers should be given on a voluntary basis, it was explained that the students who would participate in the research were free to participate or not and that they were willing to participate in the study.

Data analysis

The collected data was recorded and evaluated in a computer environment using the SPSS 25.0 statistical program. Frequency and percentage analyses were used to examine the descriptive characteristics of the students who agreed to participate in the study. Mean and standard deviation statistics were used to analyze the scales. Kurtosis and Skewness values were examined to determine whether the determined variables showed a normal distribution. Tabachnick et al. [25] calculated the skewness values of the variables as + 1.5 to -1.5.; George and Mallery [26], stated that between + 2.0 and − 2.0, it showed normal distribution. In this study, variables were found to show normal distribution. Parametric methods were used in the evaluation of the data. Independent groups t-test, one-way analysis of variance (Anova) and post hoc (Tukey, LSD) were used in the analysis of changes in scale scores according to the descriptive characteristics of the students. Pearson correlation analysis was used for the analysis of the relationship between the scales.

Results

Participants

The participants of the study were fifty-nine senior students from the Department of Nursing at Kumluca Health Sciences Faculty of Akdeniz University. 57.6% of the respondents were female and 42.4% were male. The average age of the students participating in the study was 23.017 ± 2.03 (min: 21, max: 31). The students' response to the perceived economic situation was 28.8% low, 64.4% medium and 6.8% good. 88.1% of the students participating in the study reported that they did not make any medical errors during their clinical practice, while 11.9% reported that they made medical errors.

Medical error tendencies and mindfulness levels of senior nursing students

In this study, the total mean score of the students from the MTS scale "medication and transfusion practices" sub-dimension was found to be 79.91 ± 1.25 (min = 18, max = 90) (Table 1). According to the MTS assessment, it was determined that the students had a low tendency to make medical errors. There was no statistically significant difference ($p > 0.05$) between the students' descriptive characteristics and their MTS scale score averages (Table 2). In this study, the students' MAAS score average was found to be 62.96 ± 1.64 (min = 15, max = 90) (Table 1). The students had a medium-high level of conscious awareness. There was no statistically significant difference ($p > 0.05$) between the students' descriptive characteristics and their MAAS score averages (Table 2).

The relationship between medical errors and mindfulness levels of senior nursing students

Pearson Correlation Analysis was used to determine the relationship between the students' total MAAS and MTS scale scores. Accordingly, there was a weak, positive ($r = 0.194$) and statistically insignificant ($p > 0.05$) relationship between the students' mindfulness levels and medical error tendency levels (Table 1).

Discussion

This study provides new evidence on the mindfulness levels and medical error tendencies of senior nursing students. The lack of research evidence on the mindfulness and medical error tendencies of senior nursing students contributes to the novelty value of this study. According to our study results, the total mean score of the Mindful Attention Awareness Scale (MAAS) of senior nursing students was found to be 62.96 ± 1.64 (min = 15, max = 90), which was above the median value. The total mean score of the Malpractice Trend Scale (MTS) was

Table 1 Correlation between students' mindfulness levels and medical error tendency levels (*n* = 59)

		METS Mean (SD) 79.91 ± 9.61 (Min/Max = 18 / 90)
MAAS	Pearson Correlation	.**194**
Mean (SD)	*p*	.**141**
62.96 ± 12.62 (Min/Max = 15 / 90)	N	59

METS; Medical Error Tendency Scale, **MAAS**; Mindful Attention Awareness Scale, **SD**; Standard deviation. **N**: Sample size, *Correlation is significant at *p* < 0.01 level

The mean Mindfulness (MAAS) and Medical Error Tendency Scale (METS) scores of nursing students are given in Table 2. Pearson Correlation Analysis was used to determine the relationship between the MAAS and METS levels of the students. Accordingly, there was a weakly positive (*r* = 0.194) and statistically insignificant (*p* > 0.05) relationship between the students' mindfulness levels and their medical error tendency

Table 2 Evaluation of students' medical error tendency and mindfulness levels of nursing students according to their descriptive characteristics (*n* = 59)

Variables		N	Mean (SD) METS	P	Mean (SD) MAAS	P
Age	23 years and under	46	79.43 ± 10.10	t: − 0.719	63.82 ± 11.46	t: 0.984
	24 years and over	13	81.61 ± 7.71	p: 0.475	59.92 ± 16.27	p: 0.329
Sex	Woman Man	34	80.47 ± 9.64	t: 0.514	63.17 ± 12.64	t: 0.148
		25	79.16 ± 9.70	p: 0.609	62.68 ± 12.85	p 0.883
Perceived economic situation	Low	17	79.88 ± 7.94	F: 0.167	61.29 ± 11.79	F: 1.663
	Medium	38	80.21 ± 10.56	p: 0.847	62.57 ± 12.84	p: 0.199
	High	4	77.25 ± 7.84		73.75 ± 11.47	
Status of receiving training on patient safety	Yes	47	80.42 ± 10.16	t: 0.805	63.19 ± 12.75	t: 0.269
	No	12	77.91 ± 77.02	p: 0.424	62.08 ± 12.63	p: 0.789
Have you ever made medication errors in the clinics you worked in during your training?	Yes	7	81.00 ± 7.65	t: 0.316	62.85 ± 18.19	t: − 0.024
	No	52	79.76 ± 9.89	p: 0.753	62.98 ± 11.93	p: 0.981

METS; Medical Error Tendency Scale, **MAAS;** Mindful Attention Awareness Scale, **SD**; Standard deviation. **N;** Sample size, *p* < 0,05

Table 2 shows the mean scores of the students in the MTS "medication and transfusion practices" sub-dimension and the mean scores they received from MAAS according to their descriptive characteristics. In the analysis, no statistically significant difference was found between the students' Medical Error Tendency and Conscious Awareness Levels according to their descriptive characteristics (*p* > 0,05)

found to be 79.91 ± 1.25 (min = 18, max = 90), which was high, meaning that the intern students' tendency to make medical errors was low according to the scale evaluation (Table 1). Additionally, no statistically significant difference (*p* > 0.05) was found between the students' descriptive characteristics, medical error tendencies, and mindfulness levels. Considering the effects of mindfulness on individuals, such as positive personal transformation [27], preserving and developing the existing mindfulness skills of nursing students becomes important as it can increase the students' focus on care.

This study found that nursing students' tendency towards medical errors is low. Similar to our study finding, In Karaveli's study, it was determined that nursing students' medical error tendencies were low according to the students' total MTS score averages [28]. In the study by Durmaz et al., it was found that nursing students had a low tendency to make medical errors [29]. Other research results in the literature also report that student nurses have a low tendency to make medical errors, and these findings also support our study [30–34]. However, in the literature, the tendency of student nurses to make medical errors was found to be high in the studies of Akgün Şahin, Özkan and Ersun [35–37]. The reason for these differences may be that the studies were conducted in different institutions and groups. It should also be noted that nursing students in our study may have given excessively high scores to the scale items by considering ideal nursing practices rather than practical nursing practices. At the same time, considering that the students participating in the study will be in the nursing profession in the future, having a low tendency for medical errors is important in terms of preventing possible errors and reducing medical error rates.

In the present study, no statistically significant difference was observed between the age groups of the students and the total mean score of the MTS "medication and transfusion practices" sub-dimension. However, a statistically significant difference was identified between the mean scores of the "medication and transfusion practices" sub-dimension of the scale according to age groups in the study by Demir et al. [31]. The present study established that there were no statistically significant differences in terms of MTS total averages according to the gender of the students. This finding is consistent with those reported by Güneş and Karakaş [32, 38]. Contrary to our study, Turk et al. [34] and Durmuş et al. [39] reported that the difference between the gender of student nurses and the MTS total score averages was statistically significant, and the score averages of female students were higher than male students. The prevailing hypothesis suggests that the observed variations in literature are attributable to differences in participant characteristics and educational levels.

In the present study, no significant correlation was identified between students' engagement in a course on patient safety and their propensity to commit medical errors. This finding aligns with the results of other studies in the literature, which have also demonstrated that participation in educational programmes focused on patient safety does not result in a discernible shift in attitudes towards medical errors [31, 40]. The similarity of the results is attributable to the fact that the research population consists of university students.

Another finding of the present study was that the average total score for the students' mindfulness levels (MAAS) was 62.96 ± 1.64 (min = 15, max = 90), which was above the median value. An examination of studies conducted with nursing students revealed that Azak's

study determined the MAAS score average for nursing students to be 60.14 ± 11.43 [19]. In Yaman's study, the MAAS score average of student nurses was found to be 53.03 ± 12.59 [41]. In the study conducted by Erkin et al. [42] 60.51 ± 11.35; It is reported as 62.87 ± 14.13 in the study conducted by He et al. [43]. In the present study, and in the aforementioned studies, the students' level of mindfulness was found to be slightly above average. It can thus be concluded that the findings of the present study are consistent with those of the extant literature.

In the present study, no significant differences were found in terms of students' conscious awareness level and their age, gender or perceived income level. Similarly, Azak's study found no significant differences in terms of age and gender, but a significant difference was found in terms of conscious awareness level and perceived income level [19]. The findings of this study may be influenced by a number of factors, including socioeconomic conditions, geographical location, and stressors associated with cultural characteristics.

The findings of the present study demonstrate a weak positive relationship, albeit one that is statistically insignificant, between students' levels of mindfulness and their tendency to make medical errors (see Table 1). In contrast, Tarhan's study reported that a brief mindfulness-based stress reduction programme had a positive effect on nursing students' awareness of medical errors and risks [44]. This finding is consistent with the results of the present study, insofar as it demonstrates a correlation between the levels of mindfulness exhibited by students and their propensity to engage in medical error.

Limitations of the study
The present study is subject to certain limitations. Firstly, the sample size was moderate, a factor which may have resulted in response bias and limited the generalizability of the results. Secondly, the study was limited to senior students at a university; therefore, the results can only be generalized to this group. Thirdly, the study used a cross-sectional research design, which precluded the examination of causal relationships. However, the conscious awareness of the participants at the time they completed the questionnaire was addressed. Nevertheless, the study may contribute to the prevention of medical errors by enhancing the conscious awareness levels of senior nursing students.

Conclusions
In the present study, the relationship between the levels of mindfulness and the tendency to make medical errors among senior nursing students was examined. It was determined that the students' conscious awareness level was above the median value, and their tendency to make medical errors was low. However, it was concluded that

as the students' mindfulness levels increased, their tendency to make medical errors decreased, although this result was not significant. It should be noted that this finding is limited to the sample group under investigation. Further research is required with a larger sample size to examine the relationship between students' medical error tendencies and their mindfulness levels.

This study is significant in its capacity to elucidate the correlation between student nurses' conscious awareness and their propensity to commit medical errors. The observation that the incidence of errors among students in our study is minimal can be interpreted as an indication of the presence of a patient safety culture. In order to perpetuate a safe patient culture and to ensure the maintenance of high levels of conscious awareness among students, it is recommended that their participation in awareness training be supported. To enhance student nurses' patient safety awareness, it is recommended that nursing faculties and hospitals collaborate more closely, utilizing contemporary educational methods, such as simulation-based training, to reduce the occurrence of adverse events.

Author contributions
SG and GT: Conceptualization, Methodology, Software. GT: Data curation, Writing- Original draft preparation. SG: Visualization, Investigation. GT: Supervision, Software, Validation.: SG: Writing- Reviewing and Editing.

Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
Institutional permission was obtained for research from the Clinical Research Ethics Committee of Akdeniz University (Decision No: CRECAU- 743 Date: 27.09.2023) and from the chief physician of the hospital where the research was conducted. The purpose of the study and the requirements of the study were explained to the senior nursing students participating in the study, and verbally informed consent was obtained in accordance with ethical principles.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Additional information
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