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Nursing Students' Perception of Anxiety and Illegible Handwriting as Contributing Factors to Increased Medication Error Risks in Southern Philippines

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ABSTRACT

Background: Nursing is a demanding profession, increasingly burdened by a global shortage of healthcare workers, particularly nurses. This shortage elevates the risk of medication errors, a leading cause of preventable harm in healthcare systems. Among nursing students, reported rates of medication errors vary significantly, underscoring the need for targeted educational interventions to address personal factors such as sleep deprivation and anxiety. **Methods:** This descriptive survey study assessed the perceived susceptibility to medication errors among nursing students at Mindanao State University - Iligan Institute of Technology (MSU-IIT), College of Health Sciences (CHS), focusing on students in Levels 2 to 4. The aim was to understand students' perceptions of their vulnerability to medication errors in clinical settings, informing the development of targeted interventions to enhance patient safety. A sample of 173 students was selected through stratified random sampling. An online questionnaire, adapted from the Medication Error Questionnaire, assessed susceptibility across technical, human, operator, and organisational factors. The questionnaire demonstrated face validity and reliability, with a Cronbach's Alpha of 0.842. Data analysis using ANOVA identified differences in susceptibility across academic year levels. **Results:** The findings indicate that nursing students demonstrate low susceptibility to medication errors, with scores of 3.39 for technical factors, 2.71 for knowledge-related human factors, 2.43 for personal-related human factors, 2.02 for environmental-related organizational factors, and 2.69 for administrative-related organizational factors. Most respondents positively acknowledged the statements but identified key risk factors, including sleep deprivation, anxiety, illegible handwriting, and excessive patient assignments. Notably, no significant differences in susceptibility were found across academic year levels, challenging the assumption that senior students possess greater competence. **Conclusion:** Targeted educational interventions are crucial to reduce medication error risks among nursing students. Recommendations include incorporating time management and self-care practices into the curriculum, enhancing simulation training, and fostering supportive environments. Addressing these issues may improve student well-being and patient safety, warranting further exploration of the effects of sleep and anxiety on clinical performance.

Keywords: Anxiety; Medication Errors; Nursing Education; Sleep Deprivation

INTRODUCTION

Nursing is a demanding profession, with significant emotional, physical and mental strain (Lorenzen, 2019). The global nursing shortage, expected to reach 4.5 million by 2030 (WHO, 2024), worsens nurse workload and increases medication error risks, which are a leading cause of preventable harm and adverse events, contributing to patient morbidity and mortality (Wang & Manskow, 2024; Manias, Kusljic & Wu, 2020). In the U.S., medical errors are the third leading cause of death (Albreiki *et al*., 2024), highlighting the urgent need for effective strategies.

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Among nursing students, medication errors are a widespread concern, with rates ranging from 10% to 80% globally (Mohebi, Bijani & Dehghan, 2024). This variability underscores the need for targeted educational interventions. However, personal factors like sleep deprivation, anxiety, and heavy workloads remain underexplored in relation to nursing students' susceptibility to medication errors (Thomas *et al*., 2017). These challenges, coupled with limited awareness of their long-term effects, impact students' readiness to provide safe, effective care in clinical settings.

While extensive research has examined various factors contributing to medication errors—such as the medication administration process (Jessurun *et al*., 2022), attitudes toward medication safety (Fernandez *et al*., 2022), pharmacology knowledge (Prochnow, Harden & Riley, 2022), and overall patient safety practices (Ayyad *et al*., 2024; Kakemam *et al*., 2024)—there remains a significant gap in understanding the personal factors influencing nursing students' susceptibility to these errors. Addressing this gap could provide crucial insights for developing targeted strategies to enhance patient safety and nursing education.

This study aims to assess nursing students' perceived susceptibility to medication errors at Mindanao State University - Iligan Institute of Technology (MSU-IIT), College of Health Sciences (CHS), focusing on Levels 2 to 4. By exploring how students perceive their risk of making medication errors in clinical settings, the study will provide valuable insights into the factors influencing their readiness to practice safely, informing educational interventions to improve medication safety awareness and competencies, ultimately enhancing patient care.

METHODOLOGY

This study used a descriptive survey design to assess the perceived susceptibility to medication errors among nursing students in Levels 2 to 4 at Mindanao State University - Iligan Institute of Technology (MSU-IIT), College of Health Sciences (CHS). Due to COVID-19 restrictions, all participants were first-time hospital duty participants, which is atypical for their academic levels. The study focused on MSU-IIT CHS nursing students during the 2022-2023 academic year with no prior hospital duty exposure. A stratified random sampling method selected 173 respondents, with sample sizes based on year-level distribution. Thirty-one pilot study participants were excluded to avoid duplication in the final sample.

The research instrument consisted of a three-part questionnaire. Part 1 gathered socio-demographic data. Part II, adapted from Apsay *et al*. (2018), initially contained 24 statements across four categories: Knowledge, Administrative, Personal, and Environmental. To align the instrument with the Eindhoven Model of Incident Causation (van der Schaaf, 1995), the researchers revised these categories into three primary factors: Technical, Human Operator, and organisational. Knowledge and Personal factors were merged under Human Operator, and Administrative and Environmental factors were combined under organisational. A new category, Technical Factors, was introduced to account for previously unaddressed error sources. This revision resulted in a 30-item questionnaire.

Face validity was established through feedback from a clinical instructor specialising in pharmacology, while reliability testing in the pilot study resulted in a Cronbach's alpha of 0.842, indicating good internal consistency. The questionnaire, using a 4-point Likert scale, assessed factors contributing to medication errors. Data were analysed using ANOVA to examine differences in perceived susceptibility across academic levels. Part 3 of the questionnaire asked respondents to rank factors based on their perceived impact, offering more profound insights into the factors influencing medication error perceptions in nursing education.

To accommodate the participants' clinical rotations and scheduling conflicts, the survey was administered online via Google Forms. The data collection period spanned from December 2022 to March 2023, allowing sufficient time for all 173 respondents to complete the questionnaire. The extended duration was influenced by the participants' demanding schedules, many of which prioritised academic and clinical responsibilities. Despite these challenges, the online format enabled efficient data collection and broad participation, ensuring the study's success.

Ethical Consideration

This study received ethical approval from the Ethics Review Committee of the College of Health Sciences,

Mindanao State University, Philippines with reference number E-2023-17 on 05th March, 2023.

RESULTS

Table 1 presents the demographic profile of the respondents, consisting of second- to fourth-year nursing students from Mindanao State University - Iligan Institute of Technology (MSU-IIT), College of Health Sciences. A total of 173 students participated, with 35.3% in their second year, 22.0% in their third year, and 42.8% in their fourth year. The majority (61.8%) were aged 21 to 22 years, and 75.1% of participants were female.

Table 1: Demographic Profile of the Respondents

	Frequency	Percentage (%)
Age		
19-20	48	27.7
21-22	107	61.8
23-24	18	10.4
Sex		
Male	43	24.9
Female	130	75.1
Year Level		
Second Year	61	35.3
Third Year	38	22.0
Fourth Year	74	42.8
TOTAL	173	100

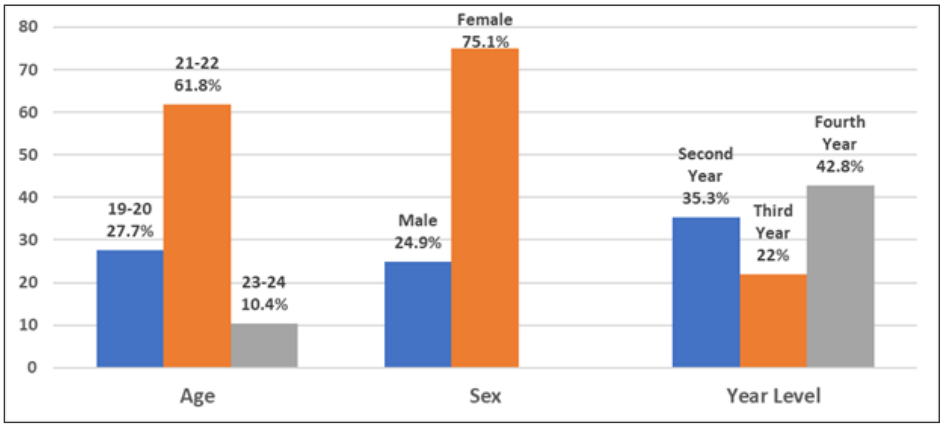

Figure 1: Demographic Profile of the Respondents

Table 2 presents nursing students' perceptions of technical factors influencing medication errors. The findings show strong agreement, with eight out of ten statements receiving a high endorsement. Most respondents disagreed with the statement that they rarely assess patients or perform drug calculations before administering medication. The overall mean score of 3.39 reflects a positive response, indicating that MSU-IIT College of Health Sciences nursing students perceive themselves as having low susceptibility to medication errors related to technical factors, demonstrating confidence in their medication administration practices.

In this study, a positive response signifies that the overall responses of the respondents for a given statement do not increase the risk of medication errors. Conversely, a negative response indicates an increased risk. In this context, nursing students positively responded to nine out of ten statements, suggesting their adherence to safe drug administration practices. However, a negative response was recorded concerning the issue of unclear or illegible handwriting by physicians, highlighting a potential risk factor that could contribute to medication errors.

Table 2: Respondents' Status on Medication Errors in Drug Administration Related to Technical Factors

Technical Factors	Mean	SD	Description
The physician's handwriting is not clear and easy to read, which then makes me more prone to medication errors.	3.72	0.63	Strongly agree
I seldom assess the patient (i.e. taking of vital signs, presence of allergies) before administering medications, which then makes me more prone to commit medication errors.	1.83	0.92	Disagree
When needed, I always label the medications I prepared. Thus, I believe that I am less prone to commit medication error/s.	3.69	0.57	Strongly agree
Before administering medications, I seldom do drug calculations, which then makes me more prone to commit medication errors.	2.02	0.95	Disagree
I always administer the medications to my assigned patients at the prescribed time and frequency, which then makes me less prone to commit medication errors.	3.64	0.55	Strongly agree
I always check and review the physician's/doctor's order for the patient's name, drug name to be administered, dosage, route and time the drug must be administered, which then makes me less prone to commit medication error/s.	3.77	0.50	Strongly agree
I always document the medications I administer to my patients, which then makes me less prone to commit medication errors.	3.78	0.44	Strongly agree
I always check the name of the drug more than once (i.e. upon getting the medication from the drug cabinet / storage, during drug preparation, and / or right before administering the drug to the patient), which then makes me less prone to commit medication error/s.	3.79	0.47	Strongly agree
I always ask for the patient's complete name before medication administration, which then makes me less prone to commit medication error/s.	3.89	0.31	Strongly agree
In preparing and administering drugs, I always adhere to hospital policies and their standards of practice, which then makes me less prone to commit medication error/s.	3.75	0.47	Strongly agree
Overall	3.39	0.24	Strongly agree

Legend: 3.25–4.00 (strongly agree); 2.50–3.24 (agree); 1.75–2.49 (disagree); 1.00–1.74 (strongly disagree)

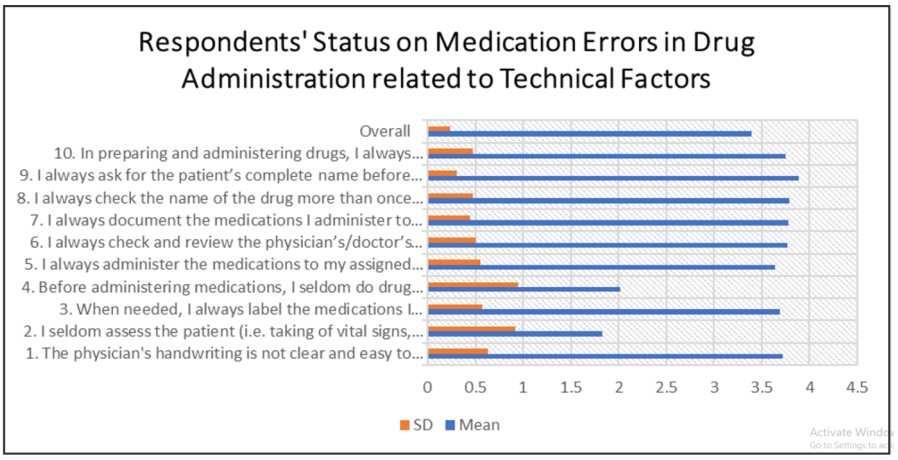

Figure 2: Respondents' Status on Medication Errors in Drug Administration Related to Technical Factors

Table 3 presents respondents' perceptions of knowledge factors in medication administration. The data show general agreement with the statements, with students notably disagreeing with the claim that they lack effective demonstrations and return demonstrations. These findings suggest that nursing students at MSU-IIT-CHS perceive themselves as having a strong knowledge base, leading to low susceptibility to medication errors related to knowledge factors. Their positive responses to all five knowledge-related statements reflect confidence in their ability to prevent errors through their understanding and skills in medication administration.

Table 3: Respondents' Status on Medication Errors in Drug Administration Related to Knowledge (Human Operator) Factors

Knowledge Factors	Mean	SD	Description
I have adequate knowledge about the nature and purpose of drugs. Thus, I believe that I am less prone to commit medication error/s.	2.80	0.70	Agree
I have adequate skills in administering medications. Thus, I believe I am less prone to commit medication error/s.	2.88	0.73	Agree
I have adequate knowledge in the use of different equipment for drug administration. Thus, I believe that I am less prone to commit medication error/s.	2.78	0.72	Agree
I am not provided with effective demonstrations and/or return demonstrations regarding drug administration. Thus, I believe that I am more prone to commit medication error/s.	2.19	0.88	Disagree
I have a solid understanding of pharmacology abbreviations, which I believe reduces my risk of making medication errors. This knowledge helps me navigate information accurately and enhance patient safety.	2.88	0.69	Agree
Overall	2.71	0.46	Agree

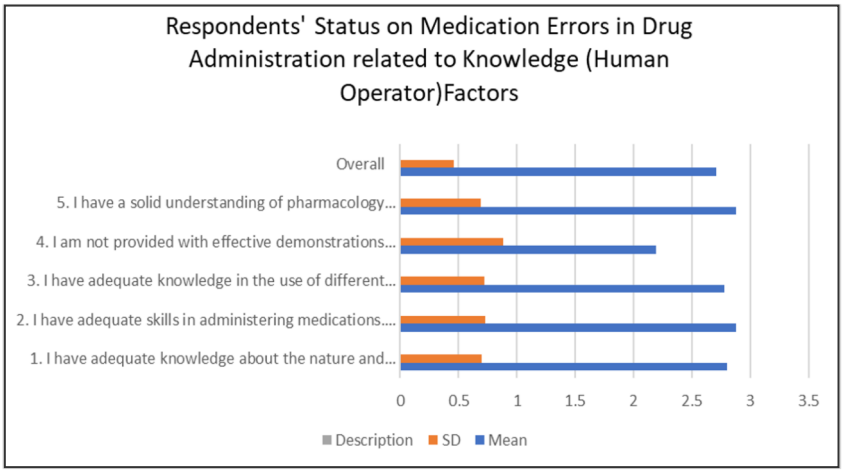

Figure 3: Respondents' Status on Medication Errors in Drug Administration Related to Knowledge (Human Operator) Factors

Table 4 presents respondents' views on how personal factors influence medication errors. The data reveal that respondents do not consider personal factors like stress or fear as significant contributors to medication errors. However, they acknowledge that inadequate sleep before shifts and anxiety about making harmful medication errors increase susceptibility. Despite reporting low levels of stress and personal issues, fatigue and anxiety still pose potential risks. While anxiety and lack of sleep are common, only two of the five identified personal factors were consistently acknowledged, suggesting that personal factors have minimal impact on actual medication error risk.

Table 4: Respondents' Status on Medication Errors in Drug Administration Related to Personal (Human Operator) Factors

Personal Factors	Mean	SD	Description
1. I always don't get adequate sleep before going on duty. Thus, I believe that I am more prone to commit medication error/s.	2.67	0.86	Agree
2. When I have a lot of personal problems, I become greatly bothered and I find it difficult to focus. Thus, I believe that I am more prone to commit medication error/s.	2.14	0.85	Disagree
3. I always become too stressed before and / or during the duty shift. Thus, I believe that I am more prone to commit medication error/s.	2.25	0.84	Disagree
4. I always feel anxious or fearful about the possibility of making mistakes and / or harming the patients. Thus, I believe that I am more prone to commit medication error/s.	2.83	0.88	Agree
5. I always feel afraid of holding the syringe / administering medications and my hand trembles whenever I prepare or administer medications. Thus, I believe that I am more prone to commit medication error/s.	2.27	0.86	Disagree
Overall	2.43	0.60	Disagree

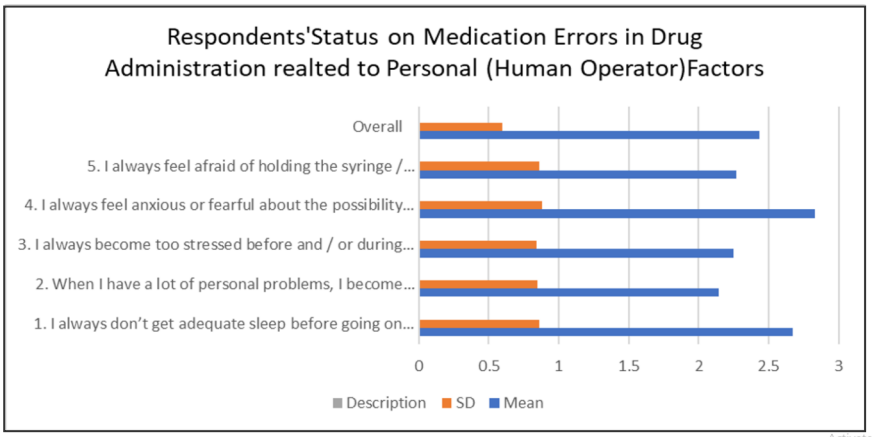

Figure 4: Respondents' Status on Medication Errors in Drug Administration Related to Personal (Human Operator) Factors

Table 5 presents the responses of second- to fourth-year nursing students regarding environmental (organizational) factors in medication errors. The data show that, on average, respondents disagreed with all five statements related to environmental factors. These findings suggest that MSU-IIT-CHS nursing students perceive environmental factors as having minimal impact on their susceptibility to medication errors, indicating a low perceived risk associated with these factors in drug administration.

Table 5: Respondents' Status on Medication Errors in Drug Administration Related to Environmental (Organizational) Factors

Environmental Factors	Mean	SD	Description
The room temperature in the nurse's station is hot and not conducive for preparing medications. Thus, I am more prone to commit medication error/s.	1.87	0.90	Disagree
There is inadequate lighting in the nurse's station forpreparing medications. Thus, I am more prone to commit medication error/s.	1.92	0.88	Disagree
The noise in the nurses' station distracts me whenever I prepare the medications. Thus, I am more prone to commit medication error/s.	1.77	0.79	Disagree
It is too crowded and/or there is not enough working space for preparing medications in the nurse's station. Thus, I am more prone to commit medication errors	2.35	0.90	Disagree
The set-up or arrangement of medications and equipment in the hospital is too disorganized. Thus, I am more prone to commit medication errors.	2.17	0.84	Disagree
Overall	2.02	0.64	Disagree

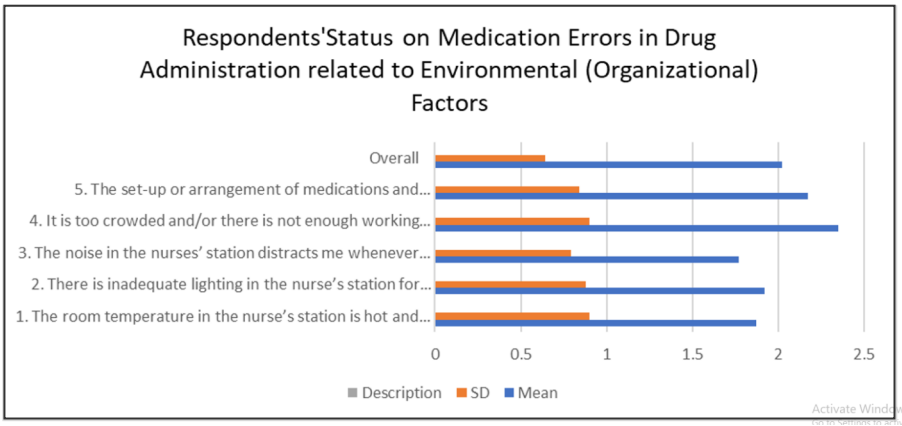

Figure 5: Respondents' Status on Medication Errors in Drug Administration Related to Environmental (Organizational) Factors

Table 6 presents respondents' perceptions of administrative factors in medication errors. The findings show strong support for four of the five statements, indicating that respondents generally perceive administrative factors as having minimal impact on medication errors. However, a significant concern emerged regarding heavy patient loads, with respondents noting that being assigned too many patients impairs concentration, increasing the likelihood of errors. While the overall data suggest low susceptibility to administrative factors, the recognition of challenges posed by high patient loads highlights an area requiring attention to ensure patient safety and improve clinical practice.

Table 6: Respondents' Status on Medication Errors in Drug Administration Related to Administrative (Organizational) Factors

Administrative Factors	Mean	SD	Description
I have a hard time concentrating as I am assigned to many patients during my duty shift, which then makes me more prone to commit medication error/s.	2.50	0.80	Agree
Whenever I prepare and administer medications, my clinical instructor always gives me the necessary supervision and follow-ups. Thus, I am less prone to commit medication error/s.	3.60	0.63	Strongly agree
I am afraid to inquire about drug preparation and administration with my clinical instructor, which then makes me more prone to commit medication errors.	1.75	0.84	Disagree
The staff nurses, physicians, and other healthcare professionals are approachable and friendly, which then makes me less prone to commit medication error/s.	3.38	0.69	Strongly agree
The clinical instructor, staff nurses, physicians, or other healthcare professionals' corrections and demeaning comments emotionally affect me. Thus, I am more prone to commit medication errors.	2.23	0.84	Disagree
Overall	2.69	0.36	Agree

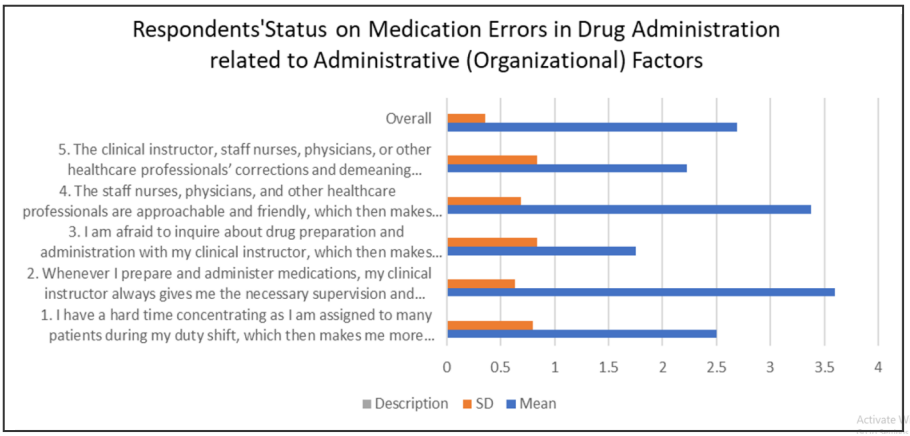

Figure 6: Respondents' Status on Medication Errors in Drug Administration Related to Administrative (Organizational) Factors

Table 7 ranks the perceived impact of contributing factors to medication errors—technical, human operator, and organizational—across year levels. Second-year students ranked human operator factors as the most critical, followed by technical and organizational factors. Third- and fourth-year students supported this order, placing human operator factors first, technical second, and organizational factors third. This consistent emphasis on human operator factors across all year levels highlights the need for targeted interventions to improve patient safety in nursing education and practice.

Table 7: Overall Rank of the Contributing Factors to Medication Errors

Year Level	Technical Factors	Human Operator Factors	Organizational Factors
Second Year	2nd	1st	3rd
Third Year	1st	1st	3rd
Fourth Year	2nd	1st	3rd

Table 8 presents the rankings of factors contributing to medication errors based on third-year nursing students' perceptions. Technical and human operator factors were identified as the most significant influences,

while organizational factors ranked third in affecting the students' perceived susceptibility to medication errors. This ranking highlights the critical areas that require attention to improve patient safety and reduce medication errors in nursing practice.

Table 8: Ranking of Contributing Factors to Medication Errors as Perceived by Third-Year Students

Rank	Frequency	Percentage
Technical Factors		
1st	16	43.2
2nd	14	37.8
3rd	7	18.9
Human Operator Factors		
1st	19	51.4
2nd	17	45.9
3rd	1	2.7
Organizational Factors		
1st	2	5.4
2nd	9	24.3
3rd	26	70.3
Total	37	100%

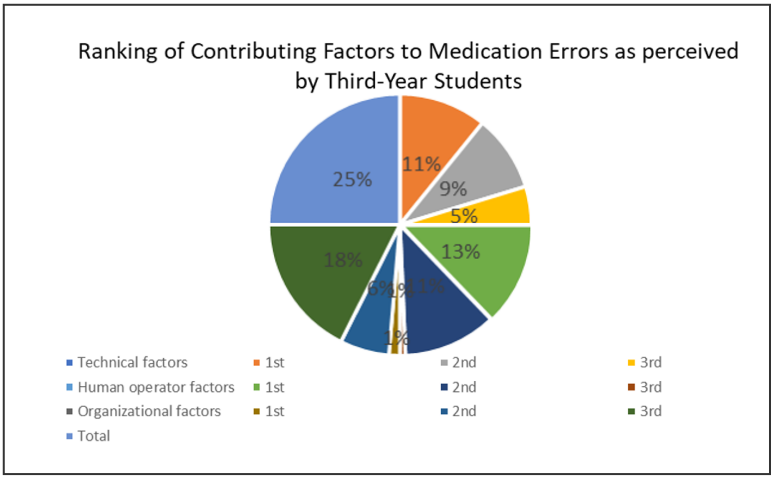

Figure 7: Ranking of Contributing Factors to Medication Errors as Perceived by Third-Year Students

Table 9 presents insights into the differences in susceptibility to medication errors across technical, human operator, and organizational factors. The data show no significant differences between academic years for any factors, as all p-values exceeded 0.05. This consistent pattern suggests that nursing students, regardless of year level, share a similar vulnerability to medication errors. These findings highlight the need for university-wide, evidence-based interventions to address these risks and ensure patient safety across the nursing curriculum.

Table 9: Analysis of Susceptibility to Medication Errors

Factors	*F*-statistic	*p*-value	Remark
Technical factor	0.124	0.883	Not significant
Knowledge factor	2.195	0.114	Not significant
Personal factor	0.123	0.884	Not significant
Environmental factor	0.600	0.550	Not significant
Administrative factor	0.216	0.806	Not significant

H0: There is no significant difference in the susceptibility to medication errors in terms of technical factors, human operator factors, and organizational factors.

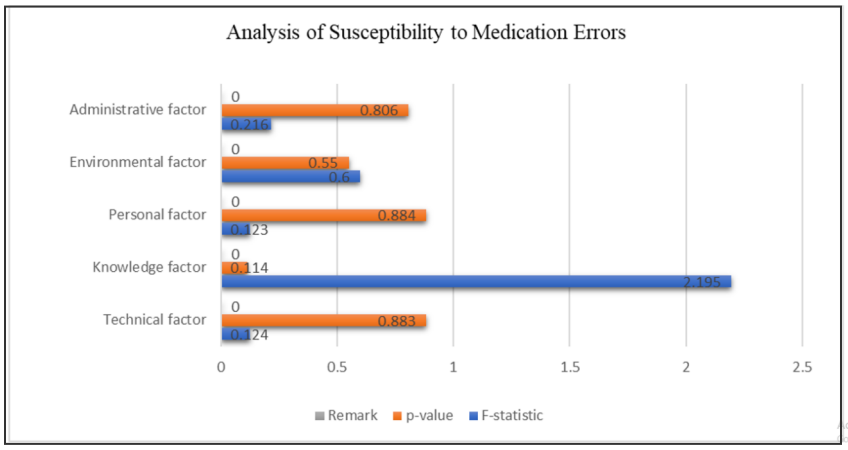

Figure 8: Analysis of Susceptibility to Medication Errors

DISCUSSION

The study highlights key factors influencing nursing students' susceptibility to medication errors. While students demonstrated adequate knowledge and supervision in medication administration, both external and internal factors still contribute significantly to their error risk.

Knowledge and Supervision

Students reported sufficient knowledge and clinical supervision, contrasting with Bam *et al.* (2021), which identified knowledge and supervision gaps as major contributors to medication errors. This discrepancy may reflect improvements in nursing education and supervision, suggesting a shift toward more effective training. However, knowledge alone is not enough; practical skills and real-world applications must also be integrated to ensure students can confidently apply their learning in clinical settings.

Illegible Handwriting

A key concern in this study is the impact of illegible handwriting on medication errors. Respondents noted that unclear physician orders increased their risk of mistakes. This finding aligns with Ishak and Ibrahim (2024) and Ramos (2024), emphasizing the need for clear and legible healthcare communication to minimise errors. Addressing this issue requires systemic changes, including better training for physicians on legibility and the potential adoption of electronic prescribing systems to reduce risks.

Sleep Deprivation

The study highlighted a significant relationship between inadequate sleep and an increased likelihood of medication errors. This finding resonates with the work of Hou *et al*. (2025), who highlighted that poor sleep among physicians increases the risk of medical errors. Given that nursing students often face demanding schedules, addressing sleep deprivation is critical. Strategies such as advocating for better work-life balance, implementing educational programmes on sleep hygiene, and considering scheduled naps during shifts could enhance cognitive performance and reduce error rates.

Anxiety and Stress

A key finding was the link between anxiety and medication errors. Respondents reported that fear of mistakes increased stress, affecting performance. Belli and Uslu (2025) support this, noting that anxiety lowers self-efficacy in tasks like medication administration. Szwamel *et al.* (2025) also highlighted elevated stress levels in nursing students, raising the risk of errors. Providing mental health support, stress management, and fostering open discussions about mistakes can reduce anxiety, enhance safety, and help students develop resilience for clinical practice.

Workload Challenges

The study highlighted the negative impact of heavy patient loads on students' concentration and the increased risk of medication errors. Shafqat *et al.* (2025) found that high workloads correlate with a higher likelihood of

errors, as overwhelming responsibilities impair cognitive processing (Ali *et al*., 2020; Çetin & Cebeci, 2021). This underscores the need for educational institutions to reassess workload distribution during clinical rotations. Managing patient loads for nursing students is crucial for maintaining focus, accuracy, and improving patient safety.

Academic Competence

Finally, the lack of significant differences in susceptibility to medication errors across academic years challenges the assumption that advanced students inherently possess greater competency. This finding echoes the work of Fusco *et al*. (2021) and raises critical questions about the effectiveness of the nursing curriculum. It highlights the necessity for ongoing evaluation and adaptation of educational strategies to ensure that all students, regardless of their academic year, are equipped with the skills and knowledge required to minimise medication errors.

Limitation

This present study is limited to one study locale or university only, posing potential limitations to its generalisability. The result may not apply to other settings, groups, or cultures, and it may not reflect broader trends and behaviours related to susceptibility to medication errors. Since the study was taken only from a government nursing school, the lack of participant diversity may not capture the students' wide range of experiences. Future research should consider including private and public schools to enhance the scope and applicability of the study.

CONCLUSION

In this study, addressing factors contributing to medication errors among nursing students is critical for improving patient safety and care quality. Targeted educational interventions, such as incorporating time management, self-care practices, and stress reduction techniques into the nursing curriculum, are essential. Additionally, fostering a supportive environment, enhancing communication skills, utilising simulation training, and teaching effective multitasking strategies are key recommendations.

Nursing educators and clinical preceptors must develop programmes that prepare students to navigate clinical challenges, including the risks of sleep deprivation. These initiatives will improve both student well-being and patient safety. Further research is needed to explore the impact of sleep deprivation and anxiety on medication errors, as well as the effectiveness of time management training and stress reduction interventions. Longitudinal studies and research on simulation training's role in enhancing clinical competence and the relationship between workload and error rates will provide valuable insights for advancing nursing education and patient safety.

Conflict of Interest

The authors declare that they have no competing interests.

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