



RESEARCH ARTICLE

Influence of Nurses Workload Regarding Medication Errors Knowledge in Pediatric Critical Care Unit

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| ARTICLE INFO | ABSTRACT |
|---|---|
| Received: May 23, 2024 Accepted: Jun 26, 2024 | Medication errors encompass preventable occurrence resulting in inappropriate medication use or patient harm, occurring during administration processes, dispensing, or prescription. To assess the influence of workload on nurses' knowledge about medication errors in the pediatric critical care units. A descriptive cross-sectional design was employed for this study to investigate the influence of workload on nurses' medication errors knowledge, particularly within the realm of pediatric critical care, from August 1, 2023, to March 1, 2024. The study utilized a questionnaire comprising three sections: the first to gather sociodemographic data of addict patients, and the second Nursing workload questionnaire, and third section Knowledge, Attitude And Behavior (KAB) In Medication Errors Questionnaire. A non-probability (purposive) sampling technique was employed in this study, involving 134 nurses works in critical care units. Data analysis encompassed descriptive and inferential statistics. Findings revealed the perception of the causes among the three levels for nursing workload at most (55.1%) were high, medication error knowledge among nurses at critical care at most (74.5%) were good, and results showed there were significant statistical positive direction correlations between workload on nurses' knowledge about medication errors at the critical care unit at p- value $P < 0.05$. More than half of the nurses in the study displayed a high level of workload, and good knowledge about medication errors. According to the findings of the research, show that significant correlation between workload and medication errors knowledge. |
| Keywords | |
| Influence | |
| Nurses workload | |
| Medication errors | |
| Pediatric critical care unites | |
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INTRODUCTION

Critically ill pediatric patients in the pediatric critical care unit (PCCU) are at high risk of medication errors due to factors such as complex medication regimens, disease severity, comorbidities, and narrow therapeutic margins of certain treatments. The high-stakes nature of caring for critically ill children, including neonates and premature infants, makes them more vulnerable to medication errors (MEs), especially when it comes to weight-based dosage errors and the timely delivery of drugs. It has been found that the rate of medication errors in children is up to three times greater than in adults (Brennan *et al.*, 2020). Prescription errors, dosage-related errors, look-alike-sound alike medications, employee exhaustion, knowledge gaps, and environmental factors that impact healthcare workers' productivity are some of the main factors that contribute to medication errors. Serious harm and potential danger to patients can result from MEs. Between 7,000 and 9,000 individuals die every year as a result of drug errors; over 7 million people in the United States are

impacted, and over \$40 billion is needed to cover the costs (Tu *et al.*, 2023; Jam *et al.*, 2014). Nursing workload is characterized as the result of the average daily patient census, factoring in the level of care type and patients dependency, along with the average timing spent providing assistant to each patient (Reis *et al.*, 2023). A nurse's productivity can be enhanced by combining the physical and mental aspects of their workload. In order to increase nurses' productivity and prevent physical, emotional, and social difficulties brought on by excessive stress and a demanding workload, it is important to accurately and promptly assess nurses' psychological health (Sobhani, Hosseini and Tabanfar, 2023). Nurses working in pediatric emergency departments (PEDs) have demanding and challenging responsibilities, which subject them to exceptionally heavy workloads, both physically and mentally. Approximately 20% of all consultations are attributed to visits to the PED, and there has been a significant annual increase in the number of patients attending the PED. This has resulted in a higher workload in PEDs, as reported by (Kaya and Dalgıç, 2022; Kanval *et al.*, 2024). Because nurses work around the clock and have a direct impact on pediatric patients' quality of care, it is crucial to accurately forecast the number of nurses needed, manage their workload, and improve work design (Othman, El-Fattah and Ragab, 2022). Among the variables that increase the risks to health and medication errors are the unfavorable working circumstances of nurses, the need to stay up continuously, and night duty (BÖLÜKBAŞ, ÖZYER and Çilingir, 2020). Irregular dosing can lead to medication errors, which in turn can endanger patients by producing unwanted side effects. In addition, they can happen because of things like nurses' lack of expertise, an ineffective system for organizing and communicating, a heavy workload, problems with shift changes, and a flawed system for managing the ward

(Živanović, Javorac and Knežević, 2019).

Important of study: Pediatric critical care unit nurses often experience professional exhaustion due to the demanding nature of their work, high expectations from superiors regarding efficiency, long hours, frequent shifts, and, most importantly, the usual absence of public recognition and rewards for their hard work this lead to occurrence of medication errors in critical care unit (Alrabadi *et al.*, 2020).

METHODOLOGY

Design of Study: A descriptive cross-sectional design used in this study, from August 1st, 2023, to March 1st, 2024.

Ethical Considerations: Official permissions were obtained from relevant authorities prior to data collection. Approval was first secured from the Council of the Nursing College\ University of Karbala under number (UOK.CON 23.015). The instrument used in the study was also approved by the Research Ethics Committee of the College of Nursing\ University of Karbala. Subsequently, permission was sought from Karbala Teaching Hospital for Children to collect the data to ensure collaboration and agreement. Ethical considerations were meticulously observed to uphold professional study conduct, ensuring the moral integrity necessary for handling participants' sensitive information and maintaining confidentiality. Nurses' participation was entirely voluntary, with the researcher informing them that their data would be kept confidential until publication, solely for scientific purposes. Participants in the study provided both written and verbal consent to the researcher.

Study Setting: The study was carried out in the field of pediatric critical care nursing at Karbala Teaching Hospital for Children.

Study Sample: A non-probability (purposive) sampling technique was employed in this study for 134 nurses works in critical care units, aim to determine the impact of workload on medication errors knowledge.

Study Instrument:

The self-administered questionnaire used to gather the data from the respondents was made up of three sections:

Sociodemographic characteristics: This section contains the respondents' age, gender, marital status, educational level, years of experience, monthly income, number of years of experience in critical units, and have you participated in previous courses on medication errors.

Nursing workload questionnaire: This questionnaire, developed by Ahmed Abdallah, aims to assess nurses' perceptions regarding their workload (8). It comprises 10 items on the Work Environment, authored by Ahmed Othman. Permission was obtained via email from the copyright owner, utilizing Brisling's back-translation model. The Nursing Workload Questionnaire 10 was translated into Arabic by two bilingual physicians working in healthcare, then back-translated by two additional bilingual physicians. Scoring is based on a five-point Likert scale, ranging from (1) strongly disagree to (5) strongly agree.

Knowledge, Attitude and Behavior (KAB) In Medication Errors Questionnaire: The questionnaire developed by Professor Marco Di Muzio consists of seven items. The scoring system for this questionnaire is as follows: 0: Strongly disagree, 1: Disagree, 2: Undecided, 3: Agree, and 4: Strongly agree

RESULTS OF THE STUDY

Table 1: Distribution of the Participants According to their socio-demographic data Characteristics:

| Demographic Characteristics | Subgroup | f. | % |
|-----------------------------|---|----|-------|
| Age group | 22- 34 years | 71 | 72.4 |
| | 35- 47 years | 24 | 24.5 |
| | 48- 59 years | 3 | 3.1 |
| | Total | 98 | 100.0 |
| | Mean \pm SD 30.96 \pm 7.775 Min- Max 22 - 59 years | | |
| Sex | Male | 61 | 62.2 |
| | Female | 37 | 37.8 |
| | Total | 98 | 100.0 |
| Marital status | Single | 30 | 30.6 |
| | Married | 66 | 67.3 |
| | Separated | 2 | 2.0 |
| | Total | 98 | 100.0 |
| Educational level | Secondary school | 29 | 29.6 |
| | Institute | 20 | 20.4 |
| | College | 42 | 42.9 |

| | | | |
|---|---|----|-------|
| | Master's and above | 7 | 7.1 |
| Income | 400-600 thousand dinars | 35 | 35.7 |
| | 601-800 thousand dinars | 38 | 38.8 |
| | 801 thousand dinars and more | 25 | 25.5 |
| | Total | 98 | 100.0 |
| Training course about medication error | Yes | 53 | 54.1 |
| | No | 45 | 45.9 |
| | Total | 98 | 100.0 |
| Years of experience in the hospital | 1- 8 years | 64 | 65.3 |
| | 9- 16 years | 18 | 18.4 |
| | 17- 25 years | 16 | 16.3 |
| | Total | 98 | 100.0 |
| | Mean \pm SD 7.62 \pm 7.022 Min- Max 1 - 25 years | | |
| Years of experience in the unit | 1- 6 years | 72 | 73.5 |
| | 7- 13 years | 19 | 19.4 |
| | 14- 20 years | 7 | 7.1 |
| | Total | 98 | 100.0 |
| | Mean \pm SD 4.78 \pm 4.809 Min- Max 1 - 20 years | | |

%=Percentages, f= frequencies, S.D = Standard Deviation, M = Mean of score, Max= maximum and Min= minimum

In table 1 the results showed the age for 98 nurses at the pediatric critical care units were at most (72.4%) from 22 to 34 years with mean 30.96 years. Regarding the sex, the most (62.2%) of the nurses were male and the most were (67.3%) married. According to the educational level the most (63.3%) were complete college or. The results also shown the income for nurses at most (38.8%) receive 601 to 800 thousand dinars. And shown years of experience in the hospital with mean 7.62 years and years of experience in the unit with mean 4.78 years. The most (54.1%) of the nurses' participants in Training course about medication error.

Table 2: The perception of the causes among the three levels for nursing workload:

| Level | Range | f. | %. | Mean | SD |
|-----------------|---------|----|-------|-------|-------|
| Low | 10 - 23 | 0 | 0 | | |
| Moderate | 24 - 37 | 44 | 44.9 | | |
| High | 38 - 50 | 54 | 55.1 | | |
| Total | 10 -50 | 98 | 100.0 | 37.87 | 5.454 |

%=Percentages, f= frequencies, S.D = Standard Deviation, M = Mean of score

The results in table 2 showed the perception of the causes among the three levels for nursing workload at most (55.1%) were high with mean 37.87 (Min- Max 10-50).

Table 3: The medication error knowledge among nurses at critical care:

| Level | Range | f. | %. | Mean | SD |
|--------------|---------|----|-------|-------|-------|
| Poor | 7 - 16 | 0 | 0 | | |
| Fair | 17 - 25 | 25 | 25.5 | | |
| Good | 26 - 35 | 73 | 74.5 | | |
| Total | 7 -35 | 98 | 100.0 | 28.23 | 3.569 |

%=Percentages, f= frequencies, S.D = Standard Deviation, M = Mean of score

The results in table 3 showed the medication error knowledge among nurses at critical care at most (74.5%) were good with mean 28.23 (Min- Max 7-35)

Table 4: Assess the influence of workload on nurses' knowledge about medication errors at the critical care units:

| N= 98 | Workload | | |
|--------------------------|----------|----------|--------|
| | Cc | p. value | Result |
| Nurses' knowledge | .202* | .047 | S |

P=probability value, Cc= Correlation coefficient, S: Significant at $P < 0.05$, NS: Non-Significant at $P > 0.05$, HS: Highly Significant at $P < 0.001$.

In table 4 the results showed there were significant statistical positive direction correlations between workload on nurses' knowledge about medication errors at the critical care unit at p- value $P < 0.05$

Table 5: The relationship between workload and medication errors knowledge with nurses' sociodemographic characteristics. :

| Demographic Characteristics | Subgroup | Workload | | | Knowledge | | |
|-----------------------------|------------------|----------|----------|----------|-----------|----------|----------|
| | | M | Analysis | p. value | M | Analysis | p. value |
| Age | 22- 34 years | 3.77 | Cc=.006 | .954 | 3.95 | Cc=.314 | .002 |
| | 35- 47 years | 3.81 | | | 4.27 | | |
| | 48- 59 years | 3.93 | | | 4.10 | | |
| Sex | Male | 3.80 | t= .308 | .759 | 4.10 | t= 1.630 | .106 |
| | Female | 3.76 | | | 3.93 | | |
| Martial status | Single | 3.91 | F=2.817 | .065 | 3.93 | F=2.594 | .080 |
| | Married | 3.71 | | | 4.06 | | |
| | Separated | 4.40 | | | 4.71 | | |
| Education | Secondary school | 3.73 | F=.237 | .790 | 3.90 | F=2.136 | .124 |
| | Institute | 3.78 | | | 4.00 | | |
| | College | 3.80 | | | 4.06 | | |

| | | | | | | | |
|-----------------------------------|------------------------------|------|---------|------|------|---------|------|
| | Master's and above | 3.87 | | | 4.31 | | |
| Income | 400-600 thousand dinars | 3.76 | F=.369F | .692 | 3.84 | F=6.691 | .002 |
| | 601-800 thousand dinars | 3.84 | | | 4.03 | | |
| | 801 thousand dinars and more | 3.73 | | | 4.30 | | |
| Experience in the hospital | 1- 8 years | 3.78 | Cc=.051 | .621 | 3.92 | Cc=.238 | .018 |
| | 9- 16 years | 3.73 | | | 4.26 | | |
| | 17- 25 years | 3.90 | | | 4.23 | | |
| Experience in the unit | 1- 6 years | 3.78 | Cc=.092 | .365 | 3.97 | Cc=.198 | .051 |
| | 7- 13 years | 3.79 | | | 4.20 | | |
| | 14- 20 years | 3.90 | | | 4.22 | | |
| Training course | Yes | 3.81 | t=.482 | .631 | 4.05 | t=.258 | .797 |
| | No | 3.76 | | | 4.02 | | |

P=probability value, S: Significant at $P < 0.05$, NS: Non-Significant at $P > 0.05$, HS: Highly Significant at $P < 0.001$.

In Table 5, significant negative correlations were observed between workload and nurses' age, years of experience in the hospital with a significance level of $P < 0.05$. Additionally, there were significant positive correlations between medication error knowledge, nurses' age, and years of experience in hospital, at $P < 0.05$.

DISCUSSION

Table 1 Clearfield that the majority of the 98 nurses employed in pediatric critical care units fell within the age group of (22-34) years, represented 72.4% of the study sample. These findings are appropriate with a study by (Alrabadi *et al.*, 2020) which investigated medication errors among registered nurses in Jordan and found that 75% of respondents were aged (20-34) years. However, our results differ from those of (Erdoğan and İnan, 2018) who assessed burnout levels among nurses in a hospital setting and reported that 81.7% of participants were aged (20-30) years. Regarding gender distribution, the majority (62.2%) of nurses in present study were male. This aligns with (Alrabadi *et al.*, 2020) findings, where male respondents accounted for 51.3%, while females accounted for 48.7%. In contrast, (de Lima Garcia *et al.*, 2019) investigate patient safety culture and burnout in pediatric hospitals, found that 86.5% of participants were female. Marital status analysis revealed that 67.3% of participants in present study were married, consistent with findings by (Hajibabae *et al.*, 2023) who reported a marriage rate of 75.7% among nurses in Erbil hospitals. However, (Adly, Ismail and Saleh, 2020) study on the nurses' knowledge and practice regarding the safety standard precautions in the pediatric critical care found that 73.2% of respondents were single, conflicting our findings. In terms of educational realization, the majority (63.3%) of sample had completed college or institute, with 67.1% possess a Bachelor's degree in nursing, agree with findings from (Elsayed, Abusaad and Hashem, 2020) study on nurses' knowledge regarding neonatal safety when using intravenous devices. However, (Hariyati, Mediawati and Eryando, 2021) study contradicts this, revealing that (73.78%) of nurses with diploma education were involved in medication errors. Regarding years of experience in the hospital, (65.3%) of nurses had (1-8) years of experience, in line with (Kainat *et al.*, no date) findings on nurses' knowledge and practice

regarding medication error reporting (AZADI *et al.*, 2020) study on nurse workload in various units founded that (40.2%) of nurses with (1-5) years of experience were included in the sample, whereas our study revealed that (73.5%) of nurses had between (1-6) years of experience. Regarding participation in training on medication errors, (54.1%) of nurses had undergone such training, agree with (Alandajani *et al.*, 2022) findings on nurses' knowledge and attitudes toward medication errors. However, (Jassima and Ebrahimb, 2020) study indicated that only 35% of nurses participated in training sessions, disagree with our findings.

Table 2 presents the findings regarding the perception of nursing workload, with a higher percentage (55.1%) indicating alignment with a study by (Hariyati, Mediawati and Eryando, 2021; Jam *et al.*, 2013) on the impact of workload on medication errors by nurses. Hariyati's study appeared that nursing workload levels were high among nurses (77.44%). However, these findings contradict those of (Destiani, Mediawati and Permana, 2020) who evaluated nurses' mental workload as care providers, with statistics indicating that a significant proportion of participants (67%) experienced a moderate level of intellectual exertion.

Table 3 presents study indicating a predominantly good level of medication error knowledge among nurses in critical care, with a mean score of (28.23) at range (7-35). These results agree with a study conducted by (Alandajani *et al.*, 2022) which also assessed nurses' knowledge and attitudes about medication errors, revealing that approximately (55%) of nurses demonstrated a high level of understanding of medication errors. However, findings from a study by (Abassy and Al-Mosawi, 2021) analyze pediatric nurses' knowledge concerning medication administration errors at CCU in Baghdad City disagreement with the present study's results, showing that a low level of knowledge regarding medication administration errors at CCU.

Table 4 shows the results indicating a statistically significant positive correlation between workload and nurses' knowledge regarding medication errors in the CCU, with a $p < 0.05$. This finding is in line with a study by (Hariyati, Mediawati and Eryando, 2021) that determine the impact of workload on medication errors by nurses, revealing a statistically significant association between workload and medication errors ($p = 0.001$; $\alpha < 0.05$). Conversely, a separate study by (BÖLÜKBAŞ, ÖZYER and Çilingir, 2020) assessing the impact of workload perception and occupational stress on nurses' attitudes towards medical errors in surgical units found no statistically significant difference in average scores related to individual workload perception and medication errors ($p > 0.05$).

Table 5 presents the study's findings regarding the relationship between various factors and nurses' workload. About age: The study found no significant correlation between age and workload ($p = 0.954$), agree with (AZADI *et al.*, 2020) study. However, (Babamohamadi *et al.*, 2023) study yielded disagree with results, indicating a significant positive correlation between workload and age ($p = 0.027$). Regarding level of education: There was no significant relationship between workload and education level ($p = 0.790$), agree with (AZADI *et al.*, 2020) findings. Conversely, (Yusefi *et al.*, 2019) study found a significant correlation between level of education and workload ($p = 0.03$). Regarding experience in the hospital: The study found no correlation between workload and experience in the hospital ($p = 0.621$), agreements with (AZADI *et al.*, 2020) research. Overall, while the study by (Hariyati *et al.*, 2021) assessed workload as the most significant factor influencing medication errors by nurses, this study didn't find a significant association between workload and other demographic factors. The study found a significant correlation between age group and knowledge of medication errors ($p=0.002$), coordinated with (Alandajani *et al.*, 2022) findings. Nurses' knowledge and attitudes towards medication errors also showed a significant correlation ($p=0.001$). However, (Ben *et al.*, 2023) study conflicted these results, finding no significant link between age and knowledge of medication errors ($p > 0.05$). Regarding level of education, no significant correlation was found with knowledge of drug errors ($p = 0.124$), aligning with (Alenezi and Baker, 2023) study ($p=0.129$). Conversely, (Othman *et al.*, 2022) study indicated a significant association between level of education

and knowledge of preventing medication errors ($p=0.004$). Finally, about hospital experience, a significant association was found between knowledge of drug errors and experience ($p=0.018$), coordinate with (Alandajani et al., 2022) findings. However, (Ben et al., 2023) study found a weak, negative correlation between years of experience in hospitals and knowledge about preventing medication errors ($p= 0.602$).

CONCLUSIONS: The study concludes that the most of nurses have high level of workload and good knowledge about medication errors, and there is a significant correlation between workload and medication errors knowledge, and there is no significant relationship between workload and nurses' sociodemographic characteristics, and significant relationship between medication errors knowledge and some nurses' sociodemographic characteristics.

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ABBREVIATIONS

Pediatric Critical Care Units (PCCUs).

Medication Errors (MEs).

Pediatric Emergency Department (PEDs).

Critical Care Unit (CCU).

AUTHORS' CONTRIBUTIONS

The authors contributed to the work by participating in the design, acquisition, analysis, and interpretation of data. They drafted or critically revised important intellectual content and provided final approval of the version to be published. The authors also agreed to be accountable for all aspects of the work.

FUNDING

This research did not receive any external funding.

AVAILABILITY OF DATA AND MATERIALS

The data utilized in this study are accessible upon request from the corresponding author.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study obtained approval from the Ethics Committee of the College of Nursing, University of Karbala, on August 1, 2023, under ethical approval number UOK.CON 23.015. Additionally, the administration of Karbala Teaching Hospital for Children was briefed on the study's objectives and data collection methods, and their written informed consent was obtained.

CONSENT FOR PUBLICATION

We hereby give our consent for the publication of the aforementioned manuscript, along with any accompanying images or data included therein.

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