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Original Research Article

Awareness of Pediatric Nurses Regarding Drug Preparation and Administration in Gaafer bin auf Children Hospital, Sudan

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Abstract

Background: This study aimed to assess the awareness of nurses who care for pediatric patients related with drug preparation and administration conducted in Gaffer Bin Auf children hospital. ***Methods:*** A cross-sectional study was conducted from November to December 2015, in Gaffer Bin Auf children hospital, largest pediatric hospital in Khartoum state. The total sample size was 92 participants. The self-administered questionnaire was constructed with a total of 26 questions. For data analysis, we performed nonprobability descriptive study design. ***Results:*** The results imply that Majority of respondents aged between 20-30 years (56.5%). Approximately half of the nurses held a bachelor's degree (52.2%), while the remainder held a diploma (47.8%). A significant proportion of nurses (83.7%) reported no prior training in drug preparation and administration. Most nurses (46.7%) had 2-5 years of clinical experience, and 69.6% worked afternoon and night shifts. Regarding drug preparation and administration, varying levels of knowledge were observed among nurses. Notable percentages of nurses demonstrated awareness in areas such as double-checking during preparation (56.5%) and using distilled water or normal saline for non-contraindicated suspension drugs (56.5%), nurse answered can avoid a mistake during Preparation by prepare medication for one individual at a time with (90.2%), most of nurses have good level of knowledge regarding to drug preparation & administration practice with (65.6%). bachelor's degrees are more likely to demonstrate proficient drug preparation and administration practices compared to those with diplomas, with a significant difference of 94% (p=0.047, AOR: 0.6, 95% CI: 0.03, 1.1). This research indicating that bachelor's degree nurse graduates generally exhibit better educational preparedness for quality and safety. Additionally, participants working morning shifts are 3.4 times more likely to exhibit good drug preparation and administration practices compared to those on night shifts (p=0.011, AOR: 3.4, 95% CI: 1.3, 8.1), and 4.6 times more likely compared to those on afternoon shifts (p=0.015, AOR: 4.6, 95% CI: 1.8, 9.2). Participants with good knowledge of drug preparation and administration practices are 2.614 times more likely to exhibit proficiency compared to those with poor knowledge (p<0.001, AOR: 2.614, 95% CI: 1.78, 3.90). ***Conclusion:*** The study revealed significant insights into the demographic characteristics, educational backgrounds, and practices related to drug preparation and administration among nurses. Despite a substantial portion reporting no prior training, varying levels of knowledge were evident, with most nurses demonstrating awareness in key areas such as double-checking during preparation and using appropriate solutions for suspension drugs. While there are areas for improvement, the findings suggest a solid foundation of knowledge among nurses regarding medication safety, highlighting the importance of ongoing education and fostering a culture of continuous learning within healthcare settings

Keywords: Pediatric, medication, preparation, administration.

INTRODUCTION

Medication administration is a fundamental nursing role; however, it is not without risk, it is especially complex within the pediatric setting, with many factors influencing practice [1]. Nurses constitute the most important element in noticing and preventing the errors in order to decrease the risks in the process of administration of drugs to children, the most commonly observed error in the hospital setting is related with medication administration [2].

Medication administration error is defined as any preventable event which occurs in the time period which starts with supply of a medication and includes the follow-up period after administration. The risk is higher in drug administrations in the childhood age group compared to adults [2]. It can be classified as either acts

of commission or omission, and may include the following: wrong drug; wrong route; wrong dose; wrong patient; wrong timing of drug administration; a contra-indicated drug for that patient; wrong site; wrong drug form; wrong infusion rate; expired medication date; or prescription error. Such errors can occur in either an intentional or unintentional manner [3].

Many factors including reconstitution, preservation and interaction with other fluids in addition to inappropriate commercial format of the drugs which will be used in the childhood age group predispose to errors[2]. Hospitalized children are more susceptible to experiencing complications as a result of medication errors than adults [4]. Children present unique demands in regards to medication ordering, dispensing, and administering and monitoring as they often require weight-based dosing calculations, a situation further complicated by a lack of standardized pediatric easy-to-use dosage formulations. Further, the process of dosing is complicated by the interchange of milligrams and micrograms [5].

Delivering medications to children requires that an individual dose incorporate comprehension of the age, weight and surface area of the child. As well, children's medications are dispensed in multiple preparations, including drops, elixirs, chewable tablets, capsules and infusions. Tenfold medication errors are more likely to occur among children as a result of non-suspicious small volumes posing severe consequences in pediatrics[5]. Administration errors are often linked to inadequate information at the patient's bedside. Incomplete medical orders or patient charts can cause clinicians to miss allergies or administer drugs incorrectly. Use of the wrong route (e.g. an intramuscular dose given intravenously), administration of an incorrect dose (e.g. giving a full tablet when the order called for only ½), and administration of a dose at an incorrect time are some of the more common errors at the bedside [6].

Medication safety is a key issue in the quality and patient safety movement in Canada and Worldwide. Medication delivery is complex in all areas of health care; safe delivery of medications to children, however, presents additional challenges and opportunities for error. Pediatric medication errors have been identified as the most frequent type of medical error involving children [5].

Reports such as To Err Is Human, published by the Institute of Medicine [7], have brought attention to the importance of recognizing and preventing the medication errors that are occurring in hospitals today. These errors are especially concerning in the pediatric population due to their increased vulnerability to medication errors. Study assessing medication errors and adverse drug events in pediatric inpatients reported a similar incidence in pediatric and adult patients. However, this study also reported that potential adverse drug events occurred 3 times more often in pediatric patients when compared to adults[8].

Measurement Tools, Data Collection, and Data Analysis

The self-administered questionnaire was constructed with a total of twenty-six questions. The questionnaire was composed of a total of 26 questions 10 of which were related with the demographic properties and general characteristics of the nurses, 14 of which were related with the level of knowledge and practice of drug preparation, calculation and administration errors and its prevention, and one of which related with nurse's opinions regarding the of factors which contribute to drug preparation and administration errors. For the content validity test, the Index of Item-Objective congruence (IOC) was utilized and evaluated by three experts. Prior to actual data collection, a pilot test was conducted among eighteen nurses from another university with the same characteristics in Khartoum City (Omduman hospital). For the reliability test, the Cronbach's alpha score was 0.72.

The quantitative data were collected by the main researcher at Gaafer bin Auf Children's Hospital. The data collection process includes a comprehensive explanation of the study and questionnaires, informed consent, and questionnaire distribution. It took a maximum of 20 minutes to complete the questionnaire.

We have one dependent variable - Drug Preparation and Administration with a binary outcome (categorical data), and all independent variables are also grouped into categorical variables. For data analysis, we used statistical software - SPSS version 17. We performed three steps of data analysis. The first step, we performed descriptive statistics analysis. For bivariate analysis, we used 1) Simple logistic regression as the second step and 2) Multivariable analysis using binary logistic regression as the last step. Simple logistic regression was used to assess the association between each determinant or factor and the dependent variable. Independent variables with a significant level of p-value < 0.25 were selected for further analysis into the binary logistic regression model (p-value ≤ 0.05).

2.1. Ethical Consideration

A verbal informed consent was obtained from participants before answering the questionnaire. Each questionnaire enclosed a covering letters including purpose of the study along with instructions for participants and contact details of the researcher. In addition, the questionnaire was placed anonymously, and participants were assured that all information would be kept strictly confidential and used only for research.

3. RESULTS

Table 1 shows the socio-demographic characteristics and general characteristics of participants. More than half of the participants were aged years 20- 30

(56.5%). Most participants are bachelor education level (52.2%). About (83.7%) not got Training Regarding Drug Preparation and Administration, about (46.7%) have 2-5 Years Duration of experience and (69.6%) of participants afternoon/night work shift.

Table1: The socio-demographic characteristics and general characteristics of participants

Socio-demographic characteristics	No	%
Age (years)		
20- 30	52	56.5
31- 40	39	42.4
41- 50	1	1.1
Educational level		
Bachelor	48	52.2
Diploma	44	47.8
Training Regarding Drug Preparation and Administration		
Yes	15	16.3
No	77	83.7
Duration of experience		
Less than 2 Year	7	7.6
2-5 Year	43	46.7
5-10 Year	36	39.1
More Than 10 Year	6	6.5
Work Shift		
Morning	25	27.2
Afternoon	3	3.3
Afternoon/Night	64	69.6

Table 2 shows the job characteristics related to participants, such as (41.3%) 2-5 Years experiences in pediatric department and (47.8%) Work more than 16 hours in a day (1-2 In 1 Week Period).

Table 2: The Job Characteristics

Job characteristics	No	%
Experiences in pediatric department		
Less Than 2 Years	32	34.8
2-5 Year	38	41.3
5-10 Year	22	23.9
Work more than 16 h in a day		
Never	31	33.7
1-2 In 1 Week Period	44	47.8
2-3 In 1period	17	18.5

Table 3 shows the drug preparation practices among the participants, for preparations of high risk drugs (56.5%) checking by two individuals, for preparation suspension drug (56.5%) distill water or normal saline used and (90.2%) answered can avoid a mistake during preparation by prepare medication for One Individual at a time.

Table 3: Drug Preparation Practices

Items	No	%
Preparations of high-risk drugs		
Preparing only by the physician	29	31.5
Checking by two individuals	52	56.5
Prepared like other drugs	9	09.8
For preparation suspension drug		
Normal saline for all medication	5	05.4
Distil Water for all medication	35	38.0
Distell water or normal saline	52	56.5
Can avoid a mistake during Preparation by		
Prepare medication for One Individual at a time	83	90.2
Can Prepare medication For More than one pt At The same time	6	06.5
Can Prepare Medication for One Individual Before Some Hours	3	03.3

Table 4 shows the level of knowledge regarding to drug preparation & administration practice, scores are categorized into good and poor levels by median cutoff point (median is 20). Among total 92 respondents, majority scored good knowledge level (65.5%) and followed by poor knowledge level (34.4%).

Table 4: Level of Knowledge Regarding to Drug Preparation & Administration Practice

Knowledge level	Frequency (%)
Poor level	31 (34.4)
Good level	61 (65.6)
Median (Interquartile Range)	20 (1)
Minimum, Maximum	14, 24

The results of the bivariate analysis with simple logistic regression and binary logistic regression with cut of point (0.05) analysis on factors associated with drug preparation & administration practice (N=92), shown in table 5, gave Educational level, Work Shift and Knowledge regarding to drug preparation & administration practice have associated significant results.

Table 5: Binary Logistic Regression Analysis on Factors Associated with Drug Preparation & Administration Practice (N=92)

Variable	drug preparation & administration practice			95% CI		p-value [a.]		95% CI	
	Poor	Good	Crude OR	Lower	Upper		Adjusted OR	Lower	Upper
	N (%)	N (%)							
Socio-demographic properties characteristics									
Age (years)									
20- 30	11 (34.3)	21(65.6)	1			0.41			
31- 40	13 (32.6)	42 (76.3)	1.9	0.9	4	0.10	0.2	0.33	2.22
41- 50	4 (80)	1(20)	1.4	0.5	3.8	0.49	0.3	0.42	2.32
Sex									
Male	8 (40)	12 (60)	1						
Female	19(26.3)	53 (73.6)	2.29	0.27	31.17	0.374	0.4	0.66	1.1
Educational level									
Bachelor	9 (12.5)	63 (87.5)	1						
Diploma	6 (30)	14 (70)	1.7	0.9	3.0	0.047*	0.6	0.3	1.1
Duration of Experience									
Less than 2 Year	5 (41.6)	7 (58.3)	1			0.62			
2-5 Year	18 (36)	32 (64)	2.75	0.28	26.5	0.38	1.4	0.33	1.6
5-10 Year	3 (23)	10 (77)	0.69	0.15	3.06	0.62	0.23	0.34	2.8
More Than 10 Year	17 (35.3)	11 (64.7)	1.79	0.18	17.6	0.61	2.01	0.78	3.1
Work Shift									
Night	5 (27.7)	13 (72.2)	1			0.029 *			
Morning	20 (47.6)	22 (52.3)	1.6	1.3	7.5	0.011	3.4	1.3	8.1
Afternoon	11 (34.3)	21 (75.7)	1.2	1.2	7.6	0.015	4.6	1.8	9.2
Knowledge regarding to drug preparation & administration practice									
Poor	32 (34.78)	22 (23.90)	1						
Good	60 (65.21)	70 (76.08)	2.61	1.761	3.869	<0.001*	**2.614**	1.748	3.909

[b.] P - value from multiple logistic regression * Significance at p <0.05 and ** Overall significant level p <0.05.

4. DISCUSSION

The majority of participants fell within the age range of 20-30 years, comprising 56.5% of the sample. This suggests that younger healthcare professionals are actively involved in drug preparation and administration, potentially indicating a generational trend in the

workforce. A notable percentage, 83.7%, did not receive specific training regarding drug preparation and administration. This highlights a potential gap in education and training within the healthcare system, approximately half of the participants, 46.7%, had 2-5 years of experience, a majority of participants, 69.6%, worked during the afternoon or night shift, suggesting the need for attention to fatigue and its potential impact on medication safety. A significant proportion, 41.3%, had 2-5 years of experience specifically in the pediatric department, indicating a specialized area of practice among participants, nearly half of the participants, 47.8%, reported working more than 16 hours in a day, emphasizing the demanding nature of their roles and potential implications for patient safety and quality of care.

For high-risk drug preparations, a substantial number of participants, 56.5%, reported a double-checking process by two individuals, indicating adherence to safety protocols, in the preparation of suspension drugs, a similar percentage, 56.5%, used distilled water or normal saline, highlighting common practices in medication preparation, he majority of participants, 90.2%, believed that mistakes during preparation could be avoided by preparing medication for one individual at a time, underscoring the importance of focused attention to reduce errors.

The assessment of knowledge levels revealed that the majority of respondents, 65.5%, demonstrated a good level of knowledge, while 34.4% exhibited a poor level. This indicates overall competence among participants.

The results imply the nurses who have Diploma's educated level have good drug preparation & administration practice less likely 94% than bachelor's educated level with p-value = 0.047(AOR: 0.6, 95% CI: 0.03, 1.1). line with study done the American Association of Colleges of Nursing (AACN) by Bachelor's degree nurse graduates report better quality and safety educational preparedness [9]. The participants have morning work shift have good drug preparation & administration practice more 3.4 times than participants have night work shift with p- value 0.011 (AOR: 3.4, 95% CI: 1.3, 8.1), and more about 4.6 time more for afternoon work shift with p- value 0.015 (AOR: 4.6, 95% CI: 1.8, 9.2). Line with study done in general hospital and a residential facility of a northern Italian city, the findings imply that nurses who work a rotating night schedule should get extra consideration since they are more likely to have negative health impacts and job discontent [10].

The results indicate the participants who have good knowledge regarding to drug preparation & administration practice have 2.614 more time than the participants who have poor knowledge, with p value=<0.001 (AOR:2.614, 95% CI: 1.78, 3.90), line with study done by [11], indicate nurses exhibited inadequate familiarity with medications, highlighting a significant obstacle they encountered. They expressed the need for pharmacists to meticulously organize medications, while also expressing a desire for ongoing learning opportunities and additional training to mitigate medication errors

5. CONCLUSION AND RECOMMENDATIONS

These results highlight several significant factors influencing nurses' drug preparation and administration practices, including educational level, work shifts, and knowledge levels. To address identified obstacles, it is crucial for healthcare institutions to prioritize continuous education and training programs, particularly focusing on resuscitation medications, and to ensure effective collaboration between nurses and pharmacists in organizing medications. Additionally, strategies should be implemented to support nurses' ongoing learning and skill development to enhance medication safety and mitigate errors in clinical practice.

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