Efficacy of an Training Program Based Intervention in Changing Knowledge Nurses Concerning Medication Dosage Errors in Pediatric ward in Mosul City, Iraq

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ABSTRACT

Background: Any avoidable event that might lead to inappropriate medication use or patient harm while the patient, healthcare professional, or consumer is in control of the pharmaceuticals.

Objective: The aim of the study to determine the efficacy of an training program based intervention in changing knowledge nurses concerning medication dosage errors in pediatric ward in Mosul City, Iraq

Methods: A randomized controlled trial with a true experimental design was used for the program from October 1, 2024, to May 1, 2025. Five public healthcare facilities with pediatric wards were included in the study. More than 250 questioners were distributed to nurses from pediatric wards in Mosul hospitals at random. The nurses were then selected for the study by either giving the questioners to one and leaving one on or two, or the other way around, giving the questioners to pediatric ward nurses and leaving one. The researcher then received 165 questioners, and approximately 90 nurses did not fit the criteria. Lastly, there is a chance that there will be 26 male and 34 female pediatric ward nurses in the two groups, each holding a different position.30 nurses who consented to participate in the study were included in the sample, and 30 nurses who work in pediatric wards were included in the control group. The experimental and control groups were created by random assignment. Version 26 of the Social Science Statistical Package (SPSS) was used in the investigation to analyze the data. The statistical techniques used to analyze data and assess results.

Results: The finding show that the changes in nurses' knowledge regarding medication dosage errors across the study phases. The mean score during the Pre phase was 7.888 (Fair level), reflecting a need for improvement. After the intervention, the Post1 phase showed a significant increase to 17.444 (Good level), demonstrating its effectiveness. By the Post2 phase, the mean score slightly decreased to 17.333 but remained at a good level, indicating sustained knowledge retention.

Conclusion: This study concluded that the program was effective through the three tests that were conducted on nurses in hospitals, as they were tested first and their knowledge of the directions of incorrect drug doses was weak and unacceptable, while when the intervention, i.e. the training program, was conducted, their knowledge became good in the second test and the researchers continued to follow them after the program for two months. They were tested for the third time and it was found that they still retained the same information, i.e. their knowledge remained in a positive and high direction at the same time.

Keywords: Efficacy, Training Program, Knowledge, Medication Dosage Errors

INTRODUCTION

Any unintentional departure from the recommended dosage of a medication that happens during the prescription, dispensing, or administration processes and has the potential to cause harm to the patient is referred to as a medication dosage error [1,2]. Overdoses, underdoses, omissions, and improper administration techniques are a few examples of these mistakes. Due to the requirement for exact dosage based on weight, age, and developmental physiology, pediatric patients are especially at risk. Miscommunication between medical professionals, similarity in drug names or packaging, computation errors, and insufficient training are some contributing factors [3-5]. Manual procedures or a lack of clinical decision support systems are frequently the cause of these mistakes. Interventions such as clinical decision support tools, computerized provider order entry (CPOE) systems, and standardized procedures for the prescription and administration of medications have been used in healthcare settings to lower the risk [6].With reports indicating that 48.1% of people save medications for personal use, high rates of self-medication suggest that the community regularly uses drugs for healing. Drugs must be used rationally (RUM) in order to be accessible, safe, and of high quality. Particularly in developing nations dealing with issues like poverty and overpopulation, inappropriate treatment practices can result in serious problems like medication errors and non-compliance [7,8]. Healthcare

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professionals oversee the administration of medications in clinical settings, especially for pediatric patients, where compliance can be optimized. Medication errors can still happen, though, and they frequently arise from using the wrong drugs or dosages. Because of their smaller bodies, children are particularly susceptible, making weight-based dosage calculations more difficult. Serious repercussions can result from even small dosage mistakes [9,10]. According to recent research, medication administration errors (MAEs) are more common in pediatric patients than in adults; in fact, some studies have found that children are three times more likely than adults to experience potentially harmful errors. Children's developmental limitations and the fact that the majority of medications are intended for adult use are two factors that contribute to this. There are serious risks associated with pediatric dosage calculations going wrong, as some errors can result in dangerously high dosages [11]. According to an analysis of medication errors in pediatric settings, the most frequent mistakes are made at the wrong time, followed by incorrect routes and dosages. Hospital research shows that treatment procedures account for a large percentage of errors, with dose errors being especially common. In intensive care units (ICUs), the complexity of care leads to a higher frequency of serious medication errors [12,13]. The aim of the study to determine the efficacy of an training program based intervention in changing knowledge nurses concerning medication dosage errors in pediatric ward in Mosul City, Iraq.

MATERIALS AND METHODS

Study Design: The program at pediatric wards in Mosul hospitals used a true experimental design with a randomized controlled trial to determine the effectiveness of a training program-based intervention on nurses' knowledge regarding medication dosage errors in pediatric wards from October 1, 2024, to May 1, 2025, as shown in the figure(1).

Study Setting: The focus of the current study was Mosul. The capital of the Nineveh governorate in northern Iraq is Mosul. Five public healthcare facilities with pediatric wards were included in the study: “Al-Khansaa Teaching Hospital, AL-Salam Teaching Hospital, Ibn AI-

Study Sample: More than 250 questioners were distributed to nurses from pediatric wards in Mosul hospitals at random. The nurses were then selected for the study by either giving the questioners to one and leaving one on or two, or the other way around, giving them to pediatric ward nurses and leaving one. The researcher then received 165 questioners, and approximately 90 nurses did not fit the criteria. Ten nurses who participated in the pilot study were later removed, and five healthcare workers withdrew from the study.Lastly, there is a chance that there will be 26 male and 34 female pediatric ward nurses in the two groups, each holding a different position. 30 nurses who consented to participate in the study were included in the sample, and 30 nurses who work in pediatric wards were included in the control group. The experimental and control groups were created by random assignment.

Data Collection Tools: Prior to the program's lectures, the researcher created the tools, which include demographic data and nurses' understanding of medication dosage errors in pediatric wards that are connected to knowledge based on multiple-choice questions. The instrument is divided into two sections, each of which has multiple sections.Although there were numerous questions in the second section and demographic information in the first, the knowledge section only had four multiple-choice questions. **Part I:** The demographic parameters encompass data pertaining to the nurse's age, gender, educational attainment, overall years of service in pediatric wards, name of the hospital, and involvement in training courses relevant to the study issue. **Part II:** This section of the tools pertains to the level of knowledge that nurses possess about medication dosage erorrs. The tool is primarily constructed using information derived from preliminary study findings, a literature review, and expert comments. This component of the instrument consists of six questions pertaining to the nurse's knowledge.

Data Collection Period: The study was carried out at pediatric wards in a few Mosul hospitals over a six-month period, from September 16, 2024, to March 17, 2025.

Analysis of statistical date: Frequency and percentage analysis are used to calculate demographic characteristics using descriptive methods. The data value is estimated using both the mean and the standard deviation. A statistical measure of a random variable's degree of variability around its mean is the standard deviation (S.D.). An approach to descriptive statistical data analysis. Comparing two related samples using the paired T-test and the Fisher Exact Test for Equality of Variances

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Figure 1. Atheer Teaching Hospital, Ibn-Sena Teaching Hospital”, which is on the left, and Al Mosul General Hospital, which is on the right.

RESULTS

Table 1. The result presents the statistical results of the demographic variables and homogeneity for both the sample study group and control group in the study

Test of Homogeneity						
P-value	Type of test	%	No.	Groups	Items	Demographic variables
0.999	Fisher's exact test	43	13	Control	20-29	Age
		47	14	Study		
0.779		33	10	Control	30-39	
		27	8	Study		
0.999		24	7	Control	40-49	
		26	8	Study		
0795	Fisher's exact test	40	12	Control	Male	Gender
		47	14	Study		
0795		60	18	Control	Female	
		53	16	Study		
0.999	Fisher's exact test	20	6	Control	Secondary degree	Level of education
		23	7	Study		
0.295		50	15	Control	Diploma degree	
		33	10	Study		
0.422		30	9	Control	Bachler degree	
		44	13	Study		
0.795	Fisher's exact test	53	16	Control	1-5	General years of experience in pediatric wards
		60	18	Study		
0.748		23	7	Control	6-10	
		17	5	Study		
0.567		10	3	Control	11-15	
		7	2	Study		
0.671		7	2	Control	16-20	
		13	4	Study		
0.999		7	2	Control	21-25	
		3	1	Study		
0.671	Fisher's exact test	7	2	Control	Yes	Training course
		13	4	Study		
0.671		93	28	Control	No	
		87	26	Study		

Table 2. Statistical result for Nurses Knowledge about medication dosage error

Axises	Q	Scale	Pre -Study			Pre -one-Study			Pre -Two-Study		
			N (%)	M	Ass.	N (%)	M	Ass.	N (%)	M	Ass.
Nurses knowledge about medication dosage errors	Q1	Incorrect	19(63)	7.333	Fair	1(3)	19.333	Good	2(7)	18.666	Good
		Correct	11(37)			29(97)			28(93)		
	Q2	Incorrect	17(57)	8.666	Fair	1(3)	19.333	Good	2(7)	18.666	Good
		Correct	13(43)			29(97)			28(93)		
	Q3	Incorrect	19(63)	7.333	Fair	3(10)	18	Good	2(7)	18.666	Good
		Correct	11(37)			27(90)			28(93)		
	Q4	Incorrect	21(70)	6	Poor	2(7)	18.666	Good	2(7)	18.666	Good
		Correct	9(30)			28(93)			28(93)		
	Q5	Incorrect	16(53)	9.333	Fair	10(33)	13.333	Fair	8(27)	14.666	Good
		Correct	14(47)			20(67)			22(73)		
	Q6	Incorrect	17(57)	8.666	Fair	6(20)	16	Good	8(27)	14.666	Good
		Correct	13(43)			24(80)			22(73)		
Mean				7.888	Fair		17.444	Good		17.333	Good

N: Frequency, %: Percentage, M: Mean of total score, Poor= 0.00 – 6.66, Fair= 6.7 – 13.3, **Good= 13.4 – 20**

Table 3. "Significance Testing of Differences Between (Pre&Post-1), (pre &post2),(post1 &post2) for Paired Samples for study group

Axises	Status	Pre Study Mean	t	P-value	Sig.
Nurses knowledge about medication dosage erorrs	Pre	0.344	27.044	0.000	H.S
	Post1	0.873			
	Pre	0.344	29.198	0.000	H.S
	Post2	0.843			
	Post1	0.873	4.267	0.000	H.S
	Post2	0.843			

Table 4. Analysis of Effect Size Levels Based on Kendall's Coefficient and Friedman Test

Type of knowledge	value (χ^2)	n	K	Size effect (E.S)	Decision
Nurses' knowledge about medication dosage errors in pedatric wards	51.98	30	3	**0.87**	Strongly effect

DISCUSSION

The demographic characteristics of the study group and the control group are thoroughly compared in this study. Age, gender, educational attainment, years of experience working in pediatric wards, and training course attendance are the main factors under analysis. Fisher's exact test is the statistical test used to compare the groups, and the p-values are given to evaluate how homogeneous the two groups are. Since all p-values are higher than 0.05, which indicates that there are no significant differences between the groups, the results show that the study and control groups are demographically comparable across all variables. This implies that the two groups are a good fit, which is essential to guaranteeing the reliability of the study's conclusions. In the study group, 47% (14 nurses) and 43% (13 nurses) were between the ages of 20 and 29; in the control group, 33% (10 nurses) and 27% (8 nurses) were between the ages of 30 and 39; and in the study group, 24% (7 nurses) and 26% (8 nurses) were between the ages of 40 and 49 (Table 1). Additionally, it revealed that females made up 53% (16 nurses) of the study group and 60% (18 nurses) of the control group, while males made up 47% (14 nurses) and 40% (12 nurses) of the study group. In terms of education, 44% (13 nurses) of the study group and 30% (9 nurses) of the control group had bachelor's degrees, 33% (10 nurses) of the study group and 50% (15 nurses) of the control group had nursing institute degrees, and 23% (7 nurses) of the study group and 20% (6 nurses) of the control group had completed secondary school. Sixty percent (18 nurses) of the study group and fifty-three percent (16 nurses) of the control group had one to five years of experience in pediatric wards; seventeen percent (5 nurses) of the study group and twenty-three percent (7 nurses) of the control group had six to ten years; seven percent (2 nurses) of both groups had eleven to fifteen years; thirteen percent (4 nurses) of the study group and seven percent (2 nurses) of the control group had sixteen to twenty years; and three percent (1 nurse) of the study group and seven percent (2 nurses) of the control group had twenty-five years. Finally, whereas 87% (26 nurses) of the study group and 93% (28 nurses) of the control group had not previously attended training courses regarding medication dosage errors, 13% (4 nurses) of the study group and 7% (2 nurses) of the control group had attended work-related training courses.I found more than one study on the same topic that compared the demographic characteristics in our study[14,15]. Significant shifts in nurses' understanding of medication dosage errors over the course of the study are shown in Table (2). There was room for improvement, as evidenced by the Pre phase mean score of 7.888 (Fair level). The effectiveness of the intervention was demonstrated by the Post1 phase, which showed a significant increase to 17.444 (Good level) after the intervention. The mean score showed sustained knowledge retention by the Post2 phase, where it dropped slightly to 17.333 but stayed at a good level. Numerous studies on the same subject have demonstrated that the more targeted the program, the more successful it is, the more noticeable the change is[16-18]. The statistical differences in mean values across nurses' knowledge of medication dosage errors in the (Pre&Post-1), (Pre & Post2), and (Post1 & Post2) studies are shown in Table (3). Following the intervention, the mean values rose in every dimension. Statistically significant differences (H.S.) are indicated by high t values and a P-value (less than 0.05). In line with our research, two studies conducted in Iraq discovered that program commitment increases nurses' knowledge[19-23]. The impact of interventions pertaining to medication dosage errors in pediatric wards is shown in Table (4). Following the intervention, the nurses' understanding of medication dosage errors demonstrated a significant impact, with an overall effect size of 0.87. According to other research, the more effective the program is, the stronger the effect is and the stronger the relationship between the variables[24-27].

CONCLUSION

This study concluded that the program was effective through the three tests that were conducted on nurses in hospitals, as they were tested first and their knowledge of the directions of incorrect drug doses was weak and unacceptable, while when the intervention, i.e. the training program, was conducted, their knowledge became good in the second test and the researchers continued to follow them after the program for two months. They were tested for the third time and it was found that they still retained the same information, i.e. their knowledge remained in a positive and high direction at the same time. This is confirmed by testing the size of the program's effect, which was also a positive effect size.

RECOMMENDATION

This study recommends conducting local, regional and global studies. That is, on more than one scale and in a comprehensive manner for all health institutions in order to reduce the risks of medical errors within institutions and hospitals as well as primary health care centers and to take a larger sample to be a comprehensive study.

LIMITATIONS OF THE STUDY

One of the limitations that emerged in our current study is that many nurses do not have enough time to participate in the study because most of the participants had commitments in the wards or were involved in the disease. Also, some were reluctant to participate due to administrative work within the health institution.

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acquisition, analysis and interpretation of data; (2) drafting the article and revising it critically for important intellectual content; and (3) final approval of the manuscript version to be published. Yes.

Potential Conflict of Interest: None

Competing Interest: None

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