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The knowledge regarding pediatric drug calculation among the staff nurses

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Abstract

Introduction: Medication errors occur repeatedly and universally, but medication errors involving pediatric patients attracts due to their high incidence and serve life threatening condition. Nurses have to be very skill full in mathematical calculation and numerical ability to calculate the proper dose and drug calculation because a single mistake in calculation can lead to severe life threatening condition to children. Medication mistake can take place at any phase of during nursing care. This includes the medicine transcribing, preparing of medicines, medicines prescribing, and calculation of dosage, medication administration, monitoring and documentation of medicines to the patients.

Purpose: The study was aiming to assess the knowledge level regarding pediatric drug calculation of the nurses in selected hospitals of Pune city.

Material and Method: A descriptive study was conducted, using 22 items structured questionnaire. Hundred (100) staff nurses working in Pediatric Department were chosen for the study through non-probability purposive sampling technique.

Result: the obtained result data revealed that, maximum participants (39%) were from the age group of 26-30 years, majority of participants (69%) were staff nurses had general nursing and midwifery educational qualification, regarding total clinical work experience, (37%) the participants were with less than 3 years, In pediatric work experience majority of participant were (59%) were less than 3 years' experience, maximum (61%) participants were not attended any workshop or conference on pediatric drug calculation. Results also revealed that maximum 59% participants scored average, 24% participants scored well and 17% participants scored poor knowledge. The knowledge mean score was 11.2. There is no significant association found with knowledge score and selected demographic characteristics of staff nurses working in pediatric department.

Conclusion: From the above findings, the researcher concluded that there is great need for improving the knowledge level in nurses because the average knowledge is not good knowledge. Researcher also recommends for nurses to attend in-service education, workshops or conference related to pediatric drug calculation to enhance the knowledge regarding pediatric drug calculation. Knowledge is continuous progression which requires reinforcement and re-education of fresh and changing practice to keep nurses update and knowledgeable.

Keywords: Knowledge, pediatric drug calculation and pediatric staff nurses

Introduction

Administration of the medication is most important nursing responsibility. The need for accuracy in preparing and administrating medication to children is greater than that of an adult. Pediatric dose is small when it compared with adult dose and a very small calculation mistake can represent a greater error [2].

The most essential viewpoint for choice of a medication and foundation of the best possible pediatric dose is the affirmation that the pediatric patient isn't only a little grown-up. Infants, kids and young people have distinctive physiological, pharmacokinetic and pharmacodynamics parameters contrasted with grown-ups. The distinctions are basically identified with the progressions happening and development and require individual dosages. Thus, rules of particular measurements and valuable means for count of pediatric doses must be produced keeping in mind that the end goal is to improve the adequacy and helpful farthest point and avert genuine unfavorable impacts.

Two strategies are generally revealed as being ideal for meaning of the best possible pediatric drug measurements, specifically per weight and per body surface area. Be that as it may, such strategies not generally yield a similar medication dose, prompting the need of appropriate assessment to decide the perfect circumstance for every person. Use of body weight as a measure for assessment of helpful doses ought to be utilized only for mean doses, generally figured for anti-toxins, since the blood convergences of the medications are not corresponding

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to weight. Measurements in view of the body weight are accepted to be inadequate for the accomplishment of legitimate serum convergence of most medications, being the body surface the most substantial reason for dose, since it is identified with some physiological capacities that record for the distinctions in pharmacokinetics in patients of various ages.

The impact of medications is straight forwardly identified with the blood volume and digestion, being the body surface region better for computation of the pediatric dose. Estimated volume of the liquid compartment and examinations on the blood convergences of medications have great connection with the body surface area.

Need for the study

Medication error is common and dangerous to the patient. Pediatric drug dose calculations are based on the age and weight, risk of error in dosage. Overdose of prescribed drug may lead to toxicity and life threatening condition while low doses may lead to slow prognosis. This research study is carried out to assess the knowledge of nurses regarding the pediatric drug doses calculation [3].

A cross sectional study on Assessment of knowledge of pediatric nurses related with drug administration and preparation” at two educational and research hospital in the Istanbul in April, 2013 and May, 2013. 98 pediatric nurses were participating in this study. According to this study 15% nurses are not able to convert dose unit to each other and 16% nurses are not able to calculate the doses after drug reconstituted found [4].

Pediatric nurses are accountable for preparing, administering and calculating the proper dose of potent drugs that affect the patients. During clinical experience investigator also observed that sometimes staff nurses are not able to calculate the right dose of prescribed medicine or reliable on pediatric physician. As a being a pediatric staff nurse investigator felt that each and every pediatric nurse should be competent in the pediatric drug calculation. Pediatric medicine management and drug calculation is the most important task and responsibility of staff nurses so investigator felt that there is a need to evaluate the knowledge regarding pediatric drug calculation in pediatric staff nurses.

Objectives of this study

1. To assess the level of knowledge regarding pediatric drug calculation among the staff nurses.
2. To associate the level of knowledge among staff nurses with selected demographic variables.

Review of literature

These literatures which was reviewed and appropriate to this study and categorized under the following headings: -

1. Literatures related to pediatric drug calculation
2. Literatures related to knowledge of the staff nurses regarding pediatric drug calculation

1. Literatures related to pediatric drug calculation

According to the joint commission report 2008 faults related with drug dose calculation mistakes and it is the one of the most important reason that can avoid the adverse incidents. Expert agreed on this, “The medication faults can harm more to pediatric in comparison to adult patients.” This report also revealed that 22% drugs adverse events were avoidable, 17.8% can be identified prior and 16.8% can be mitigated

more efficiently [5].

A randomized control open study was conducted by Bjoerg et.al on “improvement of drug dose calculations by classroom teaching or e-learning: a randomized controlled trial in nurses.” Total 167 women and 16 men was selected for this study. For data collection tool structured questionnaire was given which contains 14 items. Result shows that the number of right response after classroom instruction is 11.9 and after e-learning was 11.6. 14% responses are inappropriate after e-learning and 22% responses are inappropriate after classroom instruction [6].

A prospective observational study was completed by Yemisirach Feleke *et al.* on “Medication Administration Errors Involving Paediatric In-Patients in a Hospital in Ethiopia.” The result shows that 196 (89.9%) drug administration faults were recognized from total 218 observations. In that intravenous medication faults were 90.8% and oral medication fault were 8.2%. the dosage faults were 26.5% and drug omitted medication fault were 21.4%. Researcher conclude that the high frequency of fault was observed [7].

2. Literature related to knowledge of the staff nurses regarding pediatric drug calculation

In Narayana Medical College Hospital, Nellore, a cross sectional study was also completed by K. Padma *et al.* “To assess the knowledge regarding drug dosage calculation in children among staff nurses and student nurses”. Findings of this study revealed that nurses had 46.7% inadequate, 53.3% moderately adequate knowledge while in nursing students had 53.3% inadequate and 40% moderately adequate and 6.7% adequate knowledge. At the end investigator conclude that nursing students having adequate knowledge in comparison with staff nurses regarding pediatric drug dose calculation [8].

A cross sectional study was conducted by Mr. Ali Bulbul *et al.* on “Assessment of knowledge of pediatric nurses related with drug administration and preparation” at two educational and research hospital at Istanbul in April to May, 2013. 98 nurses were selected for this study. Maximum 48% participants were undergraduate. Finding shows that 13.3 % mistake was related to metric conversion and 14.3 % mistake was related to powder weight calculation. In this study researcher found that undergraduate nurses were good to complete right drug calculation and propose for in-service education will be good for future adjustment [9].

A cross sectional survey study was completed by Ms. Sandra Fleming on “an evaluation of the drug calculation skills of registered nurses” at five medical colleges’ hospitals in Ireland. Total 124 nurses participated in this study. Structured knowledge questionnaire was given for data collection. Result shows that Nurses 60.08% nurses have average drug calculation skills and only 4% nurses have good drug calculation skills. Item analysis shows that in 64.75 % in metric conversion, 81.25% tablet doses, 68.66% fluid doses and 36.66% in drip rates calculation were the right answers given by nurses. Researcher concludes that in-service education and continue education is the main key factor to increase the knowledge among the nurses [10].

A prospective observational study conducted by N. Morgan *et al.* on “Opportunities for performance improvement on relation to medication administration during pediatric stabilization” at tertiary academic medical center in south east region of U.S. 30 participants were selected for this study by random sampling method. Results shows that in metric

conversion section total 120 medication order were there and the metric conversion fault was 14.2%. In intravenous dose measuring 32.7% was wrongly measured and the total 150 medication order were prescribed. Researcher concludes that nurses perform an essential role in the medication administration. Researcher recognized that there is a great need to improve the knowledge of nurses through continue education [11].

A prospective observational study was conducted by T. Ahmed *et al.* on “Medication administration errors evaluation in pediatric ward by pharmacist” at Bolan medical complex hospital Quetta, teaching hospital in Pakistan. The data collection was completed from the treatment chart of admitted cases in pediatric unit. 287 patients were admitted in which 62.71% were males and 37.2% were females. The total drug administration was 8179. Finding shows that total medication fault was 6718 (82.13%). In that the maximum fault was omission fault with 80.78%. total wrong dose mistake was 0.16% and incorrect dose error was 0.02%. According to researcher the most common cause for drug administration fault are noisy environment, troubled patients, workload, stress level of staff deficiency of awareness in staff nurses about drug administration procedure [12].

**Experimental section
Material and Method**

A descriptive study was adopted to conduct the study. Hundred (100) staff nurses working in Pediatric Department of selected hospitals of pune city with non-probability purposive sampling technique. The inclusion criteria for the study was all trained registered nurses working in pediatric ward, who had undergone Masters of Science Nursing degree or Bachelors in nursing or Post Basic Degree or General Nursing and Midwifery or Auxiliary nursing midwifery.

Description of tool

The tool consisted of two sections

Tool I: (Demographic data)

This tool is constructed to collect background information of the participants to be included in the study. It consists of demographic variables such as gender, age, education, experience etc.

Tool II: (Structured knowledge questionnaire on pediatric drug calculation)

It comprised of Twenty-two [22] knowledge questions regarding Pediatric Drug Calculation. Each right answers scored one mark and incorrect responses are scored 0 (zero). Total score is Twenty-two [22]. A response key is prepared. Level of knowledge will be grade as:

Level of knowledge score range

- Good : 15 to 22
- Average : 7 to 14
- Poor : 0 to 6

Plan for Data Analysis

The descriptive statistics such as frequency, percentage, mean and standard deviation was used to organize demographic variables. Chi-square non-parametric test was implemented to find out the association of knowledge level with their demographic variables.

Result and Discussion

100 staff nurses were selected for data collection from selected hospitals of Pune City.

Section I: Analysis related to the demographic variables of the staff nurses in frequency and percentage distribution.

Table 1: Frequency Distribution of participants as per Demographic Variables. n = 100

Demographic Data			
Parameters		Frequency	Percentage (n=100)
Gender	Male	0	00%
	Female	100	100%
Age (Years)	20-25	33	33%
	26-30	39	39%
	31-35	10	10%
	>36	18	18%
Professional Education	ANM	7	7%
	GNM	69	69%
	BSc. N	13	13%
	PBBsc. N	11	11%
	MSc. N	0	0%
Clinical Experience (Years)	0-3	37	37%
	4-6	22	22%
	7-10	18	18%
	>10	23	23%
Pediatric Experience (Years)	0-3	59	59%
	4-6	21	21%
	7-10	4	4%
	>10	16	16%
Attend Workshop or Conference	Yes	39	39%
	No	61	61%

Table 1 presents that distribution of demographic data

- All participants were Female 100%.
- Majority 39 % belonged to the of 26-30 year of age group.
- Majority of participants 69% were staff nurses had General Nursing and Midwifery educational qualification.
- Regarding clinical work experience, 37% the participants were with less than 3 years.
- Regarding pediatric work experience, 59% the participants were with less than 3 years.
- Maximum 61% participants were not attended any workshop or conference on pediatric drug calculation.

Section II: Analysis related to knowledge regarding pediatric drug calculation among the staff nurses.

Table 2: Knowledge score of staff nurses regarding pediatric drug calculation n = 100

Knowledge score				
	Poor (06)	Average (714)	Good (15-22)	Total
Frequency	17	59	24	100
Percentage	17.00%	59.00%	24.00%	100%

Table 2 shows the knowledge score of staff nurses regarding pediatric drug calculation reveals that majority 59 (59%) of staff nurses have Average knowledge and 24 (24%) staff nurses have good knowledge and only 17 (17%) staff nurses have poor knowledge of pediatric drug calculation.

Table 3: Mean Knowledge score and Standard Deviation of staff nurses regarding pediatric drug calculation n = 100

Knowledge mean score	Standard deviation
11.2	4.33

Table 3 shows the mean knowledge score of staff nurses

regarding pediatric drug calculation is 11.2 and Standard Deviation is 4.33

Section III

Item wise analysis of knowledge of staff nurses regarding pediatric drug calculation according to their domain

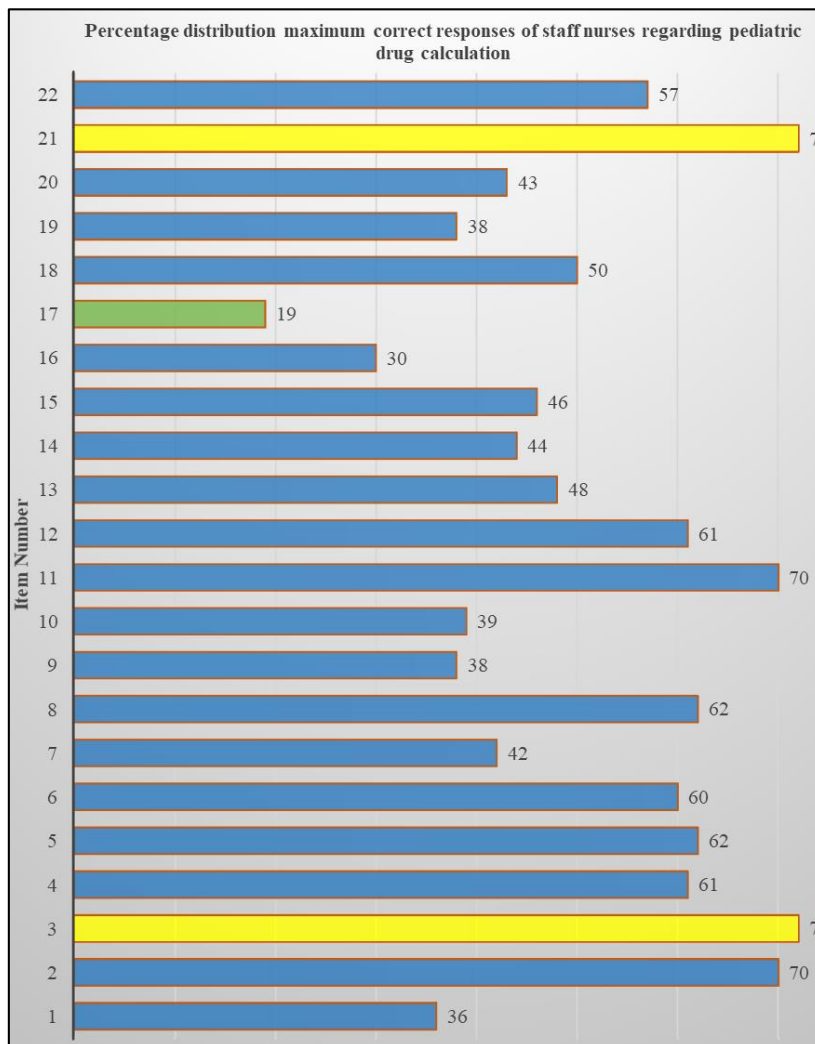


Fig 1: Maximum correct responses of staff nurses regarding pediatric drug calculation.

The data presented bar diagram-1 shows that among the participants, Maximum correct responses were from item number 3rd and 21st (72%) and the least correct responses were from item number 17th (19%).

The knowledge was assessed by structured questionnaire which comprises of 22 items. The areas were divided into eight broad areas namely:

Table 4: Item wise analysis of knowledge of staff nurses regarding pediatric drug calculation according to their area.

Sr. no	Area Name	Total no of item	Item no serial wise	Knowledge mean score
1	Metric Conversion	2	1	1.06
			2	
2	Drop Factor	2	3	1.33
			4	
3	Pediatric Drug Calculation Formula	4	5	2.26
			6	
			7	
			8	
4	Rights of Drug Administration	2	9	0.77
			10	
5	Oral Route	5	11	2.69
			12	
			13	
			14	

			15	
6	Intra Muscular Route	2	16	0.49
			17	
			18	
7	Intravenous Drip	3	19	1.31
			20	
8	Intravenous Injectoion Route	2	21	1.29
			22	

Table: 5 presents that maximum knowledge mean score was 2.69 in Oral Route area and the minimum mean knowledge score was 0.49 in Intra Muscular Route are.

Section-IV: Analysis related to association of demographic variables with knowledge level of staff nurses regarding pediatric drug calculation.

Table 6: Association of demographic variables with knowledge score of staff nurses regarding pediatric drug calculation n= 100

Demographic variables		Knowledge Score			d.f.	P-Value	Chi Square Calculated Value	Chi Square Table Value	Inference
		Poor	Average	Good					
Age	20-25	6	20	7	6	0.96	1.39	12.59	No association
	26-30	5	24	10					
	31-35	2	6	2					
	>36	4	9	5					
Professional Education	A.N.M	2	3	2	6	0.92	1.93	12.59	No association
	G.N.M	12	42	15					
	BSc Nursing	2	7	4					
	PBBsc Nursing	1	7	3					
Clinical Experience	0-3	6	22	9	6	0.87	2.43	12.59	No association
	4-6	3	13	6					
	7-10	3	9	6					
	>10	5	15	3					
Pediatric Experience	0-3	10	35	14	6	0.83	2.76	12.59	No association
	4-6	3	13	5					
	7-10	1	1	2					
	>10	3	10	3					
Attended any workshop or conference	Yes	7	19	13	2	0.28	3.50	5.99	No association
	No	10	40	11					

*, association at 0.05 level of significance All chi-square table value is greater than chi-square calculated value so there is no any demographic variable is associated with knowledge score regarding pediatric drug calculation. all the p-values are more than 0.05 (p>0.05) so there is no any demographic variable is associated with knowledge level of staff nurses regarding pediatric drug calculation.

Discussion

The discussion of the present study was based on the results achieved after the analysis of collected data. It is described in the view of the objective of the current study.

Current results are supported by a study conducted by Timothy S. Lesar *et al.* "Error in the use of medication dosage equations". The findings show that 59.5 % staff nurses having mathematical drug calculation error. In that fraction error were 22 %, calculation error 13.5 %, desired each dose fault was 11%, total daily dosage interval fault was 7%, total dose frequency error in calculated dose was 4 % and total daily single dose fault was 2%. The investigator conclude that medication error may take place in any part of a drug administration. Human wellbeing institution must take initiative to decrease the possibility for miscalculations resulting from the use of drug calculation formulas [20].

Dr. Miriam McMullan *et al.* conducted a cross sectional study, "Patient safety: numerical skills and drug calculation abilities of nursing students and registered nurses" in 2006. Total 44 nurses and 229 student nurses selected for the study. The findings show that 45% nurses and 55% student nurses were failed in the numeracy test. Out of 229, 92% student nurses and out of 44, 59% nurses failed to pass the drug calculation exam. The investigator conclude that registered nurses need to refresh their knowledge with regular self-testing ability and by regular in-service education [21].

Conclusion

It is important that staff nurses are responsible for the child's safety. Medication administration, dosage calculation are the important part of the patient care and nurses needs to update their knowledge. It was found that once the staff nurses completed their study and start doing their job in clinical area maximum nurses will start forgetting the basic theoretical knowledge as well as practical knowledge is increased.

The results show the average knowledge and average knowledge is not the good knowledge so nurse needs to update their knowledge by in-service education, attending conference and workshop related to pediatric drug calculation.

Implications

Nursing Education

With exchanging health care trend in nursing education offered various certificate courses at conference and workshops related to drug calculation.

However, specialty oriented courses are offered at the Master level. In-service education programme for nurses need to be implemented to meet the Excellency in nursing care of the patient as part of their professional practice.

Nursing Administration

In the event of changing disease manifestation, new pharmacological researches, newly introduced drugs,

knowledge explosion, technological and ever growing challenges of child health nursing, the administration has an accountability to deliver nurses with substantial ongoing education opportunities by them for in-service education programs, special courses workshop and conferences. This will enable the nurses in updating their knowledge.

Nursing Research

There are increasing number of studies related to pediatric drug calculation in child health

Nursing specifically taken up by the nurses at master's and PhD level in various Indian settings.

Limitations

1. The study was limited only on knowledge.
2. The study was limited to only one-time assessment of the test.
3. One assessment situation didn't replicate the scenario of "actual world".

Recommendations

1. A similar research can be conducted with large sample to generalize the results.
2. A pretest posttest research can be carried out to assess the effectiveness of structured teaching programme drug dosage calculation in children.
3. Similar research can be carried out in other hospital setting in different areas.

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