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A quasi-experimental study: The impact of the Pediatric Around Mobile Application on the knowledge and attitude of nursing students regarding pediatric emergencies and commonly used pediatric drugs in Odisha

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Abstract
Background: Pediatric emergencies require prompt recognition, accurate clinical judgment, and appropriate pharmacological management to prevent morbidity and mortality among children. Nursing students, as future frontline healthcare providers, play a crucial role in the early identification and management of pediatric emergencies. Adequate knowledge of emergency care principles and commonly used pediatric drugs, along with a positive and confident attitude, is essential for delivering safe and effective pediatric care.
Objective: To assess the effectiveness of the pediatric android mobile application on education and health care.
Methods: One group pre- test post- test quasi experimental research design was adopted in the study aim. 50 student nurses who meet the inclusion criteria were selected as study objects using random sampling technique. Pretest was based on the closed ended questionnaire. A time limit of 30 minutes class regarding mobile application was taken for each sample. After 3-4 days post test was conducted.
Results: The knowledge level of student nurses in pretest having mean score of 11.54 2.85 level and post mean of 18.56 2.14, at $p<0.00$ level. The major findings of the study revealed that the post mean score percentage were higher than the pretest mean percentage. Total pretest mean score percentage in knowledge aspect was 46.14% and it increased to 74.24% without the application and it increased to 100% with the use of mobile application. The study revealed that the post test score increased significantly. In posttest 100% of the subjects attained most satisfactory scores (18- 25) in the knowledge aspect.
Conclusion: There is no association between demographic variable and knowledge level. Most of the student nurses having good attitude towards the pediatric emergency drug mobile application regarding its practical use as well as educational use. The study concluded that use of mobile application on pediatric emergency and general drug calculation was effective in improving the knowledge of the students.

Keywords: Pediatric emergency drug, mobile application, nursing students, effectiveness

Introduction

Pediatric emergencies require prompt recognition, accurate decision-making, and appropriate pharmacological management to prevent morbidity and mortality among children. Nurses play a crucial role in the early identification and management of pediatric emergencies, as they are often the first healthcare professionals to assess and respond to critically ill children. Adequate knowledge and a positive attitude toward pediatric emergency care and the safe use of commonly prescribed pediatric drugs are therefore essential competencies for nursing students, who represent the future nursing workforce.

The effectiveness of mobile-based educational tools is essential to determine their role in improving nursing education. Therefore, this quasi-experimental study was undertaken to assess the impact of the Pediatric AROUND mobile application on the knowledge and attitude of nursing students regarding pediatric emergencies and commonly used pediatric drugs in Odisha. The findings of this study may contribute to the integration of mobile learning strategies into nursing curricula to strengthen pediatric emergency preparedness and promote safe pediatric drug administration [1].

The effectiveness of mobile-based education compared with booklet-based education on mothers' perceptions regarding antibiotic use. A quasi-experimental design was adopted, involving 160 mothers of children aged 1–6 years who attended urban community health centers in Iran. Participants were divided into an experimental group (n = 80) and a control group (n = 80). Both groups received education on the appropriate use of antibiotics; however, the experimental group was instructed through a mobile application, while the control group received information via a booklet. Data were collected using the Parental

Perception on Antibiotics (PAPA) scale before the intervention and again two to four weeks afterward. Statistical analysis was performed using SPSS version 19. The findings indicated that the majority of mothers relied on nurses or other healthcare professionals (91.9%) and their prior experiences (86.3%) as primary sources of information about antibiotics. Post-intervention results demonstrated a significant improvement in the experimental group's perceptions across all subscales—including knowledge and beliefs, behaviors, adherence, and awareness of antibiotic resistance—when compared to the control group ($p < 0.05$) [2].

Early cardiopulmonary resuscitation (CPR) training in children is essential for improving community preparedness during emergencies. This review assessed the effectiveness of educational strategies and technologies in enhancing children's knowledge, attitude, and practice (KAP) related to CPR. Primary studies involving children up to 12 years of age were identified through multiple databases. Out of 35 articles reviewed in full, 17 studies met the inclusion criteria. The findings showed that most educational interventions had a positive effect on children's CPR-related KAP, although one study reported only a moderate improvement in attitude. While some decline in outcomes was noted over time, post-training levels remained higher than baseline. Overall, age-appropriate CPR education during childhood strengthens emergency response skills and supports the development of a more prepared society [3].

Nursing students are at increased risk of medication safety errors in the neonatal intensive care unit (NICU), often due to limited communication experience. This study examined the effectiveness of a NICU medication safety simulation (NMSS) in improving communication clarity, patient hand-off confidence, and patient safety competency among final-year nursing students. Using a nonequivalent control group pretest–posttest design, 60 students were divided into experimental and control groups. The experimental group participated in simulation-based medication error scenarios. Results showed significant improvements in communication clarity and patient safety competency in the experimental group, along with increased patient hand-off confidence after controlling for pretest scores. The study concluded that integrating NMSS into the pediatric nursing curriculum enhances communication skills and promotes patient safety in the NICU [4].

A quasi-experimental pre–post intervention study was conducted among pediatric and neonatal nurses from two tertiary hospitals in South Brazil between October 2022 and January 2023. Data were collected in three phases: pretest, intervention using the PiccPed® mobile application, and post-test. Nurses' knowledge of evidence-based PICC maintenance was assessed using a 15-item test, along with app usage time. Fifty-six nurses completed the study. Post-test knowledge scores showed a significant improvement compared to pretest scores. Greater score gains were observed among nurses without postgraduate qualifications. Additionally, increased time spent using the app was significantly associated with higher post-test scores. The findings indicate that the PiccPed application effectively improves nurses' knowledge related to safe PICC maintenance in pediatric and neonatal care [5].

Smartphone-based emergency preparedness education significantly improved coping knowledge among fifth- and sixth-grade students compared to traditional teaching, indicating the effectiveness of mobile-based learning [6].

This quasi-experimental study showed that mobile app–based health education significantly improved asthma knowledge among school children compared to routine face-to-face teaching, highlighting the effectiveness of mobile technology in health education [7].

This randomized controlled study evaluated the effect of using Kahoot in pediatric emergency nursing education on students' academic performance and motivation. Sixty nursing students were divided into experimental and control groups. Students using Kahoot achieved significantly higher midterm, final and overall exam scores and showed greater motivation compared to the control group. The findings indicate that Kahoot is an effective teaching tool for improving both achievement and motivation in pediatric emergency nursing lessons [8].

This quasi-experimental study found that both serious games and problem-based learning significantly improved nursing students' knowledge and clinical decision-making skills in pediatric transfusion medicine. While the serious game showed greater gains than the control group in both outcomes, problem-based learning mainly enhanced decision-making skills. Overall, both teaching strategies were effective compared to traditional instruction [9].

This quasi-experimental study evaluated the Roozbehyar mobile application, designed using micro learning and gamification, for psychiatry clerkship training. Students using the app showed significantly higher written exam scores and reported above-average satisfaction with learning content. The findings suggest that micro learning-based mobile applications effectively enhance knowledge and learner satisfaction in psychiatry education [10].

Methodology

Study Design

This study adopted a quasi experimental survey approach.

Knowledge test	Treatment	Knowledge test without app	Knowledge test without app
Pre test	Android mobile app	Post test	Post test
PR1	X	PO1	PO2

Study Setting

Sum Nursing College, Bhubaneswar, Khordha, Odisha.

Sampling Method

In this study simple random sampling technique is used.

Sample size

A total of 50 nursing students were included in this study. The sample size was determined using Yamane's formula.

According to Yamene's formula

$n = N/ (1+ N e^2)$

Here n= Sample size, N = Population size, e = Percentage of error i.e. 0.05

Inclusion Criteria

- Students who are willing to participate in the study.
- Students who are available during the study.
- Students who are studying GNM, B.Sc, PBSc, at Sum Nursing College at Bhubaneswar, Odisha.
- Able to understand the language of the questionnaire (e.g., Odia/English) and give informed consent.
- Consent to participate (written or documented verbal consent).

Exclusion Criteria

- 1st year and 2nd year G.N.M and BSc students.
- Msc nursing students.
- Women who refuse or withdraw consent.

Description of the tools

Data were collected using three tools:

Tool-1: Self-structured socio-demographic questionnaire the variables. The socio-demographic tool consisted of six items related to personal history (age, gender, professional qualification, total experience, attained any inservice education, source of information.).

Tool-2: Questionnaire used to assess the attitude scale, 18 questions to determine the attitude of the students towards mobile application.

Tool-3: Questionnaire given to assess the knowledge of student nurses regarding pediatric emergency and general medication and dosage calculation. Total score for knowledge assessment is 25, if the answer is correct the score is 1, if the answer is wrong the score is 0.

Scoring Interpretation: Good- 20 to 25 marks, average- 15 to 20 marks, poor- below marks

Tool validation

Content validity: Reviewed by 5 experts (1 medical professionalism, 4 nursing professionalism). The tools demonstrated strong reliability, with Cronbach's α. values of. 91. Pre-testing (tryout) done in hospital for clarity, ambiguity, and timing.

Study variables

Demographic variables: age, gender, professional qualification, total experience, attained any inservice education, source of information.

Independent variables: Pediatric AROUND mobile application

Dependent variables: Knowledge and attitude of nursing students

Data collection procedure

The data collection for the present quasi-experimental study was carried out in a systematic and organized manner after obtaining formal permission from the concerned authorities of the selected nursing institution in Odisha. Ethical clearance was obtained from the Institutional Ethics Committee prior to the initiation of the study. The purpose of the study was explained to the nursing students, and informed written consent was obtained from each participant. Confidentiality and anonymity of the subjects were ensured throughout the study.

The sample was selected based on the predetermined inclusion and exclusion criteria using the chosen sampling technique. On the first day, a pre-test was administered to assess the baseline level of knowledge and attitude of nursing students regarding pediatric emergencies and commonly used pediatric drugs. The pre-test data were collected using a structured knowledge questionnaire and an attitude rating scale.

Following the pre-test, the Pediatric AROUND mobile application was introduced as the intervention. The researcher oriented the participants on how to install and use the application. The students were instructed to utilize the mobile application for a specified period to learn about pediatric emergencies and commonly used pediatric drugs. The investigator monitored the use of the application and clarified doubts during the intervention period.

After the completion of the intervention period, a post-test was conducted using the same structured knowledge questionnaire and attitude scale to evaluate the effectiveness of the Pediatric AROUND mobile application. The collected data were checked for completeness and accuracy, coded, and prepared for statistical analysis to determine the impact of the mobile application on the knowledge and attitude of nursing students.

Ethical considerations

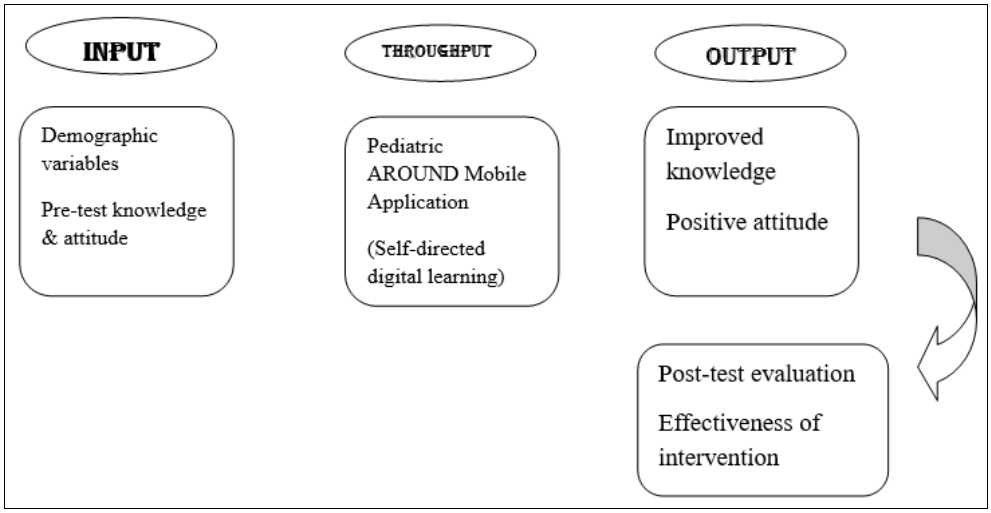
Ethical approval was obtained from the Sum Nursing College, Odisha, with approval dated 22.10.2015 (Ref. No.: SOADU/SNC/IRB/388/2015). Permissions were also secured from the medical superintendent, the head of the department, and relevant staff.

Statistical Analysis

SPSS version 21 was used for data analysis. Demographic information and baseline characteristics were summarized using descriptive statistics, including mean values, standard deviations, and frequency counts. The data will be collected and analyzed with descriptive and inferential statistical techniques. The demographic variables will be analyzed by using frequency and percentage. The frequency tables will be formulated for all significant information.

Theoretical framework

Ludwig von Bertalanffy: General Systems Theory views an individual or group as an open system that continuously interacts with the environment. The system receives inputs, processes them through throughput, produces outputs, and uses feedback to modify future functioning. In the present study, nursing students are considered as an open system influenced by educational intervention. It explains how nursing students (system) receive educational input through the Pediatric AROUND mobile application, process the information internally, produce measurable learning outcomes, and utilize feedback to improve pediatric emergency knowledge and attitude. This model provides a strong theoretical foundation for your quasi-experimental study.



Conceptual framework: Ludwig von Bertalanffy model

Results

Table 1: Distribution of subjects based on sociodemographic variables. (N =50)

Sl. No	Sociodemographic Variables	Frequency (f)	Percentage (%)
1.	Age		
	a. 18- 20	13	26
	b. 21- 25	30	60
	c. 26- 30	7	14
	d. 31- 35	-	-
2.	Gender		
	a. Male	2	4
	b. Female	48	96
	c. Others	-	-
3.	Professional qualification		
	a. G.N.M	28	58
	b. Bsc Nursing	12	24
	c. PBsc Nursing	10	20
4.	Total experience		
	a. 1 year	21	42
	b. 2- 4 year	10	20
	c. 5 year above	-	-
	d. < 1 year	19	38
5.	Attained any inservice education		
	a. Yes	15	30
	b. No	35	70
6.	Source of information		
	a. Work Setting	11	22
	b. Media	3	6
	c. Health Professionals	28	56
	d. Internet	8	16

The above table-1 revealed that Frequency (F) and percentage (%) distribution of patients according to age, gender, professional qualification, total experiences, attained any inservice education, source of information.

Table 2: Variables that shape work- life balance for employed women. (N =50)

Level of knowledge	Score	Pre test	Percentage (%)	Post test			
				Without app	Percentage (%)	With app	Percentage (%)
Poor	<8	4	8	-	-	-	-
Average	9- 16	45	90	12	24	-	-
Good	17-25	1	2	38	76	50	100

The data presented in table-2 revealed that the pre test findings showed that the majority of participants had an average level of knowledge; with 45 students (90%) scoring between 9 and 16, while 4 students (8%) demonstrated poor knowledge and only 1 student (2%) had good knowledge. In the post test without the app, most participants continued to have an average level of knowledge, with 12 students (24%), whereas 38 students (76%) achieved a good level of knowledge. In contrast, in the post test with the app, all participants (50, 100%) demonstrated a good level of knowledge, indicating a substantial improvement in knowledge following the use of the mobile application.

Table- 3: General level of knowledge between pre and post test. (N =50)

Pre mean score	Std. Deviation	Post mean score	Std. Deviation	t	df	P
11.54	±2.85	18.56	±2.14	-14.15	49	0.00

The challenge faced by working women has been categorized into 3 groups 0.9% of the subject had maximum challenge, 95.4% of the subject had mild challenge, and 3.7% of the subject had no challenges.

Table 4: Association of determinants of work life balance and sociodemographic variables in the subjects N =347

Sl no	Demographic data	Chi- square	Df	P value	Level of significance
1	Age	9.355	4	0.053*	Significant
2	Types of Family	3.551	2	0.169	Non-significant
3	Religion	13.070	4	0.011*	Significant
4	Marital Status	2.999	4	0.558	Non-significant
5	Educational Qualification	22.908	8	0.003*	Significant
6	Education of head Of the family	1.979	4	0.740	Non-significant
7	Occupation Of Head Of The Family	25.947	6	0.000*	Significant
8	Monthly Family Income	3.244	6	0.778	Non-significant
9	Work experience	4.289	2	0.117	Non-significant
10	Level of physical Activity	4.172	6	0.653	Non-significant
11	Distance Of Workplace	2.794	4	0.593	Non-significant
12	Easier Job Or Concession During Pregnancy	9.641	4	0.047*	Significant
13	Reason For Working	7.361	6	0.289	Non-significant
14	Duration Of Working hour	1.047	4	0.903	Non-significant
15	Shift duties	6.258	4	0.181	Non-significant
16	Enough Time To Sleep	1.671	4	0.796	Non-significant
17	Justice To Both Work and Family	0.507	2	0.776	Non-significant
18	No of Children's	1.553	4	0.817	Non-significant

The data presented in table-4 revealed that In the above table it is seen that there is a statistical significance in sociodemographic variable like age (p=0.053) and determinants of work life balance, religion (p=0.011) and determinants of work life balance, occupation of head of the family (p=0.000) and determinants of work life balance, easier job or concession during pregnancy (p=0.047) and determinants of work life balance.

Table 5: Association of challenges faced by working women and sociodemographic variables in the subjects N= 347

Sl No	Demographic data	Chi- Square	Df	P Value	Level of Significance
1	Age	0.690	4	0.953	Non-significant
2	Types of family	1.929	2	0.381	Non-significant
3	Religion	1.825	4	0.768	Non-significant
4	Marital status	0.734	4	0.947	Non-significant
5	Educational Qualification	5.921	8	0.656	Non-significant
6	Education of head of the family	2.940	4	0.568	Non-significant
7	Occupation of head of the family	2.839	6	0.829	Non-significant
8	Monthly family income	20.832	6	0.002*	Significant
9	Work experience	1.297	2	0.523	Non-significant
10	Level of physical activity	2.272	6	0.893	Non-significant
11	Distance of workplace	2.911	4	0.573	Non-significant
12	Easier job or consession during pregnancy	2.562	4	0.634	Non-significant
13	Reason for working	8.672	6	0.193	Non-significant
14	Duration of working hour	1.758	4	0.780	Non-significant
15	Shift duties	2.910	4	0.573	Non-significant
16	Enough time to sleep	44.424	4	0.000*	Significant
17	Justice to both work and family	0.097	2	0.953	Non-significant
18	No of children's	1.852	4	0.763	Non-significant

Table-4 presents that there is a statistical significance in sociodemographic variable like monthly family income (p=0.002) and challenges faced by working women, enough time to sleep (p=0.000) and challenges faced by working women.

Discussion

The quasi-experimental one-group pretest–posttest study used a convenience sample of 21 undergraduate nursing students from a private university in the south eastern United States to evaluate the effect of three elective courses containing pain management content. Knowledge and Attitudes were measured using the Pediatric Healthcare Providers Knowledge and Attitude Survey Regarding Pain (PHPKAS). Paired t-test results revealed no significant difference in students' knowledge and attitudes before and after the courses (t [20] = 0.765, p = 0.227), leading to failure to reject the null hypothesis. The findings indicate

Ongoing misconceptions, particularly regarding neonatal pain, pediatric cancer pain, and the use of sedatives and narcotics, highlighting the need for improved pain management education [11].

A descriptive study was conducted (2008) to investigate nurse's views on the factors contributing to medication errors in the hope of facilitating improvements to medication administration processes. A semi- structured questionnaire consisting of three parts was developed, narrative description of the error, the nurse's background and contributing factors. Sample included 72 female nurses who responded, 55 (76.4%) believed more than one factor contributed to medication errors. Personal neglect (86.1%), heavy workload (37.5%) and new staff (37.5%) were the three main factors in the eight categories. Need to solve other problems while administering drugs, advanced drug preparation without rechecking, and new graduate were the top three of the 34 conditions [12].

Implications of the study

The nurses having any doubt regarding pediatric drug calculation they can use this application to calculate the drug correctly, so that they can provide effective effective care to the patients.

Limitation

Apart from the use of android OS, other operating system like IOS, windows OS could be use for the better calculation of drugs. Sample size 50 limits the generalization of this study.

Conclusion

The present study was to assess the effectiveness of the pediatric android mobile application on education and health care. One group pre- test post- test quasi experimental research design was adopted in this study aim. 50 student nurses who meet the inclusion criteria were selected as study objects using random sampling technique. Pretest was based on the closed ended questionnaire. A time limit of 30 minutes class regarding mobile application was taken for each sample. After 3- 4 days post test was conducted. The use of mobile application on pediatric emergency and general drug calculation was effective in improving the knowledge of the students.

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Self

Conflicts of interest

There are no conflicts of interest for the writers.

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Ethics Approval

Ethical approval was obtained from the Sum Nursing College, Odisha, with approval dated 22.10.2015 (Ref. No.: SOADU/SNC/IRB/388/2015). Permissions were also secured from the medical superintendent, the head of the department, and relevant staff.

Data Availibility

The data is available and can be accessed with a reasonable request.

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