

An Experimental Study: The Impact and Outcome of Simulation-Based Learning Programme on Knowledge and Skill Regarding Basic Life Support and First Aid Management of Selected Medical Emergencies Among School Children in Selected Schools at Kollam District

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Abstract

Abstract

Introduction: Basic Life Support (BLS) and first aid knowledge are essential life-saving skills for school children, fostering social responsibility and humanitarian values. A large number of preventable deaths among children and adolescents occur due to cardiac arrest and accidental injuries, emphasizing the need for effective emergency preparedness training at the school level

Methods: A true experimental pre-test–post-test control group design was used to assess the impact and outcome of simulation-based learning programme on knowledge and skills related to BLS and first aid management of selected medical emergencies among school children. A total of 160 higher secondary students from two schools in Kollam district were selected using multistage cluster sampling with randomization. Tools included a socio-demographic proforma, a structured knowledge questionnaire, and an observational skill checklist covering BLS and first aid for drowning, choking, seizure, oral drug poisoning, kerosene poisoning, and snakebite. The intervention involved simulation-based teaching using CPR manikins, video demonstrations, role play, and information booklets, with reinforcement sessions on the 7th and 22nd days. Post-tests were conducted on the 15th and 30th days.

Results: Data were analysed using descriptive and inferential statistics. The experimental group showed a statistically significant improvement in knowledge and skills after the intervention. Mean BLS knowledge scores increased from 3.40 (pre-test) to 8.25 (post-test 1) and 9.42 (post-test 2) ($p < 0.001$). Skill scores improved from 1.26 in the pre-test to 8.38 and 9.01 in post-tests 1 and 2, respectively ($p < 0.001$). Significant improvements were also observed in knowledge and skills related to first aid management of selected medical emergencies across all domains ($p < 0.001$). Repeated measures ANOVA and POST HOC

confirmed significant differences over time. No significant correlation was found between knowledge and skill scores, and no association was identified with socio-demographic variables **Conclusion:** Simulation-based learning was highly effective in enhancing school children's knowledge and skills in BLS and first aid management of medical emergencies. The study recommends integrating structured BLS and first aid training into the higher secondary school curriculum.

Keywords: simulation-based learning programme, knowledge, skill, Basic Life Support, First Aid, Medical emergencies, School Children.

INTRODUCTION & BACKGROUND OF THE STUDY

The knowledge and skill on Basic Life Support and First aid are important for school children since it increases the social responsibility towards society and strengthen humanitarian values. In today's scenario, millions of deaths take place due to cardiac arrest and accidental injuries among adolescents and children. This highlights the urgent need to modify the knowledge and skill on BLS and first aid management of medical emergencies among school children. According to the Red Cross Society website, a large number of people worldwide suffer from injuries and illnesses. As a result of delayed access to medical care, in some extreme circumstances this can even result in fatalities. However instead of waiting for expert assistance someone with first-aid expertise can save lives. The "First aid" refers to providing initial and prompt care to a patient suffering from a minor or serious accident or disease. Multiple studies reinforce the value of incorporating simulation-based methods into educational curriculum to improve students' preparedness for managing medical emergencies effectively. All adults should receive first aid training, as emergencies can occur at any time for anyone. Numerous studies suggest that teachers and students should undergo first aid and BLS courses so that the trained teachers and students can become skilful and able to administer first aid independently and spontaneously in real life situations¹. Research studies demonstrates that simulation-based training significantly enhances students' competency levels and achievement outcomes. Offering schoolchildren BLS and first aid skill training programs could close the gap between the knowledge and skill in BLS and first aid, enhancing their theoretical and practical first aid skills.

According to WHO statistics released by the Health and Safety Executive, there are 35,041 reported child-related accidents. Worldwide, injuries rank as the primary cause of death for children of school age.¹⁷ Half of all deaths in young adults (15–29 years old), a third in children (5–14 years old), and a quarter in adults (30–49 years old) are attributable to injuries. Following the proper first aid procedures in the critical first hour after an accident can save lives and minimize disabilities. Thus, timely and effective management can lower morbidity and mortality rates.² A quasi-experimental study evaluated the impact of simulation-based learning on Basic Life Support skills and knowledge among secondary school students.³ The results showed significant improvements in both knowledge and skills in the experimental group compared to the control group ($p < 0.05$) after simulation-based learning programme. The study concludes that simulation-based learning is an effective method to enhance BLS competencies among secondary school students. A quasi-experimental study investigated the effectiveness of simulation-based training in enhancing knowledge of medical emergencies among high school students.⁴ The results showed a significant increase in the knowledge of medical emergencies in the experimental group compared to the control group ($p < 0.01$). The study concludes that simulation-based training is a superior educational method for

improving high school students' knowledge of medical emergencies and suggests its broader adoption in high school curriculum to prepare students for real-life emergency situations.

A quasi-experimental study was conducted to assess the effectiveness of simulation-based first aid training among high school students in Chennai.⁵ The results indicated that the experimental group showed significantly greater improvement in both knowledge and skills compared to the control group ($p < 0.01$). The study concluded that simulation-based training is a more effective approach for teaching first aid to high school students, recommending its integration into educational settings to enhance emergency preparedness. In June 2023 'Arogyamasika', a Malayalam health magazine, featured an article on "First Aid" that was both inspirational and motivational.⁶ It explained the significance of providing first aid in emergency scenarios, including drowning, snakebite, heart attacks, choking, burns, and fractures. The public received health information on how to save a life in an emergency situation. This article emphasizes the importance of teaching society's youth and young adults how to administer first aid in an emergency. The school children who receive Basic life support training can learn how to respond to an emergency situations such as cardiac arrest, drowning, choking, poisoning, seizure and able to provide lifesaving interventions before the medical help arrives. The school based training can improve students confidence, communication skill, critical thinking, team work and self-efficacy in handling emergency situations. Training programmes like BLS and First aid can enhance the students' knowledge and psychomotor skills which can be applied in other areas to act as dynamic citizens who can deal with future challenges and survive well. Therefore, the investigator identified the need for conducting a study on Effectiveness of simulation-based learning programme on knowledge and skill regarding Basic Life Support and first aid management of selected medical emergencies among school children which will help them to gain adequate knowledge, and skill with self-confidence and self-reliance in order to save the life of people in case of an emergency.

STATEMENT OF THE PROBLEM

A study to assess the effectiveness of simulation-based learning programme on knowledge and skill regarding basic life support and first aid management of selected medical emergencies among school children in selected schools at Kollam district.

OBJECTIVES OF THE STUDY

1. To assess the knowledge and skill regarding Basic Life Support and first aid management of selected medical emergencies among school children in experimental and control group.
2. To determine the effectiveness of simulation-based learning programme on knowledge and skill regarding Basic Life Support and first aid management of selected medical emergencies among school children in experimental group.
3. To compare the effectiveness of simulation-based learning programme on knowledge and skill regarding Basic Life Support and first aid management of selected medical emergencies among school children between experimental group and control group at different intervals.
4. To find out the correlation between knowledge and skill regarding Basic Life Support and first aid management of selected medical emergencies among school children after simulation-based learning programme in experimental group.

5. To find out the association of knowledge and skill regarding Basic Life Support and first aid management of selected medical emergencies among school children with selected socio demographic variable.

HYPOTHESES

H₁: There is significant difference in mean pre-test and post-test knowledge scores regarding BLS and first aid management of selected medical emergencies among school children after simulation-based learning programme in experimental group.

H₂: There is significant difference in mean pre-test and post-test skill scores regarding BLS and first aid management of selected medical emergencies among school children after simulation-based learning programme in experimental group.

H₃: There is significant difference between mean post-test knowledge scores regarding BLS and First aid management of selected medical emergencies among school children in experimental and control group

H₄: There is significant difference between mean post-test skill scores regarding BLS and First aid management of selected medical emergencies among school children in experimental and control group.

H₅: There is significant correlation between post-test scores of knowledge and skill regarding BLS and first aid management of selected medical emergencies among school children in experimental and control group.

H₆: There is significant association between pre-test knowledge and skill scores of school children regarding BLS and first aid management of selected medical emergencies with selected socio demographic variables.

CONCEPTUAL FRAME WORK

The conceptual frame work used for the present study is modified Imogene King’s Goal Attainment Theory (2001).

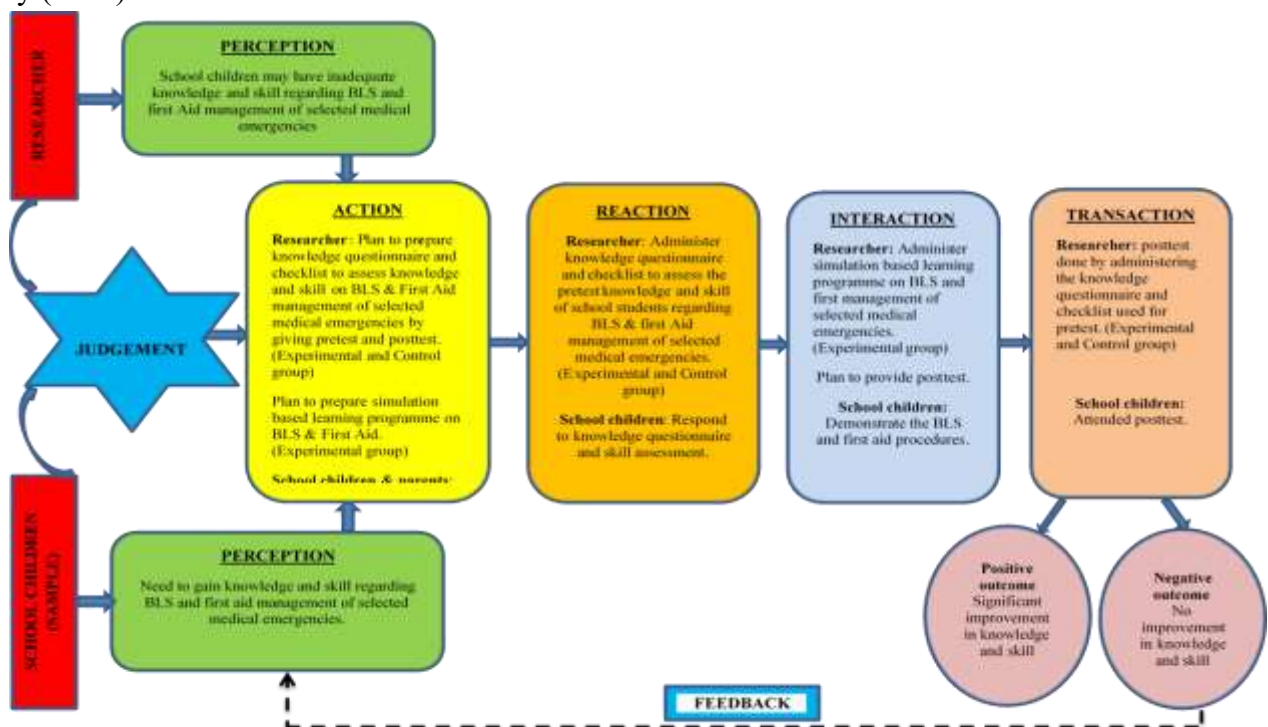


Figure1: Conceptual framework based on Imogene king’s Goal Attainment Theory (2001)

RESEARCH METHODOLOGY

Research approach : Quantitative approach

Research Design : True experimental – Randomized pretest posttest control group design

Research Setting : Selected higher secondary schools at Kollam district.

Sample : School children between the age group of 15 to 18 years studying in selected higher secondary schools in 11th and 12th standards at Kollam district.

Sample size : 160 (Experimental group 80 and Control group 80)

Sampling technique : Multistage cluster sampling with randomization

VARIABLES OF THE STUDY

Demographic variable: Age, Gender, class of study, occupation of father and Mother, Education of parents, previous knowledge on BLS and first aid management of selected medical emergencies such as drowning, choking, seizure, oral drugs, kerosene and snakebite

Dependent variable: Knowledge and skill regarding BLS and first aid management of selected medical emergencies such as drowning, choking, seizure and poisoning include, oral drug, kerosene and snakebite

Independent variable: Simulation based learning programme on BLS and first aid management of selected medical emergencies such as drowning, choking, seizure and poisoning include, oral drug, kerosene and snakebite

CRITERIA FOR SELECTION OF SAMPLE:

Inclusion criteria

The school children who are:

- Studying in 11th and 12th standard
- Between the age group of 15 to 18 years
- Available at the time of data collection
- Both gender

Exclusion Criteria

The school children:

- Who have undergone any first aid training.
- Taking treatments for chronic illness and having medical problem

TOOLS AND INSTRUMENTS

- **Tool 1: Socio demographic Performa to collect the baseline information regarding the sample.**
- **Tool 2: Self structured knowledge questionnaire.**

Part 1-7: BLS, Choking, Drowning, Seizure, Oral drug poisoning, Kerosene poisoning, Snakebite.

- **Tool 3: Observational checklist for skill assessment**

Part 1-7: Checklist for BLS, Choking, Drowning, Seizure, Oral drug poisoning, Kerosene poisoning, Snakebite.

DATA COLLECTION PROCESS

Phase 1

The data were collected after the approval from Institutional ethics committee and obtaining prior permission from the concerned administrative authority of selected schools at Kollam district. The data

collection period was from 16th November 2023 to 17th December 2023. The study was conducted in four higher secondary schools at Kollam district. Using simple random technique, 160 samples were selected based on the inclusion and exclusion criteria. Before collecting data from the samples, the researcher introduced herself and established rapport with the students and then explained the purpose of the study and data collection. After ensuring anonymity and confidentiality the written consent was obtained from their parents and assent from the participants.

Phase 2

Demographic proforma was used to assess the information regarding demographic variables. Pretest knowledge and skills were assessed using structured knowledge questionnaire and observation checklist for 160 participants and then simulation-based learning programme was conducted for 80 participants in the experimental group. The method of intervention was simulation method using Little Anne CPR Training Manikin, video clippings, role-play and information booklet. The duration of session was 30 minutes for theory on each session and 30 minutes for demonstration on each session.

Phase 3

Reinforcement was given on 7th day using video clippings for experimental group and post-test- 1 was done on 15th day using same structured knowledge questionnaire and observation checklist used for the pre-test. Then reinforcement was given on 22nd day using booklet and role-play based on case scenario. The post-test 2 was done on 30th day using same structured knowledge questionnaire and observation checklist for the experimental group.

DATA COLLECTION PROCESS

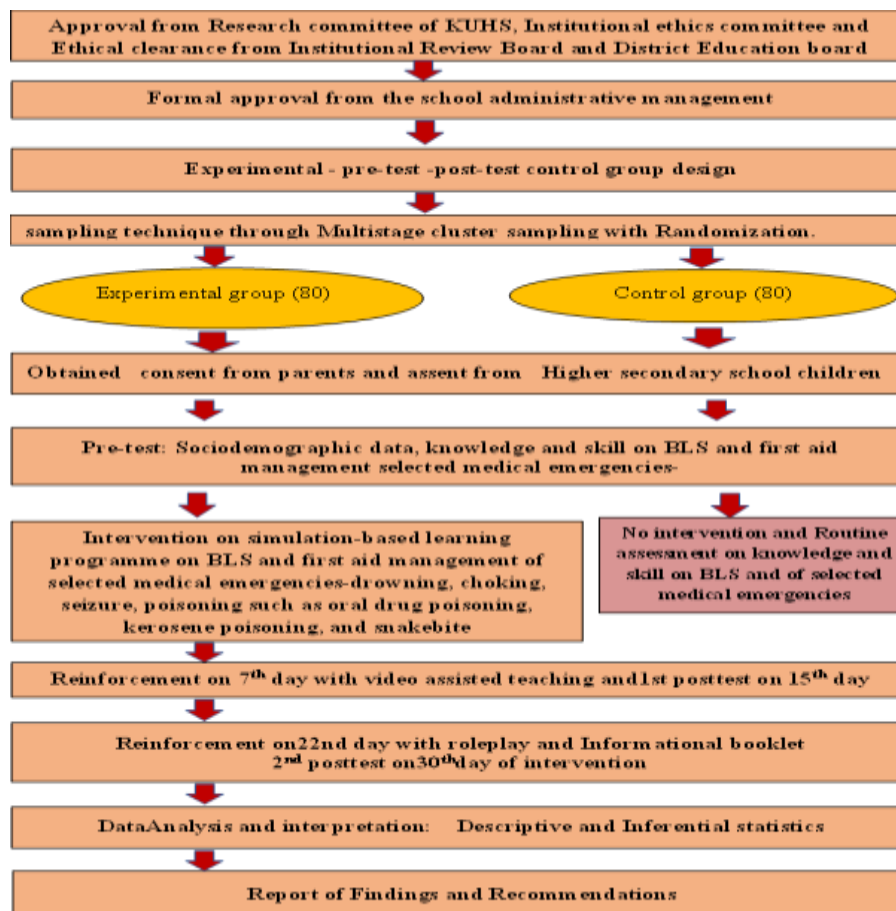


Figure 5: Schematic representation of data collection process.

DATA ANALYSIS

The data were organized and analysed in relation to objectives and hypothesis and presented under following sections

Section 1: Description of sample characteristics using frequency and percentage distribution

Section2: Frequency and percentage distribution, mean and standard deviation of pretest knowledge and skill scores regarding BLS and first aid management of medical emergencies such as choking, drowning, seizure, oral drug poisoning, kerosene poisoning, and snake bite.

Section 3: Paired ‘t’ test was used to find the effect of simulation-based learning programme on knowledge and skill regarding BLS and first aid management of medical emergencies such as choking, drowning, seizure, oral drug poisoning, kerosene poisoning, and snake bite among experimental group.

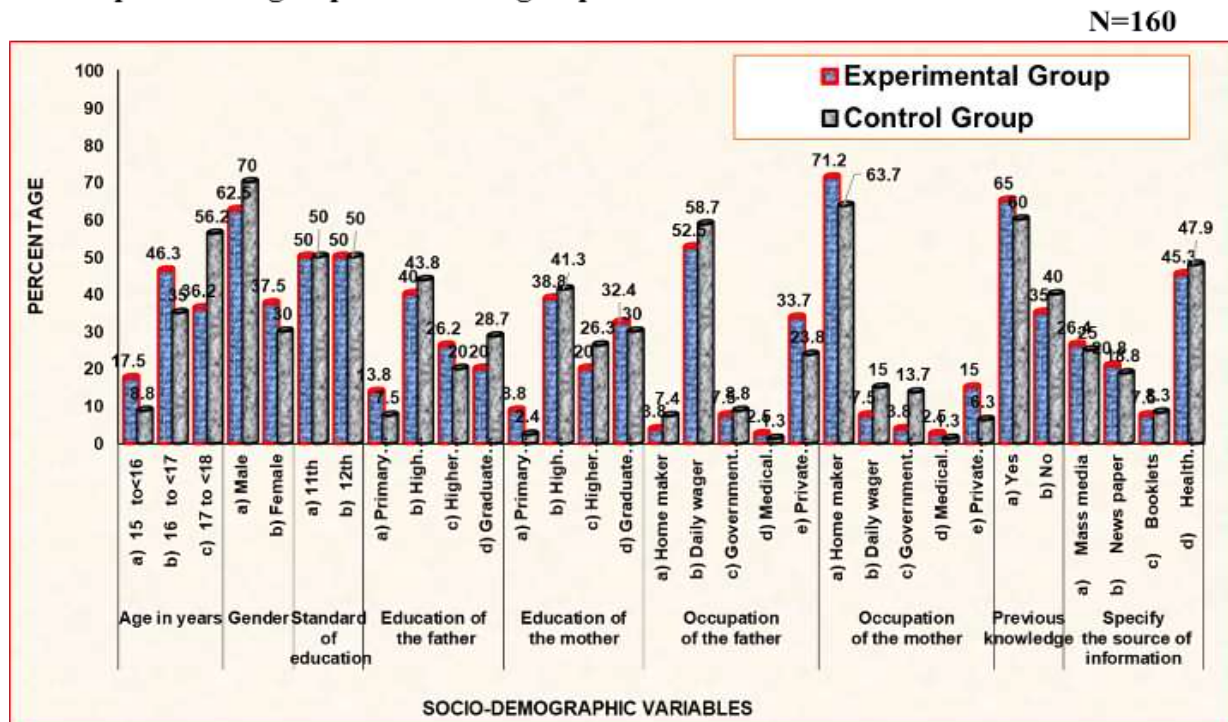
Section 4: Repeated measure ANOVA and POST-HOC test was used to compare the effectiveness of simulation-based learning programme on knowledge and skill regarding BLS and first aid management of selected medical emergencies among school children between experimental group and control group for pretest, posttest 1 and posttest 2.

Section 5: Karl Pearson co- relation coefficient was used to find correlation between knowledge and skill regarding BLS and first aid management of medical emergencies such as choking, drowning, seizure, oral drug poisoning, kerosene poisoning, and snake bite.

Section 6: Chi-square test was used for association of pre-test knowledge and skill on BLS and first aid management of medical emergencies such as choking, drowning, seizure, oral drug poisoning, kerosene poisoning, and snake bite with selected socio demographic variables.

Section 1:

Figure 2: Distribution of socio demographic variables of the school children in experimental group and control group .



Section 2:

TABLE 2: COMPARISON OF MEAN SCORES OF KNOWLEDGE AND SKILL REGARDING BASIC LIFE SUPPORT AMONG SCHOOL CHILDREN BETWEEN EXPERIMENTAL AND CONTROL GROUP IN PRETEST

Sl. No	BLS	Experimental Group [n=80]		Control Group [n=80]		Mean difference	‘t’ value	p value
		Mean	SD	Mean	SD			
		1.	Knowledge	3.40	1.131			
2.	Skill	1.26	0.688	1.30	0.682	0.04	0.346	0.730 NS

TABLE 3 : COMPARISON OF MEAN KNOWLEDGE AND SKILL SCORE REGARDING FIRST AID MANAGEMENT OF SELECTED MEDICAL EMERGENCIES AMONG SCHOOL CHILDREN IN EXPERIMENTAL AND CONTROL GROUP IN PRETEST

Sl. No	Knowledge and skill on first aid management of selected medical emergencies	Experimental Group [n=80]		Control Group [n=80]		Mean difference	‘t’ value	p value
		Mean	SD	Mean	SD			
		1.	Over all knowledge on First Aid	17.20	3.519			
2.	Over all skill on First Aid	14.51	2.413	14.57	2.504	0.06	0.161	0.873 NS

Section 3:

TABLE 4: COMPARISON OF MEAN KNOWLEDGE AND SKILL SCORES REGARDING BASIC LIFE SUPPORT AMONG SCHOOLCHILDREN BETWEEN EXPERIMENTAL AND CONTROL GROUP AT DIFFERENT INTERVALS

Level of knowledge and skill		Experimental group (n=80)		Control group (n=80)		Mean difference	‘t’ value	p value
		Mean	SD	Mean	SD			
		Knowledge on BLS	Pre-test	3.40	1.131			
	Post-test 1	8.25	0.834	3.58	1.098	4.66	30.225	<0.001*** S
	Post-test 2	9.42	0.689	3.58	1.105	5.83	41.518	<0.001*** S
Skill on BLS	Pre-test	1.26	0.688	1.30	0.682	0.04	0.346	0.730 NS
	Post-test 1	8.38	0.737	1.26	0.706	7.12	62.371	<0.001*** S
	Post-test 2	9.01	0.754	1.37	0.785	7.64	62.712	<0.001*** S

Table 5: Comparison of mean knowledge and skill scores regarding first aid management of selected medical emergencies among school children between experimental and control group at different intervals

Level of knowledge and skill		Experimental group (n=80)		Control group (n=80)		Mean difference	‘t’ value	p value
		Mean	SD	Mean	SD			
		Over all First aid knowledge	Pre-test	17.20	3.519			
	Post-test 1	51.62	1.858	18.52	4.810	33.10	57.412	<0.001*** S
	Post-test 2	56.60	1.978	18.57	4.822	38.02	65.243	<0.001*** S
Overall, Skill on first aid	Pre-test	14.51	2.413	14.57	2.504	0.06	0.161	0.873 NS
	Post-test 1	51.23	1.744	14.77	2.751	36.46	100.108	<0.001*** S
	Post-test 2	54.13	2.237	14.88	3.002	39.25	93.763	<0.001*** S

Section 4:

TABLE 6: COMPARISON OF KNOWLEDGE SCORE REGARDING BASIC LIFE SUPPORT BETWEEN EXPERIMENTAL AND CONTROL GROUP USING REPEATED MEASURE ANOVA.

Repeated Measures ANOVA			Repeated Contrast Test		
Source	F-value	p-value	Comparison	F-value	p-value
Between the Group Comparison					
Group	1017.302	<0.001*** S	-	-	-
Within Group Comparison					
Knowledge regarding Basic life support	521.614	<0.001*** S	Pre-test vs Post-test 1	986.168	<0.001*** S
			Post-test 1 vs Post-test 2	33.361	<0.001*** S
			Pre-test vs Post-test 2	956.134	<0.001*** S
Knowledge regarding Basic life support *Group	507.895	<0.001*** S	Pre-test vs Post-test 1	956.134	<0.001*** S
			Post-test 1 vs Post-test 2	33.361	<0.001*** S
			Pre-test vs Post-test 2	986.168	<0.001*** S

TABLE 7 : COMPARISON OF SKILL SCORE ON BASIC LIFE SUPPORT BETWEEN EXPERIMENTAL AND CONTROL GROUP USING REPEATED MEASURE ANOVA

Repeated Measures ANOVA			Repeated Contrast Test		
Source	F-value	p-value	Comparison	F-value	p-value
Between the Group Comparison					
Group	5299.576	<0.001*** S	-	-	-
Within Group Comparison					
Skill on Basic life support	1436.092	<0.001*** S	Pre-test vs Post-test 1	2093.614	<0.001*** S
			Post-test 1 vs Post-test 2	20.866	<0.001*** S
			Pre-test vs Post-test 2	2138.158	<0.001*** S
Skill on Basic life support *Group	1416.376	<0.001*** S	Post-test 1 vs Post-test 2	10.077	0.002*** S

TABLE 8: PAIRWISE COMPARISONS OF MEAN LEVEL OF KNOWLEDGE AND SKILL ON BLS WITHIN EXPERIMENTAL GROUP ACROSS TIME USING POST HOC-BONFERRONI ADJUSTMENT

N=80					N=80				
Time Point Comparison of Knowledge on BLS	Mean Difference	Std. Error	95% CI	p-value	Time Point Comparison of Skill on BLS	Mean Difference	Std. Error	95% CI	p-value
Pre-test vs. Post-test 1	-2.444	0.078	(-2.601, -2.288)	<0.001***	Pre-test vs. Post-test 1	-5.544	0.077	(-5.721, -5.368)	<0.001***
Post-test 1 vs. Post-test 2	-0.588	0.031	(-0.636, -0.541)	<0.001***	Post-test 1 vs. Post-test 2	-0.269	0.001	(-0.268, -0.270)	<0.001***
Pre-test vs. Post-test 2	-3.031	0.035	(-3.101, -2.962)	<0.001***	Pre-test vs. Post-test 2	-5.913	0.001	(-5.915, -5.911)	<0.001***

Figure: 3 and 4 Distribution of mean score of knowledge and skill regarding BLS at pre-test, post-test 1, and post-test 2 between experimental group and control group

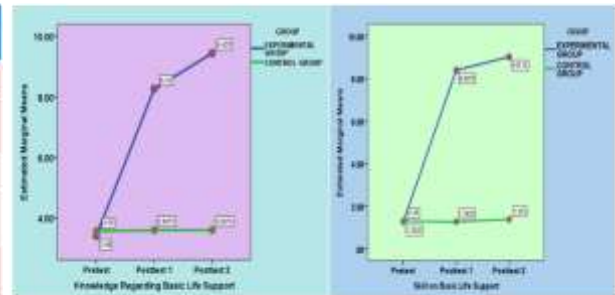


Figure:3

Figure:4

TABLE 9 : COMPARISON OF KNOWLEDGE SCORE ON FIRST AID BETWEEN EXPERIMENTAL AND CONTROL GROUP USING REPEATED MEASURE ANOVA.

N=160					
Repeated Measures ANOVA			Repeated Contrast Test		
Source	F-value	p-value	Comparison	F-value	p-value
Between the Group Comparison					
Group	4155.937	<0.001***S			
Within Group Comparison					
Knowledge on First aid	1287.565	<0.001***S	Pre-test vs Post-test 1	1686.118	<0.001***S
			Post-test 1 vs Post-test 2	38.345	<0.001***S
First aid *Group	1266.398	<0.001***S	Pre-test vs Post-test 1	1661.806	<0.001***S
			Post-test 1 vs Post-test 2	36.834	<0.001***S

TABLE 10: COMPARISON OF SKILL SCORE ON FIRST AID FOR MEDICAL EMERGENCIES BETWEEN EXPERIMENTAL GROUP AND CONTROL GROUP USING REPEATED MEASURE ANOVA.

N=160					
Repeated Measures ANOVA			Repeated Contrast Test		
Source	F-value	p-value	Comparison	F-value	p-value
Between the Group Comparison					
Group	6859.942	<0.001***S			
Within Group Comparison					
Skill on First aid	5464.898	<0.001***S	Pre-test vs Post-test 1	6249.893	<0.001***S
			Post-test 1 vs Post-test 2	113.983	<0.001***S
First aid *Group	5317.167	<0.001***S	Pre-test vs Post-test 1	6115.219	<0.001***S
			Post-test 1 vs Post-test 2	97.593	<0.001***S

TABLE 11: PAIRWISE COMPARISONS OF MEAN LEVEL OF KNOWLEDGE AND SKILL ON FIRST AID FOR MEDICAL EMERGENCIES WITHIN EXPERIMENTAL GROUP ACROSS TIME USING POST HOC-BONFERRONI ADJUSTMENT

N=80					N=80				
Time Point Comparison Knowledge on First Aid	Mean Difference	Std. Error	95% CI	p-value	Time Point Comparison Skill on First Aid	Mean Difference	Std. Error	95% CI	p-value
Pre-test vs. Post-test 1	-17.278	0.473	(-18.203, -16.271)	<0.001***	Pre-test vs. Post-test 1	-18.463	0.234	(-19.008, -17.917)	<0.001***
Post-test 1 vs. Post-test 2	-2.512	0.408	(-3.246, -1.531)	<0.001***	Post-test 1 vs. Post-test 2	-1.506	0.241	(-1.945, -1.067)	<0.001***
Pre-test vs. Post-test 2	-19.787	0.446	(-20.667, -18.508)	<0.001***	Pre-test vs. Post-test 2	-17.969	0.248	(-18.508, -17.430)	<0.001***

FIGURE: 5 AND 6 DISTRIBUTION OF MEAN SCORE OF KNOWLEDGE AND SKILL ON FIRST AID AT PRE-TEST, POST-TEST 1, AND POST-TEST 2 BETWEEN EXPERIMENTAL GROUP AND CONTROL GROUP

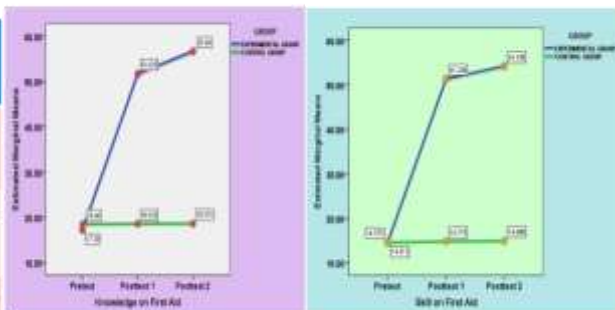


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Section 5:

TABLE 12: CORRELATION BETWEEN THE SCORE OF KNOWLEDGE AND SKILL REGARDING BLS AMONG SCHOOL CHILDREN BETWEEN EXPERIMENTAL AND CONTROL GROUP IN POST-TEST 2

N=160					
Group	Variable	Mean	SD	Karl Pearson's 'r'	p value
Experimental group	knowledge on BLS	9.42	0.689	-0.010	0.927 NS
	Skill on BLS	9.01	0.754		
Control group	knowledge on BLS	3.58	1.051	-0.056	0.625 NS
	Skill on BLS	1.37	0.785		

FIGURE: 7 AND 8 SCATTER PLOT WITH A REGRESSION ESTIMATE SHOWING CORRELATION BETWEEN KNOWLEDGE AND SKILL ON BLS IN THE EXPERIMENTAL AND CONTROL GROUP AT POST-TEST 2

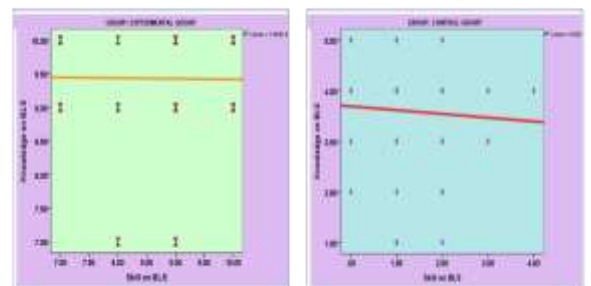


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TABLE 13: CORRELATION BETWEEN THE SCORE OF KNOWLEDGE AND SKILL REGARDING FIRST AID MANAGEMENT OF MEDICAL EMERGENCIES AMONG SCHOOL CHILDREN BETWEEN EXPERIMENTAL AND CONTROL GROUP IN POST-TEST 2

N=160					
Group	Variable	Mean	SD	Karl Pearson's r	p value
Experimental group	knowledge on first aid	56.60	1.978	0.067	0.555
	skill on first aid	54.13	2.237		NS
Control group	knowledge on first aid	18.57	4.822	0.161	0.154
	Skill on first aid	14.88	3.002		NS

FIGURE: 9 AND 10 SCATTER PLOT WITH A REGRESSION ESTIMATE SHOWING CORRELATION BETWEEN KNOWLEDGE AND SKILL ON FIRST AID IN THE EXPERIMENTAL AND CONTROL GROUP AT POST-TEST 2

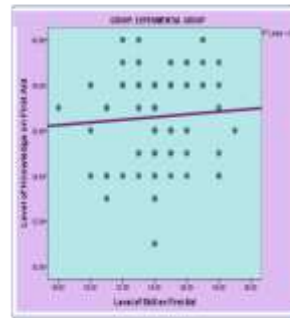


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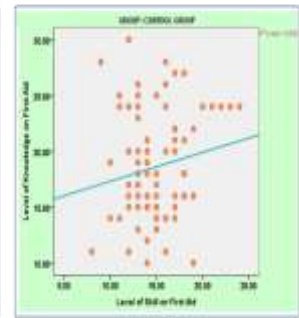


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RESULT & DISCUSSION

1. Distribution of socio demographic variables of the school children in control group and experimental group

The present study results showed no significant differences between the groups with regard to selected socio demographic variables and suggesting homogeneity across these variables ($p > 0.05$). However, significant differences were found in terms of age and mother's occupation ($p < 0.05$). Similar findings were reported by experimental study among high school students in Baghdad by Al-Tameemi et al.⁷ and a quasi-experimental study by Subramanian et al. (2020) in Chennai.⁸ found no significant differences in baseline demographic characteristics but noted variations in age and socioeconomic factors like parents' occupation.

2. Assessment of knowledge and skill scores regarding Basic Life Support among school children in experimental and control group in pretest.

The findings of the present study among school children majority 91.3% in the experimental group, 88.8% in the control group had poor knowledge on BLS. 100% of the school children in both group had poor skill on BLS. The school children in both groups were homogeneous and comparable ($p > 0.05$). The present study findings consistent with a quasi-experimental study by Aloush et.al (2019).⁹ and Experimental study by Gabriel et .al (2019)¹⁰ focusing on Theoretical knowledge and psychomotor skill acquisition of BLS training programme among secondary school students reported similarly low levels of BLS knowledge and skills before educational intervention. ($p > 0.05$).

3. Assessment of knowledge and skill scores regarding first aid management of selected medical emergencies among school children in experimental and control group.

The study findings highlights 90% of school children in both groups had poor knowledge and 95% both groups had poor skills in first aid management for selected Medical emergencies. ($p > 0.05$). The findings of the study were supported by a cross-sectional study by Balakrishnan et al. (2018)¹¹ and an experimental study by Kapoor R, et al. in Ahmedabad (2017)¹² reported that a large proportion of students had inadequate knowledge and skills about managing medical emergencies. ($p > 0.05$). Findings are similar to the current study.

4. Comparison of Mean level of knowledge and skill regarding Basic Life Support among school children in experimental group and control group between Pretest, Post-test 1 and post-test 2.

In experimental group, the pretest knowledge mean score 3.40 is increased to 8.25 in post-test 1 and 9.42 in post-test 2 which is found to be highly significant ($p < 0.001$). In control group, the pretest knowledge

mean score was 3.55 and is increased to 3.58 in post-test 1 and to 3.58 in post-test 2 which was not significant ($p>0.05$). In experimental group, the pretest mean skill score 1.26 was increased to 8.38 in post-test 1 and 9.01 in post-test 2 which is found to be highly significant ($p<0.001$). Among control group, the pretest skill mean score 1.30 increased to 1.31 in post-test 1 and 1.36 in post-test 2 which was not significant ($p>0.05$). The simulation-based learning program was effective as there was significant difference existed between pretest and post-test 1, and post-test 2 among school children in experimental group. The findings of the study were supported by an experimental study by Smith J, et al. (2021)¹³, a quasi-experimental study by Sharma et al. (2020)¹⁴ on effectiveness of a simulation-based training program for improving BLS knowledge among high school students. The findings of the current study were supported by an experimental study by Brown et al. (2020) on the effectiveness of simulation-based training on improving BLS skills among middle school students.¹⁵ showed substantial improvement in BLS skills from pretest to post-test, with significant increase in mean score (6.80, $p<0.001$). The study found mean knowledge score in the experimental group was increased from pre-test to post-test with mean difference of 5.12. ($p<0.001$). Similar to the findings of present study.

5. Comparison of Mean level of knowledge and skill regarding first aid management of selected medical emergencies among school children in experimental group and control group between Pre-test, post-test 1 and post-test 2.

The findings showed experimental group had substantial increase in knowledge across various domains of first aid management from pretest to post-test 1, overall mean difference 34.42 ($p<0.001$). In post-test 2, 39.40, showing significant improvements ($p<0.001$). The control group showed minimal changes in knowledge at post test 1 with mean differences of 0.05 to 0.12 across the same domains, and in post test 2 overall mean difference in selected medical emergencies was 0.11 and found no significant mean difference ($p>0.05$). The experimental group had substantial increase in skill across various domains of first aid management from pretest to post-test 1, overall mean difference 36.72, showing significant improvements ($p<0.001$). In post-test 2, overall mean difference 39.62, showing significant improvements ($p<0.001$). In contrast, the control group showed minimal changes in skill level at posttest 1 with mean differences 0.05 to 0.20 across the same domains and in post test 2 too and found no significant mean difference ($p>0.05$). The current study supports Martin and Robinson (2021) conducted a quasi-experimental study on simulation-based first aid training for middle school students.¹⁶ found significant increase in students' knowledge on various first aid procedures, with mean differences of 4.50 to 6.20 across different emergencies ($p<0.001$). They reported significant improvements in skills across various emergencies, similar to the present study findings ($p<0.001$). It emphasizes the need of interactive training methods on first aid management among school children.

6. Comparison on level of knowledge and skill regarding Basic Life Support between experimental and control group using repeated measure ANOVA and Post-Hoc pairwise comparisons Using Bonferroni Adjustment.

The repeated measures ANOVA in the current study demonstrates significant difference in knowledge and skills regarding Basic Life Support (BLS) between experimental and control group, both within groups and between groups ($p<0.001$). The Post-Hoc pairwise comparisons Using Bonferroni Adjustment showed significant differences between pre-test and post-test 2, ($p<0.001$). Miller et al. (2019)¹⁷ conducted a similar experimental study using repeated measures ANOVA found significant differences between-group ($p<0.001$) and within-group changes over time ($p<0.001$). Their repeated contrast test showed significant

improvements from pretest to post-test 1 and from post-test 1 to post-test 2 ($p < 0.001$), closely mirroring the findings of present study.

7. Comparison of mean level of knowledge and skill regarding first aid management of selected medical emergencies between experimental group and control group using repeated measure ANOVA and Post-Hoc pairwise comparisons Using Bonferroni Adjustment.

The repeated measures ANOVA test between-group and Within-group comparison revealed significant change in "knowledge and skill regarding first aid. ($p < 0.001$). The Post-Hoc pairwise comparisons Using Bonferroni Adjustment showed significant differences between pre-test and post-test2, ($p < 0.001$). Quasi-experimental research by Ahmed et al. (2021)¹⁸ and a longitudinal study by Wang et al. (2020)¹⁹ on effectiveness of a simulation-based training program on first aid knowledge and skills for multiple medical emergencies among school-aged children utilized 2x3 repeated measures ANOVA, similar to current study and found significant differences between the experimental and control groups ($p < 0.001$). Both studies reinforce the value of simulation-based training in retaining first aid knowledge and skills, and effective in providing practical, hands-on experience in emergency management.

8. Correlation between knowledge and skill regarding BLS among school children after simulation-based learning programme in experimental group and control group.

Karl-Pearson correlation coefficient showed both in experimental and control group had non-significant weak negative correlation between level of knowledge and skill regarding BLS ($r = -0.010$; $p > 0.05$). ($r = -0.056$; $p > 0.05$). Which inferred no evidence in relationship between knowledge and skill on BLS. The present study is supported by a cross-sectional study by Smith.J. et.al(2020)²⁰ "The Relationship Between Knowledge and Skill in Basic Life Support Training Among Adolescents." and a quasi-experimental study by Watanabe.K.et.al(2017) "Assessing the Impact of BLS Training on Knowledge and Skills among High School Students" found a non-significant negative correlation similar to the current study findings ($r = -0.03$) between knowledge and skills in BLS post-training ($p > 0.05$).²¹

9. Correlation between level of knowledge and skill regarding first aid management among school children after simulation-based learning programme in experimental group and control group.

Karl-Pearson correlation coefficient showed both in experimental and control group had non-significant positive correlation between knowledge and skill regarding first aid management of medical emergencies ($r = 0.067$; $p > 0.05$) ($r = 0.161$; $p > 0.05$). Which inferred an increase in level of knowledge there is increase in level of skill. The current study was supported by a cross-sectional study by Patel S.et .al (2019) "Evaluating the Relationship Between First Aid Knowledge and Skill Proficiency Among High School Students."²² Their findings showed a non-significant positive correlation between knowledge and skills ($r = 0.120$) ($p > 0.05$).

10. Association between knowledge and skill regarding BLS with selected socio demographic variables of school children in pretest

The Chi-square test revealed no significant association between knowledge and skill regarding BLS with selected socio demographic variables. ($p > 0.05$). The study findings are similar to a cross-sectional study by Kim J, et al. (2021) on "Socio-Demographic Factors and Their Impact on Basic Life Support Skills Among High School Students" found that socio-demographic variables have no significant association with BLS skill levels. ($p > 0.05$)²³

11. Association between knowledge and skill regarding first aid management of selected medical emergencies with selected socio demographic variables of school children in pretest.

The Chi-square test revealed no significant association between knowledge and skill regarding first aid

management of medical emergencies with selected socio demographic variables $(p>0.05)$. The current study findings are supported by a cross-sectional study Singh P, et al. (2021) on "Socio-Demographic Factors and Their Impact on First Aid Knowledge Among School Children",²⁴ showed no significant association between the knowledge and skill on first aid with selected socio-demographic variables. $(p>0.05)$.

SUMMARY & CONCLUSION

The simulation-based learning programme on knowledge and skill regarding BLS and First Aid management of selected medical emergencies proved to be effective as there was significant difference existed between pretest and post-test 1, pretest and post-test 2 increasing level of knowledge and skill among school students and were statistically significant $(p<0.001)$. Thus, the investigator concludes that simulation-based learning programme on BLS and first aid management of medical emergencies was found to be highly effective and appropriate. The researcher strongly recommends that BLS and First Aid modules have to be incorporated as mandatory portion of curriculum among higher secondary school children.

IMPLICATIONS FOR NURSING PRACTICE

- Nurses can incorporate simulation into school health programs to improve students' practical skills in BLS and first aid, enhancing emergency preparedness.
- Structured training modules for school children can be designed by school nurses and healthcare educators across different settings.
- School nurses can be trained to lead simulation-based programs, ensuring students gain both theoretical knowledge and hands-on first aid skills for emergencies like Cardiac arrest, Choking, Drowning, and Poisoning.
- The study supports policies that mandate first aid and BLS training in school curriculum to prepare future generations for emergency response.
- Nurses can use study findings to assess current school training programs and make improvements to keep them practical and up to date

IMPLICATIONS FOR NURSING EDUCATION

- Nursing programs can use simulation-based learning to build both theoretical and practical skills in BLS and first aid from the beginning
- Nursing students can lead simulation sessions in schools, promoting community involvement and gaining hands-on experience in emergency health education.
- The study highlights the need to incorporate pediatric emergency training, especially in school settings, as a core part of nursing education.
- Nurse educators can partnerships with local schools to offer clinical placements where students practice simulation-based teaching and first aid in real environments.
- Nursing programs can offer continuous education through simulation workshops and certifications to maintain nurses' BLS and first aid skills over time.

IMPLICATIONS FOR NURSING ADMINISTRATION

- Nurse administrators can obtain funding and resources to support simulation-based learning, ensuring

schools and healthcare facilities are equipped with modern training tools and technologies.

- Promote policies requiring regular First Aid and BLS training in schools, working with educational institutions to ensure consistent implementation.
- Create specialized training programs for school nurses, enabling them to lead simulation-based BLS and first aid training, which may strengthen school emergency preparedness.
- Establish regular evaluation frameworks to measure the effectiveness of simulation training, track student progress, and support ongoing quality improvement
- Through collaboration with education authorities and local governments, nurse administrators can embed nursing-led health education and simulation-based first aid training into school curriculum, standardizing emergency preparedness

IMPLICATIONS FOR NURSING RESEARCH

- The study provides a strong foundation for future research on the effectiveness of simulation-based learning across age groups, emergencies, and healthcare settings.
- Nursing researchers can study how well school children retain first aid knowledge and skills over time after simulation-based training.
- Comparative studies can assess simulation-based learning against other educational strategies to find the most effective approach for teaching emergency skills.
- Researchers can examine how cultural factors affect simulation effectiveness and adapt programs to meet the needs of diverse school communities.
- Further research can explore how school-based simulation programs influence community health outcomes, such as lowering injury-related mortality and morbidity.

LIMITATION OF THE STUDY

- The study assessed only short-term improvements in knowledge and skills following the simulation-based learning program and Long-term retention was not evaluated.
- The researcher faced difficulties in coordinating the class and students due to unexpected change in academic calendar which affected scheduling data collection.

RECOMMENDATIONS

- Incorporate simulation-based learning for BLS and first aid into the school curriculum to enhance emergency preparedness and equip students with essential life-saving skills
- Organize periodic refresher sessions to reinforce students' knowledge and skills in handling medical emergencies like choking, drowning, and poisoning, and Cardiac arrest ensuring long-term retention
- Provide training in simulation-based first aid techniques to teachers and school staff enabling them to guide and support students in emergency preparedness and fostering a comprehensive safety network within the school.
- Associate with local health departments and organizations to access resources such as simulation equipment's, trained professionals, and funding, which are vital for effective program implementation.
- Ongoing research and evaluation of simulation-based learning programs are recommended to monitor effectiveness, identify areas for improvement, and expand their application to different age groups or settings for broader health impact

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