RESEARCH PAPER

A QUASI-EXPERIMENTAL STUDY TO ASSESS THE EFFECTIVENESS OF SQUEEZING BALL TECHNIQUE ON REDUCTION OF PAIN DURING INTRAVENOUS (IV) CANNULA INSERTION AMONG HOSPITALIZED CHILDREN IN SELECTED HOSPITAL BELAGAVI, KARNATAKA.

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ABSTRACT

Background: Intravenous cannula insertion is a common procedure in hospitalized children and is frequently associated with pain and distress. Effective and simple non-pharmacological methods are needed to minimize discomfort during such procedures. **Objectives:** The objectives of the study were to assess the level of pain during intravenous (IV) cannula insertion among hospitalized children, evaluate the effectiveness of the squeezing ball technique in reducing pain during IV cannula insertion, and determine the association between pain levels and selected demographic and clinical variables.

Methodology: A quasi-experimental study was conducted among 60 children aged 4-12 years admitted to a hospital in Belagavi, Karnataka, India. Participants were divided into experimental and control groups with 30 children in each group. children in the experimental group were provided with a soft ball to squeeze during the procedure., while the control group received routine care. Pain was assessed immediately after the procedure using a standardized faces pain rating scale. Data were analysed using descriptive and inferential statistics.

Results: The baseline characteristics and pre-test pain levels were comparable between both groups. Most children initially experienced moderate pain. Post-test findings revealed a significant reduction in pain levels in the experimental group, with more children reporting mild or no pain. The difference between groups was statistically significant ($p < 0.05$), confirming the effectiveness of the squeezing ball technique. No significant association was found between pain levels and selected demographic variables.

Conclusion: The study conclude that the squeezing ball technique is an effective, simple, and cost-efficient method for reducing pain during IV cannulation in children and can be easily incorporated into routine clinical practice.

Keywords: Effectiveness, Squeezing ball technique, Pain, IV cannulation, Hospitalized children, Distraction technique.

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INTRODUCTION

Pain is a complex sensory and emotional experience associated with actual or potential tissue damage and is influenced by biological, psychological, social, and environmental factors. Pain and nociception are distinct phenomena because the experience of pain is shaped not only by sensory nerve stimulation but also by an individual's emotions, previous experiences, and cognitive interpretation. Due to its significance in patient care, pain has been recognized as the "fifth vital sign," emphasizing the need for regular assessment and effective pain management in all healthcare settings. [(1)]

In paediatric healthcare, pain is a multidimensional phenomenon involving physiological, psychological, behavioural, and developmental components. Children's responses to pain are influenced by their age, temperament, developmental stage, previous painful experiences, parental support, and the healthcare environment. Young children, particularly

preschoolers, often lack the cognitive ability to understand the purpose and temporary nature of medical procedures. As a result, they frequently perceive healthcare interventions as threatening and painful experiences [2].

Research has shown that pain during childhood is often accompanied by emotional distress, fear, anxiety, and difficulties in self-regulation. Painful healthcare procedures can trigger exaggerated behavioural responses such as crying, screaming, withdrawal, resistance, protective muscle guarding, and increased autonomic nervous system activity. These responses not only increase the child's suffering but may also complicate the successful completion of medical procedures [3].

Intravenous (IV) cannulation is one of the most commonly performed invasive procedures in paediatric healthcare settings. It is essential for administering medications, fluids, blood products, and emergency treatments. Although clinically necessary, IV cannulation is frequently identified as one of the most distressing needle-related procedures experienced by children. The procedure causes pain through tissue penetration and produces anxiety because of anticipation, fear, and uncertainty associated with needles and hospital procedures [4].

Children are particularly vulnerable to procedural pain due to their limited coping mechanisms, dependence on caregivers for emotional support, and inability to fully understand medical procedures. Studies have demonstrated that inadequate management of procedural pain may have both immediate and long-term consequences. Immediate effects include increased fear, anxiety, distress, and lack of cooperation during procedures. Long-term effects may include needle phobia, avoidance of healthcare services, mistrust of healthcare professionals, and heightened sensitivity to future painful experiences [5].

Needle-related procedures, including venipuncture and IV cannulation, are among the most common causes of pain in hospitalized children. Approximately 71% of hospitalized children undergo needle-related procedures during their hospital stay. Research findings indicate that a significant proportion of children experience moderate to severe pain during IV cannulation. Studies have reported that between 19.5% and 38.3% of children experience considerable procedural pain, while 8.5% to 38.3% report severe pain during needle-related procedures [6].

In addition to pain, procedural anxiety is highly prevalent among children undergoing IV cannulation. Studies have shown that approximately 79% to 92% of children experience significant anxiety before needle procedures. Psychological fear processing has been found to contribute substantially to pain perception, with many children fearing the unknown aspects of the procedure more than the physical sensation itself. High levels of anxiety are strongly associated with increased pain intensity and procedural distress [7].

Effective pain management is therefore a fundamental component of paediatric nursing care. Paediatric nurses have an ethical and professional responsibility to implement interventions that reduce pain and anxiety while ensuring patient safety and comfort. Although pharmacological methods are available, they are not routinely administered before simple IV cannulation because the procedure is generally brief and considered minimally invasive. Consequently, non-pharmacological interventions play a vital role in reducing procedural pain and distress in children [8]

Distraction techniques are among the most commonly used non-pharmacological approaches for managing procedural pain. These interventions work by diverting the child's attention away from the painful stimulus and focusing it on an engaging activity. Common distraction methods include music therapy, bubble blowing, balloon inflation, video viewing, storytelling, and play activities. Evidence suggests that distraction techniques significantly reduce pain perception, anxiety, and behavioral distress during needle-related procedures [9].

One simple and practical distraction method is the squeezing ball technique. This technique involves asking the child to squeeze a soft ball during the procedure. The activity provides tactile stimulation, encourages active participation, and diverts attention away from the painful event. According to the Gate Control Theory of Pain proposed by Melzack and Wall, stimulation of large sensory nerve fibres can inhibit the transmission of pain impulses, thereby reducing the perception of pain. By activating sensory pathways through hand movements, squeezing a ball may help decrease procedural pain and anxiety during IV cannulation [10].

The squeezing ball technique offers several advantages in clinical settings. It is inexpensive, non-invasive, easy to administer, and requires minimal preparation. Unlike some distraction methods that require electronic devices or additional personnel, squeezing balls can be readily used in busy hospital environments. Furthermore, the technique empowers children by actively involving them in the pain management process and promoting a sense of control during the procedure [11].

Unrelieved procedural pain may also produce adverse physiological effects. Anxiety and stress

activate the sympathetic nervous system, causing vasoconstriction, increased heart rate, and elevated stress hormone levels. These responses may make venous access more difficult and increase the likelihood of multiple cannulation attempts. Therefore, interventions that effectively reduce pain and anxiety may improve both patient comfort and procedural success [12].

Considering the high prevalence of IV cannulation among hospitalized children, the significant pain and anxiety associated with the procedure, and the potential short- and long-term consequences of inadequately managed pain, there is a need to identify effective, safe, and feasible interventions. The squeezing ball technique appears to be a promising non-pharmacological strategy because of its simplicity, affordability, and ease of implementation. Therefore, the investigator felt the need to assess the effectiveness of the squeezing ball technique on reduction of pain during intravenous cannula insertion among hospitalized children in a selected hospital, Belagavi.

MATERIALS AND METHODS

The present study adopted an evaluative research approach with a quasi-experimental post-test control group design to assess the effectiveness of the squeezing ball technique on reduction of pain during intravenous cannula insertion among hospitalized children. The study was conducted in the pediatric wards of a selected hospital in Belagavi. The study population comprised hospitalized children requiring intravenous cannula insertion. A total of 60 participants who fulfilled the inclusion and exclusion criteria were selected using a purposive sampling technique and divided equally into experimental and control groups.

The independent variable of the study was the squeezing ball technique, while the dependent variable was the level of pain experienced during intravenous cannula insertion. Demographic variables included age, gender, educational status, previous hospitalization, previous experience of intravenous cannulation, diagnosis, and duration of hospitalization. Children who were hospitalized, aged 4–12 years, conscious, cooperative, able to understand simple instructions, and requiring intravenous cannula insertion were included in the study. Children with cognitive impairments, severe illness requiring emergency intervention, those receiving analgesics or sedatives before the procedure, and those with conditions affecting pain assessment were excluded from the study.

Ethical clearance and institutional permission were obtained before the commencement of data collection. Written informed consent was obtained from the parents or guardians of the children, and assent was obtained from the children whenever appropriate. Confidentiality, anonymity, and the rights of the participants were maintained throughout the study.

DATA COLLECTION METHODS:

SECTION - I: Distribution of the Sample Characteristic Demographic Variables Of Subjects

Section II: Findings Related to Assessment of Pain During IV Cannula Insertion in the Experimental & Control Group.

Section III: Findings related to compare the pain level between experimental and control group

Section IV: Findings related to the Pre-test and Post-test Knowledge regarding squeezing ball technique.

Section V: Findings related to association between post-test pain scores and selected demographic variables.

SQUEEZING BALL TECHNIQUE:

The squeezing ball technique is a simple, safe, non-pharmacological distraction method used to reduce pain and anxiety during painful procedures. In this technique, the child is provided with a soft rubber or foam ball and instructed to continuously squeeze and release the ball during the procedure, such as intravenous (IV) cannula insertion. The technique helps divert the child's attention away from the painful stimulus and promotes active participation during the procedure.

The effectiveness of the squeezing ball technique is supported by the Gate Control Theory of Pain, which suggests that stimulation of large sensory nerve fibers through tactile activities, such as squeezing a ball, can interfere with the transmission of pain impulses to the brain, thereby reducing pain perception. In addition, the technique serves as a distraction strategy by shifting the child's focus from the needle insertion to the hand activity.

Procedure:

1. Explain the procedure to the child in simple and understandable language.
2. Provide a soft squeezing ball to the child before IV cannula insertion.
3. Demonstrate how to squeeze and release the ball.
4. Instruct the child to start squeezing the ball just before the cannulation procedure begins.
5. Encourage the child to continue squeezing and releasing the ball throughout the IV cannula insertion.
6. Observe the child for cooperation and participation during the procedure.
7. Assess the pain level immediately after cannula insertion using an appropriate

pain assessment scale such as the Wong-Baker Faces Pain Rating Scale.

8. Record the pain score and relevant observations.

RESULTS

SECTION - I: DISTRIBUTION OF THE SAMPLE CHARACTERISTIC DEMOGRAPHIC VARIABLES OF SUBJECTS

Table 1: Distribution of individuals in the experimental and control groups.

		Control		Experimental	
		N	%	N	%
Age	<8	1	3.3	3	10.0
	8-10	15	50.0	17	56.7
	>10	14	46.7	10	33.3
Gender	Male	11	36.7	15	50.0
	Female	19	63.3	15	50.0
Religion	Hindu	20	66.7	14	46.7
	Muslim	7	23.3	16	53.3
	Christian	2	6.7	0	0.0
	Other	1	3.3	0	0.0
Monthly income	<10000	6	20.0	2	6.7
	10000-20000	21	70.0	17	56.7
	>20000	3	10.0	11	36.7
Ares of residence	Urban	18	60.0	18	60.0
	Rural	12	40.0	12	40.0
types of family	Joint family	5	16.7	8	26.7
	Nuclear family	25	83.3	22	73.3
previous experience with Iv cannula	None	4	13.3	0	0.0
	Once before	4	13.3	3	10.0
	2-3 times	19	63.3	16	53.3
	>3 times	3	10.0	11	36.7
site of IV cannula insertion	Hand	30	100.0	20	66.7
	Forearm	0	0.0	0	0.0
	Foot	0	0.0	10	33.3
	Arm	0	0.0	0	0.0
types of IV Fluids	Dextrose	4	13.3	3	10.0
	Normal Saline	10	33.3	6	20.0
	Ringer Lactate	5	16.7	6	20.0
	Other	11	36.7	15	50.0

TABLE 1: Reveals that the majority for children in both categories were among an age of 8 to 10 (Control: 50%, the experiment: 56.7%). Males and females had an equal distribution (50% each) in the group performing the experiment, whereas the highest proportion of participants in a control group (63.3%) have been female. The majority of those who participated in the group performing the experiment were Muslims (53.3%). In contrast, Hindus comprised the bulk of the control group (66.7%). Most people in both groups had monthly incomes between ₹10,000 and ₹20,000. In both categories, 40% of people resided in rural areas and 60% in urban ones. Most of the youngsters in both categories came from nuclear families. An increased percentage of the kids in the group performing each experiment (36.7%) received in excess of three IV cannulation experience as opposed to the kids in the baseline group, while most was two to three prior encounters. Every child in the control group received Intravenous insertions in their hands, whereas 66.7% of children who participated in the experiment group have Intravenous insertions performed in the hands & 33.3% in their foot. In both groups, "Other fluids" were the most often given IV fluid, followed by regular saline. Overall, both groups' baseline attributes were rather similar.

Section II: Findings related to assessment of pain during IV cannula insertion in the experimental & control group.

Table 2: Pre-test & post-test pain value among the experimental and control group

		N	%
Pre test	Mild	17	28.3
	Moderate	26	43.3
	No pain	1	1.7
	Sever	16	26.7
Post test	Mild	26	43.3
	Moderate	22	36.7
	No pain	5	8.3
	Sever	7	11.7

TABLE 2: In the pre-test, most children experienced moderate pain (43.3%), followed by mild pain (28.3%) and severe pain (26.7%), while only 1.7% reported no pain.In the post-test, there was a noticeable shift toward lower pain levels. Mild pain increased to 43.3%, moderate pain slightly decreased to 36.7%, and severe pain significantly reduced to 11.7%. Additionally, the number of children with no pain increased to 8.3%.

Section III: Findings related to compare the pain level between experimental and control group

Table 3: Pre post comparison of pain score among the experimental group and control group

*<0.05 significance is obtained by Wilcoxon sign rank test

Pain score	**Experimental**		**Control**				
	Median	**IQR**	**Median**	**IQR**	**U**	**Z**	**Sig.**
Pre test	8.00	5.00	6.00	4.25	347	-1.546	0.122
Post test	4.00	4.00	6.50	4.00	296.5	-2.305	0.021**^{MW}
Z (Sig.)	-3.748 (<0.05)^{I}*		-2.72 (0.785)				

**<0.05 significance is obtained by Mann Whitney U test

Table 3 Pre-test results showed that the experimental group's median pain score was 8.00 (IQR=5.00), while the control group's was 6.00 (IQR=4.25). The Mann-Whitney U test comparison revealed a value of U=347 having a Z value for -1.546 and a p-value of 0.122, which is not of statistical significance (p>0.05). This suggests that prior to the intervention, there was no discernible difference in the two groups' levels of pain. In contrast, the experimental group's median pain score dropped to 4.00 (4.00) in the post-test, but the control group's median score was higher at 6.50 (IQR = 4.00). The results of the Mann-Whitney U test showed a significance level ($p < 0.05$) U value that was 296.5, Z value of -2.305, and p-value of 0.021. This result unequivocally shows that following the intervention, the experimental group reported far less pain than the control group.

Section IV: Findings related to the Pre-test and Post-test Knowledge regarding squeezing ball technique**.**

Table 4 Pre-test and post-test knowledge regarding squeezing ball technique among the experimental group and control group.

Knowledge		Control		Experimental	
		N	%	n	%
Pre test	Poor	5	16.7	5	16.7
	Average	15	50.0	15	50.0
	Good	10	33.3	10	33.3
Post test	Poor	0	0.0	0	0.0
	Average	0	0.0	0	0.0
	Good	30	100.0	30	100.0

Table 4 Revealed that in the pre-test, the knowledge distribution was the same for both groups: 50% of participants had average knowledge, 33.3% had strong knowledge, and 16.7% had bad knowledge. This suggests that at baseline, members in both groups have comparable levels of comprehension. The post-test showed a notable improvement after the intervention, with every participant in both groups achieving strong knowledge and none continuing to fall into the poor as well as average category. This total change indicates a significant improvement in knowledge following response to the academic intervention.

Table 4.1: Pre post comparison of Knowledge of squeezing ball technique among the experimental group and control group

Knowledge	Control		Experimental		U	Sig.
	Median	IQR	Median	IQR		
Pre test	11.00	2.00	11.00	2.00	450	1
Post test	14.00	1.00	15.00	2.00	315.5	0.039*
Z	-4.808		-4.800			
Sig.	<0.05*		<0.05*			

W * <0.05 significance is obtained by Wilcoxon sign rank test (for pre post comparison)

*U** <0.05 significance is obtained by Mann Whitney U test (for comparison between experimental & control group)

Table 4.1: showed that in the pre-test, the median knowledge score for both groups was 11.00 (IQR = 2.00). Prior to the intervention, participants in each group was similar, as evidenced by the lack of statistical significance in the difference among the groups (U = 450, p = 1). Both groups' knowledge scores increased in the post-test. The experimental group received an increased median score on 15.00 (IQR = 2.00) than the control group, which received a mean score on 14.00 (IQR = 1.00). It was discovered that there was a statistically significant difference between groups to (U = 315.5, p = 0.039), indicating that the experimental group was more affected by the intervention. With Z = -4.808 (p < 0.05) for the control group & Z = -4.800 (p < 0.05) for the experimental group, the within-group analysis applying the Wilcoxon signed-rank test, revealed an improvement of statistical significance in both groups. This suggests that both groups' knowledge scores significantly increased from the pre-test to the post-test.

Table 4.2: Association of Knowledge of squeezing ball technique with the selected base line variables.

Knowledge		Control						Chi-square (Sig.)	Experimental						Chi-square (Sig.)
		Poor		Average		Good			Poor		Average		Good		
		n	%	n	%	n	%		n	%	n	%	n	%	
Age	<8	0	0.0	1	100.0	0	0.0	6.934 (0.095)	0	0.0	2	66.7	1	33.3	3.160 (0.563)
	8-10	5	33.3	6	40.0	4	26.7		3	17.6	10	58.8	4	23.5	
	>10	0	0.0	8	57.1	6	42.9		2	20.0	3	30.0	5	50.0	
Gender	Male	3	27.3	4	36.4	4	36.4	1.920 (0.357)	3	20.0	7	46.7	5	33.3	0.394 (1.000)
	Female	2	10.5	11	57.9	6	31.6		2	13.3	8	53.3	5	33.3	
Religion	Hindu	3	15.0	10	50.0	7	35.0	4.467 (0.747)	1	7.1	7	50.0	6	42.9	2.025 (0.435)
	Muslim	1	14.3	4	57.1	2	28.6		4	25.0	8	50.0	4	25.0	
	Christian	1	50.0	1	50.0	0	0.0		0	0.0	0	0.0	0	0.0	
	Other	0	0.0	0	0.0	1	100.0		0	0.0	0	0.0	0	0.0	
Monthly income_C	<10000	2	33.3	2	33.3	2	33.3	3.550 (0.466)	0	0.0	1	50.0	1	50.0	2.568 (0.785)
	10000-20000	2	9.5	12	57.1	7	33.3		2	11.8	10	58.8	5	29.4	
	>20000	1	33.3	1	33.3	1	33.3		3	27.3	4	36.4	4	36.4	
Ares of residence	Urban	4	22.2	7	38.9	7	38.9	2.178 (0.408)	2	11.1	9	50.0	7	38.9	1.294 (0.478)
	Rural	1	8.3	8	66.7	3	25.0		3	25.0	6	50.0	3	25.0	
types of family	Joint family	3	60.0	2	40.0	0	0.0	6.875 (0.021)*	1	12.5	5	62.5	2	25.0	0.687 (0.860)
	Nuclear family	2	8.0	13	52.0	10	40.0		4	18.2	10	45.5	8	36.4	
previous experience with I vcannula	None	1	25.0	3	75.0	0	0.0	8.641 (0.104)	0	0.0	0	0.0	0	0.0	6.925 (0.095)
	Once before	1	25.0	0	0.0	3	75.0		0	0.0	1	33.3	2	66.7	
	2-3 times	3	15.8	9	47.4	7	36.8		1	6.3	11	68.8	4	25.0	
	>3 times	0	0.0	3	100.0	0	0.0		4	36.4	3	27.3	4	36.4	
site of IV cannula insertion	Hand	5	16.7	15	50.0	10	33.3	1.834 (0.505)	4	20.0	11	55.0	5	25.0	1.419 (0.575)
	Forearm	0	0.0	0	0.0	0	0.0		0	0.0	0	0.0	0	0.0	
	Foot	0	0.0	0	0.0	0	0.0		1	10.0	4	40.0	5	50.0	
	Arm	0	0.0	0	0.0	0	0.0		0	0.0	0	0.0	0	0.0	
types of IV Fluids	Dextrose	0	0.0	3	75.0	1	25.0	3.327 (0.855)	0	0.0	2	66.7	1	33.3	10.270 (.060)
	Normal Saline	1	10.0	5	50.0	4	40.0		2	33.3	1	16.7	3	50.0	

	Ringer Lactate	2	40.0	2	40.0	1	20.0		1	16.7	1	16.7	4	66.7
	Other	2	18.2	5	45.5	4	36.4		2	13.3	11	73.3	2	13.3

*<0.05 significance is obtained by fisher exact test

Table 4.2: Revealed that all of the following variables were present in the experimental group: age ($\chi^2 = 3.160$, $p = 0.563$), race ($\chi^2 = 0.394$, $p = 1.000$), religion ($\chi^2 = 2.025$, $p = 0.435$), monthly earnings ($\chi^2 = 2.568$, $p = 0.785$), area of place of residence ($\chi^2 = 1.294$, $p = 0.478$), family type ($\chi^2 = 0.687$, $p = 0.095$), site of an intravenous (($\chi^2 = 1.419$, $p = 0.575$), along with type of IV fluids ($\chi^2 = 10.270$, $p = 0.060$). This suggests that the experimental group's knowledge levels were unaffected by sociodemographic traits. The majority of the variables were not statistically significant ($p > 0.05$) in the control group, including ages ($\chi^2 = 6.934$, $p = 0.095$), race ($\chi^2 = 1.920$, $p = 0.357$), religion ($\chi^2 = 4.467$, $p = 0.747$), monthly earnings ($\chi^2 = 3.550$, $p = 0.466$), area of residence ($\chi^2 = 2.104$), site of IV cannula insertion ($\chi^{22} = 1.834$, $p = 0.505$), type of IV fluids ($\chi^{22} = 3.327$, $p > 0.855$). This suggests that there was no discernible impact of these variables on knowledge levels. However, in the control group, the type of family members ($\chi^2 = 6.875$, $p = 0.021$) demonstrated a statistically significant correlation with knowledge.

Section V: Findings related to association between post-test pain scores and selected demographic variables.

Table 5.1: Association of pain scale with the Experimental group of selected base line variables.

Socio demographic variable		**Experimental**								**Chi-square (Sig.)**
		Mild		**Moderate**		**No pain**		**Severe**		
		N	**%**	**n**	**%**	**n**	**%**	**n**	**%**	
Age	<8	0	0.0	1	33.3	0	0.0	2	66.7	5.106 (0.244)
	8-10	5	29.4	5	29.4	0	0.0	7	41.2	
	>10	3	30.0	6	60.0	0	0.0	1	10.0	
Gender	Male	3	20.0	5	33.3	0	0.0	7	46.7	2.376 (0.386)
	Female	5	33.3	7	46.7	0	0.0	3	20.0	
Religion	Hindu	3	21.4	4	28.6	0	0.0	7	50.0	3.196 (0.266)
	Muslim	5	31.3	8	50.0	0	0.0	3	18.8	
	Christian	0	0.0	0	0.0	0	0.0	0	0.0	
	Other	0	0.0	0	0.0	0	0.0	0	0.0	
Montly income	<10000	1	50.0	1	50.0	0	0.0	0	0.0	2.316 (0.773)
	10000-20000	5	29.4	7	41.2	0	0.0	5	29.4	
	>20000	2	18.2	4	36.4	0	0.0	5	45.5	
Area of residence	Urban	6	33.3	8	44.4	0	0.0	4	22.2	2.469 (0.368)
	Rural	2	16.7	4	33.3	0	0.0	6	50.0	
Types of family	Joint family	2	25.0	3	37.5	0	0.0	3	37.5	0.261 (1.000)
	Nuclear family	6	27.3	9	40.9	0	0.0	7	31.8	

Previous experience with IV cannula	None	0	0.0	0	0.0	0	0.0	0	0.0	1.204 (0.949)
	Once before	1	33.3	1	33.3	0	0.0	1	33.3	
	2-3 times	5	31.3	6	37.5	0	0.0	5	31.3	
	>3 times	2	18.2	5	45.5	0	0.0	4	36.4	
Site of IV cannula insertion	Hand	6	30.0	9	45.0	0	0.0	5	25.0	1.793 (0.438)
	Forearm	0	0.0	0	0.0	0	0.0	0	0.0	
	Foot	2	20.0	3	30.0	0	0.0	5	50.0	
	Arm	0	0.0	0	0.0	0	0.0	0	0.0	
Types of IV fluids	Dextrose	1	33.3	1	33.3	0	0.0	1	33.3	5.032 (0.589)
	Normal Saline	0	0.0	2	33.3	0	0.0	4	66.7	
	Ringer Lactate	2	33.3	3	50.0	0	0.0	1	16.7	
	Other	5	33.3	6	40.0	0	0.0	4	26.7	

Table 5.1: According to the results, there was no statistically significant correlation between any of the sociodemographic factors and pain levels ($p > 0.05$). Variables such as ages ($\chi^2 = 5.106$, $p = 0.244$), genders ($\chi^2 = 2.376$, $p = 0.386$), religion ($\chi^2 = 3.196$, $p = 0.266$), a month's earnings ($\chi^2 = 2.316$, $p = 0.773$), area of living ($\chi^2 = 2.469$, $p = 0.368$), category of the family ($\chi^2 = 0.261$, $p = 1.000$), prior experience in an intravenous (($\chi^2 = 1.204$, $p = 0.949$), site of IV cannula its insertion. ($\chi^2 = 1.793$, $p = 0.438$), as well type of intravenous fluids ($\chi^2 = 5.032$, $p = 0.589$) were all found that to be non-significant

Socio demographic variable		**Control**								**Chi-square (Sig.)**
		Mild		**Moderate**		**No pain**		**Severe**		
		N	**%**	**n**	**%**	**n**	**%**	**n**	**%**	
Age	<8	1	100.0	0	0.0	0	0.0	0	0.0	7.159 (0.393)
	8-10	3	20.0	9	60.0	1	6.7	2	13.3	
	>10	5	35.7	5	35.7	0	0.0	4	28.6	
Gender	Male	2	18.2	5	45.5	0	0.0	4	36.4	3.485 (0.298)
	Female	7	36.8	9	47.4	1	5.3	2	10.5	
Religion	Hindu	6	30.0	10	50.0	1	5.0	3	15.0	8.060 (0.823)
	Muslim	2	28.6	2	28.6	0	0.0	3	42.9	
	Christian	1	50.0	1	50.0	0	0.0	0	0.0	
	Other	0	0.0	1	100.0	0	0.0	0	0.0	
Montly income	<10000	1	16.7	4	66.7	0	0.0	1	16.7	3.361 (0.931)
	10000-20000	7	33.3	9	42.9	1	4.8	4	19.0	
	>20000	1	33.3	1	33.3	0	0.0	1	33.3	
Area of residence	Urban	6	33.3	8	44.4	1	5.6	3	16.7	1.224 (0.934)
	Rural	3	25.0	6	50.0	0	0.0	3	25.0	
Types of family	Joint family	1	20.0	3	60.0	0	0.0	1	20.0	1.144 (1.000)
	Nuclear family	8	32.0	11	44.0	1	4.0	5	20.0	
	None	1	25.0	2	50.0	0	0.0	1	25.0	9.503 (0.408)

Previous experience with IV cannula	Once before	0	0.0	3	75.0	0	0.0	1	25.0	
	2-3 times	8	42.1	8	42.1	1	5.3	2	10.5	
	>3 times	0	0.0	1	33.3	0	0.0	2	66.7	
Site of IV cannula insertion	Hand	9	30.0	14	46.7	1	3.3	6	20.0	-
	Forearm	0	0.0	0	0.0	0	0.0	0	0.0	
	Foot	0	0.0	0	0.0	0	0.0	0	0.0	
	Arm	0	0.0	0	0.0	0	0.0	0	0.0	
Types of IV fluids	Dextrose	3	75.0	0	0.0	0	0.0	1	25.0	8.175 (0.575)
	Normal Saline	2	20.0	6	60.0	0	0.0	2	20.0	
	Ringer Lactate	1	20.0	3	60.0	0	0.0	1	20.0	
	Other	3	27.3	5	45.5	1	9.1	2	18.2	

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Table 5.2: Association of pain scale with the Control group of selected base line variables.

Table 5.2: According to the results, there was no statistically significant correlation between any of the sociodemographic factors and pain levels ($p > 0.05$). The age of the patient ($\chi^2 = 7.159$, $p = 0.393$), gender ($\chi^2 = 3.485$, $p = 0.298$), religion ($\chi^2 = 8.060$, $p = 0.823$), monthly earnings ($\chi^2 = 3.361$, $p = 0.931$), residence area ($\chi^2 = 1.224$, $p = 0.934$), family type ($\chi^2 = 1.144$, $p = 1.000$), and prior IV cannulation experience ($\chi^2 = 9.503$, $p = 0.408$) were all found to be statistically non-significant.

DISCUSSION.

the major findings of the study conducted to evaluate the effectiveness of the squeezing ball technique on reducing pain during intravenous cannula insertion among hospitalized children in a selected hospital in Belagavi, Karnataka. A pre-experimental one-group pre-test and post-test design was used with a sample of 60 children aged 4–12 years. Pain was assessed using the Modified Wong-Baker Faces Pain Rating Scale.

The socio-demographic findings showed that most children in both experimental and control groups belonged to the 8–10 years age group, with nearly equal gender distribution. Most participants were from Hindu religion, urban areas, and nuclear families. The majority had previous experience of 2–3 IV cannulations, and most cannulations were performed on the hand.In the pre-test, most children experienced moderate to severe pain during IV cannula insertion. In the post-test, there was a noticeable reduction in pain levels, with an increase in children reporting mild or no pain. Comparison between groups showed that the experimental group demonstrated a significant reduction in pain scores after the intervention, while the control group showed minimal change. Statistical analysis confirmed a significant difference between pre- and post-test pain scores in the experimental group.

Knowledge regarding the squeezing ball technique also improved significantly after intervention. Initially, both groups had similar knowledge levels, but post-test results showed a marked improvement, with all participants achieving good knowledge scores.

Association analysis revealed that most demographic variables such as age, gender, religion, income, and previous IV experience had no significant relationship with pain levels in both groups. This suggests that pain perception is not influenced by demographic factors but rather by individual response and procedural factors.

Overall, the findings clearly indicate that the squeezing ball technique is an effective non-pharmacological intervention for reducing pain and improving knowledge among hospitalized children during intravenous cannula insertion.

CONCLUSION

The study was conducted to assess the effectiveness of the squeezing ball technique in reducing pain during intravenous (IV) cannula insertion among hospitalized children. The findings revealed that hospitalized children experienced high levels of pain during IV cannulation before the intervention. After the application of the squeezing ball technique, there was a significant reduction in pain levels, demonstrating that the technique is an effective non-pharmacological method for managing procedural pain. The study also found no significant association between pre-test pain scores and most selected sociodemographic variables.

Nursing Implications Nursing Services: The squeezing ball technique is a simple, safe, and cost-effective intervention that helps reduce pain, fear, anxiety, and discomfort during IV cannula insertion. Nurses should be encouraged and trained to use this technique as part of routine pediatric care.

Nursing Education: The findings emphasize the importance of incorporating non-pharmacological pain management strategies into nursing education.

Teaching methods such as demonstrations, role plays, workshops, and audiovisual aids can enhance students' knowledge and skills regarding the use of the squeezing ball technique.

Nursing Administration: Nursing administrators should promote the integration of the squeezing ball technique into standard pediatric care practices. Training programs, workshops, and staff development activities should be organized to improve nurses' competency in procedural pain management. Adequate resources, including squeezing balls, should be made available in pediatric units.

Nursing Research: The study provides evidence supporting the effectiveness of the squeezing ball technique and serves as a basis for future research. Further studies can be conducted with larger samples, different age groups, and varied clinical settings, as well as comparisons with other non-pharmacological pain management interventions.

RECOMMENDATIONS

Based on the findings of the study, the study, the following recommendations are made:

1. To improve the findings' generalizability, a comparable study with a larger sample size might be carried out.
2. To get more trustworthy and legitimate results, the study can be repeated utilizing a real experimental design with a control group.
3. Research can be done to compare the efficacy of the squeezing ball technique compared to different non-pharmacological methods such play therapy, relaxation techniques, or distraction.
4. Other age groups, including toddlers, kids of school age, and teenagers, can be included in the study.
5. Other clinical settings, such as pediatric wards, emergency rooms, and outpatient departments, can carry out comparable research.
6. To enhance nurses' understanding and application of non-pharmacological pain management strategies, educational programs might be created.
7. For a more objective evaluation, more study may incorporate physiological indicators in addition to pain levels.

LIMITATION

- The study's small sample size may have limited how broadly the results may be applied.
- The study's limited applicability stems from its confinement to a specific hospital setting.
- Results cannot be extrapolated to other operations or age groups because only hospitalized children experiencing IV cannula administration were included.
- The study's pre-experimental design, which lacked a control group, may have an impact on how strong the findings are.
- Subjective answers, which can differ from kid to child, were used to assess pain.

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