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EFFECTIVENESS OF ORAL DEXTROSE 10% IN REDUCING PAIN DURING DPT VACCINATION AMONG CHILDREN 16-24 MONTHS AT S.V.B.P HOSPITAL, MEERUT

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ABSTRACT

Introduction: Pain during routine childhood vaccination is a common but often undertreated problem that can lead to fear, anxiety, and poor cooperation during future immunization visits. Simple, safe, and cost-effective non-pharmacological interventions are needed to minimize vaccination-related pain. Oral dextrose has been reported to provide analgesic effects during brief painful procedures. However, evidence regarding the effectiveness of 10% oral dextrose in children aged 16–24 months during DPT vaccination is limited. Therefore, the present study was undertaken to assess the effectiveness of oral dextrose 10% in reducing pain during DPT vaccination.

Objectives of the Study

- To assess the level of pain using the FLACC scale during DPT vaccination among children who receive and who do not receive oral dextrose 10%.
- To find the effectiveness of oral dextrose 10% administration in reducing pain level of children during DPT vaccination.
- To find the association between the level of pain and selected demographic variables among children.

Methodology: A quantitative research approach with a quasi-experimental, non-equivalent post-test only research design was adopted. The study was conducted in the Immunization OPD of S.V.B.P. Hospital, Meerut. A total of **60 children** aged **16–24 months** were selected using a **non-probability purposive sampling technique** and equally allocated into an experimental group (n=30) and a control group (n=30). The experimental group received **2 mL of oral dextrose 10%** two minutes before DPT vaccination, whereas the control group received routine care only. Pain was assessed immediately during vaccination using the **FLACC (Face, Legs, Activity, Cry, Consolability) Behavioural Pain Scale**. Data were analysed using descriptive statistics and inferential statistics (independent *t*-test and Chi-square test).

Results: The findings revealed that **63.3%** of children in the experimental group experienced moderate pain, **26.7%** mild pain, and **10.0%** severe pain, whereas in the control group **60.0%** experienced moderate pain, **6.7%** mild pain, and **33.3%** severe pain. The mean FLACC pain score was **4.53 ± 1.68** in the experimental group and **6.40 ± 1.55** in the control group. The difference was statistically highly significant (**t = 4.4802, p = 0.0001**), indicating that oral dextrose 10% effectively reduced pain during DPT vaccination. No significant association was found between pain level and demographic variables in the experimental group, while gender and birth weight showed significant association with pain level in the control group.

Conclusion: The study concluded that administration of **oral dextrose 10%** two minutes before DPT vaccination is a **safe, simple, effective, and child-friendly non-pharmacological intervention** for reducing procedural pain among children aged 16–24 months. Incorporating oral dextrose into routine immunization practice may improve children's vaccination experience and support quality nursing care in immunization settings.

KEYWORDS: Oral dextrose 10%, DPT vaccination, FLACC scale, pain, children, immunization, non-pharmacological intervention.

INTRODUCTION

The understanding of pain perception in infants has evolved considerably over the past few decades. Earlier beliefs that neonates and young children had an immature nervous system incapable of perceiving pain have been disproven. Current evidence demonstrates that the neuroanatomical pathways for pain transmission are functional by the 24th week of gestation, while the descending inhibitory pathways responsible for modulating pain mature much later. Consequently, infants and young children may experience heightened sensitivity to painful stimuli, emphasizing the importance of effective pain management during routine medical procedures. Immunization is one of the most common painful procedures performed during early childhood. The Universal Immunization Programme (UIP) in India vaccinates millions of children annually, with the Diphtheria, Pertussis, and Tetanus (DPT) vaccine being a key component. The DPT vaccine,

particularly the whole-cell pertussis formulation used in the public health sector, is associated with significant injection-site pain due to its inflammatory properties. Children aged 16–24 months are especially vulnerable, as they exhibit increased pain awareness, anticipatory anxiety, and behavioural resistance, which may negatively affect future healthcare experiences and increase parental distress. Oral sweet solutions have emerged as a simple, inexpensive, and effective strategy for reducing procedural pain in infants. Their analgesic effect is believed to result from activation of sweet taste receptors, stimulating endogenous opioid release and reducing nociceptive transmission. Although concentrated sucrose or dextrose solutions have demonstrated efficacy in neonates and young infants, evidence supporting their use in toddlers remains limited and inconsistent. Moreover, specialized sucrose formulations are often unavailable in resource-limited settings, whereas 10% dextrose is readily available in most healthcare facilities.

OBJECTIVES

- To assess the level of pain using the FLACC scale during DPT vaccination among children who receive and who do not receive the oral dextrose 10%.
- To find the effectiveness of oral dextrose 10% administration in reducing the pain level of children during DPT vaccination.
- To find the association between pain level and selected demographic variables of children.

METHODOLOGY

A quantitative research approach with a quasi-experimental, non-equivalent post-test only research design was adopted. The researcher selected 60 children aged 16-24 months who are scheduled for DPT vaccination by using non-probability purposive sampling technique who met the eligibility criteria and divided 30 children in experimental group and 30 children in control group. Written informed consent was obtained from parents/guardians of all 60 participants and assent from all 60 children. Inclusion criteria children aged between 16 and 24 months who attended the Immunization OPD of S.V.B.P. Hospital for their scheduled DPT booster vaccination were included in the study. Eligible participants were required to be in a stable clinical condition without any acute febrile illness on the day of vaccination. Written informed consent was obtained from the parents or caregivers before enrollment. In addition, only those children whose parents or caregivers remained present throughout the vaccination procedure, enabling complete assessment of pain using the FLACC scale, were included in the study. Exclusion criteria children were excluded from the study if they had a known history of dextrose intolerance, fructose intolerance, glucose-6-phosphate dehydrogenase (G6PD) deficiency, or any metabolic disorder that contraindicated the administration of oral glucose. Those who had received analgesics, antipyretics, or sedatives within six hours before the vaccination appointment were also excluded. Furthermore, children who were critically ill or required intensive monitoring on the day of vaccination, as well as those whose parents or caregivers declined participation or withdrew their consent at any stage of the study, were not included. Study was conducted from last week of January to march 2026 at ward and OPD of SVBP hospital, Meerut, after the written permission from SIC and Head of the department of pediatrics of SVBP hospital, Meerut. The data was collected with demographic questionnaire and FLACC scale. Children in the experimental group received 2 mL of 10% oral dextrose two minutes before vaccination, while the control group received routine care. Pain was assessed using the FLACC scale during the vaccination procedure, and the FLACC scores were recorded immediately on the data collection tool. Descriptive and inferential statistics were used for data analysis.

RESULTS

The findings of the study are presented according to the objectives of the study. The data is prepared under the subsequent sections: -

SECTION I: DISTRIBUTION OF CHILDREN ACCORDING TO DEMOGRAPHIC VARIABLES

Table 4.1: Frequency and percentage distribution of children according to age

(N = 60)

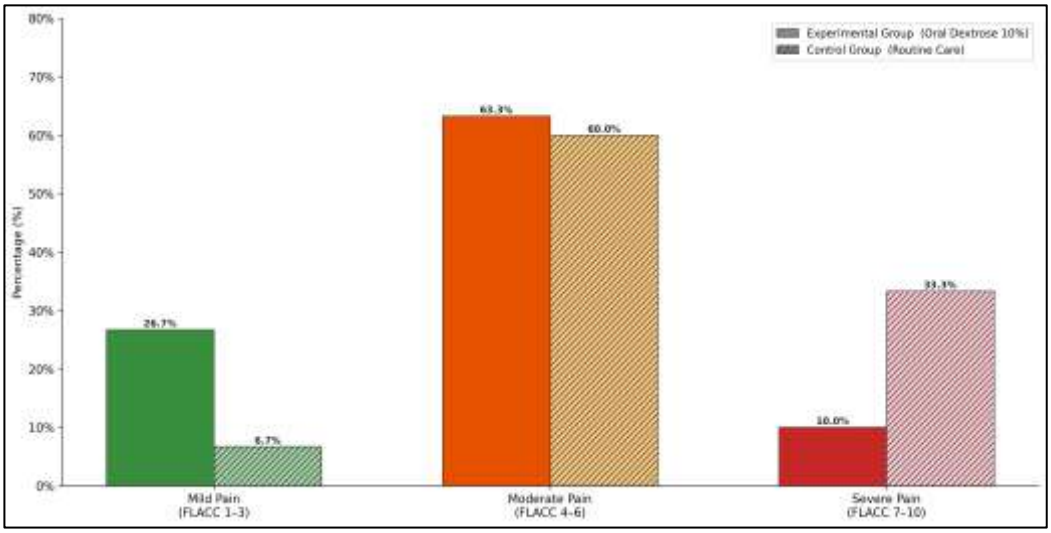
S.NO	Demographic Characterstics	experimental group		Control Group	
		Frequency	Percentage	Frequency	Percentage
1	**Age (In year)**				
	a. 16-18	12	40.0%	10	33.33%
	b. 19-21	11	36.7%	13	43.3%
	c. 22-24	7	23.3%	7	23.3%
2	**Sex**				
	a. Male	16	53.3%	14	46.7%
	b. Female	14	46.7%	16	53.3%
3	**Birth weight**				
	<2.5	7	23.3%	9	30.0%
	>2.5	23	76.7%	21	70.0%
4	**Mode of delivery**				
	a. NVD	19	63.3%	21	70.0%
	b. C- section	11	36.7%	9	30.0%

	Time of feeding before vaccination				
	a. <30 mins	8	26.6%	9	30.0%
	b. 30-60 mins	14	46.7%	13	43.3%
5	c. >60 mins	8	26.7%	8	26.7%

SECTION II: LEVEL OF PAIN DURING DPT VACCINATION AMONG CHILDREN

Table 2.1: Frequency and percentage distribution of the level of pain during DPT vaccination in both groups (N = 60)

Level of Pain (FLACC Score)	Experimental Group (n=30) f (%)	Control Group (n=30) f (%)	Interpretation
Mild (FLACC 1–3)	8 (26.7%)	2 (6.7%)	Minimal discomfort
Moderate (FLACC 4–6)	19 (63.3%)	18 (60.0%)	Moderate pain response
Severe (FLACC 7–10)	3 (10.0%)	10 (33.3%)	Intense pain / distress
Total	**30 (100%)**	**30 (100%)**	—



SECTION II: EFFECTIVENESS OF ORAL DEXTROSE 10% IN REDUCING PAIN DURING DPT VACCINATION

Table 2.1: Comparison of mean post-test FLACC pain scores between experimental and control groups — Independent t-test (n = 30 per group)

Group	n	Mean	SD	Mean Diff.	t-value (df=58)	p-value	Inference
Experimental	30	4.53	1.68	1.87	4.4802	0.0001*	Significant
Control	30	6.40	1.55	—	—	—	—

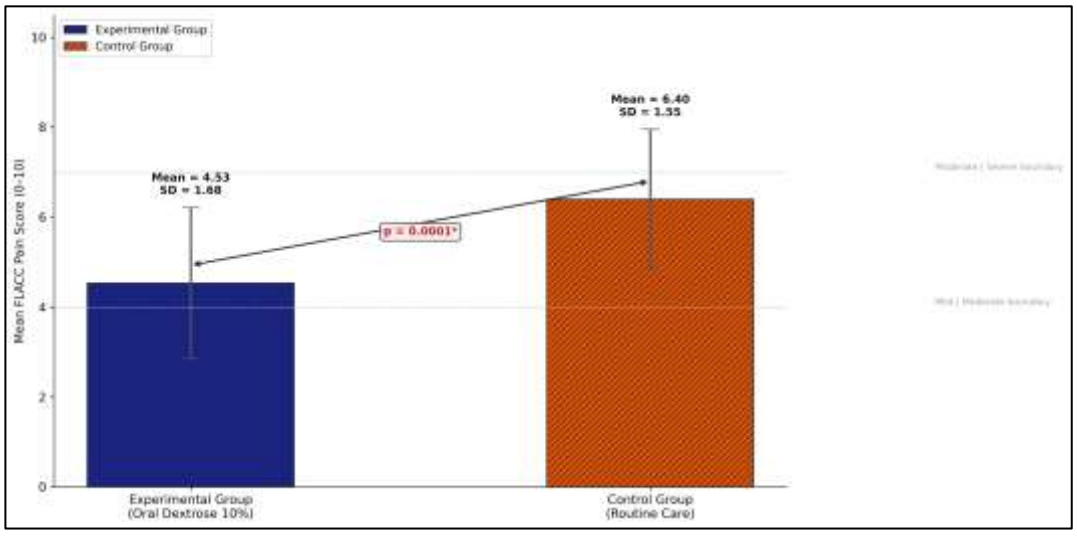


Figure 2.1: Comparison of mean post-test FLACC pain scores between experimental and control groups.

SECTION III: ASSOCIATION BETWEEN LEVEL OF PAIN AND SELECTED DEMOGRAPHIC VARIABLES

Table 3.1: Association between level of pain and demographic variables — Experimental Group (n = 30)

S.No.	Demographic Variable	df	Calculated χ^2	Table Value (p=0.05)	Inference
1	Age (in months)	4	1.24	9.49	Not Significant
2	Gender	2	0.83	5.99	Not Significant
3	Birth weight	2	1.47	5.99	Not Significant
4	Last feeding time before vaccination	4	2.89	9.49	Not Significant
5	Mode of delivery	2	0.35	5.99	Not Significant

Table 3.2: Association between level of pain and demographic variables — Control Group (n = 30)

S.No.	Demographic Variable	df	Calculated χ^2	Table Value (p=0.05)	Inference
1	Age (in months)	4	3.18	9.49	Not Significant
2	Gender	2	6.52	5.99	Significant*
3	Birth weight	2	7.34	5.99	Significant*
4	Last feeding time before vaccination	4	2.74	9.49	Not Significant
5	Mode of delivery	2	1.86	5.99	Not Significant

A total of 60 children were included in the study, with 30 participants each in the experimental and control groups. Pain during DPT vaccination was assessed using the FLACC scale. In the experimental group, 8 (26.7%) children experienced mild pain, 19 (63.3%) experienced moderate pain, and only 3 (10.0%) experienced severe pain. In comparison, the control group comprised 2 (6.7%) children with mild pain, 18 (60.0%) with moderate pain, and 10 (33.3%) with severe pain, demonstrating a higher proportion of severe pain among children who did not receive the intervention. Comparison of post-test FLACC pain scores using an independent *t*-test revealed a statistically significant difference between the two groups. The experimental group had a significantly lower mean pain score (4.53 ± 1.68) than the control group (6.40 ± 1.55), with a mean difference of 1.87 ($t = 4.48$, df = 58, $p = 0.0001$). These findings indicate that the intervention was effective in reducing pain during DPT vaccination. The association between post-test pain level and selected demographic variables was examined using the chi-square test. In the experimental group, pain level was not significantly associated with age, gender, birth weight, last feeding time before vaccination, or mode of delivery (all $p > 0.05$). In contrast, in the control group, pain level showed a significant association with gender ($\chi^2 = 6.52$, df = 2, $p < 0.05$) and birth weight ($\chi^2 = 7.34$, df = 2, $p < 0.05$), while no significant associations were observed with age, last feeding time before vaccination, or mode of delivery (all $p > 0.05$). Overall, the findings demonstrate that the intervention significantly reduced pain during DPT vaccination and that pain outcomes in the experimental group were independent of the selected demographic characteristics.

DISCUSSION

The present study demonstrated that infants in the experimental group experienced significantly lower pain during DPT vaccination compared with those in the control group. Most infants in the experimental group reported moderate pain (63.3%), with only 10% experiencing severe pain, whereas one-third (33.3%) of infants in the control group experienced severe pain. The mean post-test FLACC pain score was significantly lower in the experimental group (4.53 ± 1.68) than in the control group (6.40 ± 1.55), with a statistically significant difference (t = 4.4802, p = 0.0001). These findings indicate that the intervention was effective in reducing vaccination-related pain among infants. Similar findings were reported by Bueno et al. (2013), who found that infants receiving 10% dextrose before painful procedures exhibited significantly lower pain scores and shorter crying duration than controls. Likewise, Stevens et al. (2016) concluded that sweet-tasting solutions effectively reduce procedural pain in neonates. Kassab et al. (2012) also reported significantly lower pain responses following oral dextrose administration, while Harrison et al. (2017) recommended the routine use of sweet solutions for minor painful procedures because of their safety, low cost, and effectiveness. These findings support the use of oral 10% dextrose solution as a simple, safe, and effective non-pharmacological intervention for reducing pain during DPT vaccination in infants.

IMPLICATIONS

Nursing Practice

The findings suggest that oral dextrose 10% can be used as a simple, safe, and cost-effective non-pharmacological intervention to reduce DPT vaccination pain in children aged 16–24 months. Nurses can educate parents about its administration, use the FLACC behavioural pain scale for routine pain assessment, and implement standardized nursing protocols for pain management during immunization.

Nursing Education
The study findings can be incorporated into the nursing curriculum to emphasize non-pharmacological pain management during paediatric vaccination. Nursing students should be trained in FLACC pain assessment and oral dextrose administration, while educators can use this study as an example of evidence-based nursing practice.

Nursing Administration
Nurse administrators can develop standardized protocols for pain management during childhood immunization. Regular in-service training can be conducted for nursing staff, and oral dextrose 10% may be included as a routine supply in immunization clinics.

Nursing Research
The study adds to the evidence on non-pharmacological pain management during DPT vaccination. Further research should compare different concentrations of oral dextrose and examine the long-term effects of pain management on needle fear and immunization compliance.

RECOMMENDATIONS
Based on the findings, similar studies may be conducted with larger sample sizes to improve generalizability. Randomized controlled trials are recommended to strengthen the evidence. Future studies may compare different concentrations of oral dextrose and evaluate its effectiveness against other non-pharmacological interventions. Multi-centre studies and research on nurses' knowledge, attitudes, and practices regarding vaccination pain management are also recommended.

LIMITATIONS
The study was limited to a single hospital in Meerut with a sample of 60 children, which restricts the generalizability of the findings. It included only children aged 16–24 months receiving the DPT booster dose. The quasi-experimental design without true randomization may have introduced bias. Only immediate pain responses were assessed, and different concentrations of oral dextrose were not compared.

CONCLUSION
The present study concluded that oral dextrose 10% is an effective, safe, and inexpensive non-pharmacological intervention for reducing pain during DPT vaccination among children aged 16–24 months. Children who received oral dextrose 10% before vaccination had significantly lower FLACC pain scores than those in the control group. The findings support the routine use of oral dextrose 10% as a simple nursing intervention to improve comfort during immunization. Therefore, oral dextrose 10% can be recommended as an evidence-based strategy for pain management during DPT vaccination in young children.

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