ORIGINAL RESEARCH PAPER

Paediatric Medicine

ANALGESIC EFFECT OF ORAL DEXTROSE VS PLACEBO IN CHILDREN FROM BIRTH TILL 5 YEARS DURING IMMUNISATION: A RANDOMISED CONTROLLED TRIAL.

KEY WORDS: Immunization, oral dextrose, FLACC /NIPS score.

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ABSTRACT

Routine immunization is the commonest cause of iatrogenic pain in childhood. Dextrose (25%) has been shown to produce calming behavior, thereby reducing procedural pain in children. In this study, we want to assess the level of pain and duration of crying in experimental (who received oral dextrose) vs control group (who received distilled water). The level of pain evaluated as per FLACC score was significantly more in the control group. The difference in duration of cry between experimental and control group was also statistically significant. NIPS score at 1min for neonates showed no statistical significance for the level of pain, whereas the mean duration of cry was longer (38±11.14sec) in control group as against 35±11.8 sec in experimental group. Therefore, oral dextrose (25%) can be used in paediatric units as an analgesic for minor needle related painful procedures.

INTRODUCTION

Immunization is one of the most cost effective public health intervention and largely responsible for reduction of Under 5 mortality. Routine immunization is the commonest cause of iatrogenic pain in childhood. Immunization associated pain often goes unrecognized and is dismissed as short lived but it has numerous short and long term effects. These effects include intense reaction to future procedures, higher anxiety levels, increased distress, increased oxygen consumption and higher level of pain in adult life.[1]

Preliminary data suggests that untreated pain early in life may also have deleterious effects on the developing Central nervous system[2]. Untreated pain not only results in immediate pain and fear in infants at the time of procedure, but also leads to long term fear of needle pain and avoidance of medical care. Behavioural measures are the most reliable tools when measuring short sharp procedural pain such as during injections. Various tools for assessment of pain are available such as NIPS (Neonatal Infant Pain Scale), NFCS (Neonatal Facial Coding System), FLACC (Face, Legs, Activity, Cry, Consolability) and Wong Baker Faces Pain Scale. There are two types of pain management; pharmacological and non-pharmacological. The non pharmacological measures to alleviate pain and reduce discomfort in children include skin to skin contact, breast feeding, swaddling, providing oral tactile stimulation or sucking on a pacifier. Pharmacological intervention are rarely used for fear of their adverse effects; so non-pharmacological interventions are valuable alternatives. Sucrose is a dissacharide consisting of fructose and glucose. Dextrose (d-isomer of glucose) is a monosaccharaide. These substances have been shown to produce calming behaviour, thereby reducing procedural pain in neonates. The mechanism of action of sweet taste in producing analgesia appears to be opioid mediated. Glucose solutions are readily available in neonatal units and easier to use in routine practice. It is important that the distracter should be cheap, easily available and easily usable without any additional training and less time consuming so that it can be used easily in busy settings as well.

As an analgesia, oral sucrose has been used and recommended by American Pain Society for minor painful procedures in neonates. In Cochrane review of various RCT on the subject, it has been found that a single dose of 0.5ml to 2ml of 12-15% sucrose given 2 minutes prior to a painful event is considered safe and effective in decreasing the pain experienced by the infant.[3] Expressed breast milk, oral sucrose and oral dextrose have been accepted methods for non-pharmacological analgesia in neonates in addition to NNS and swaddling.

AIMS & OBJECTIVES

1. To assess the level of pain experienced in experimental and control group.
2. To assess the duration of cry in experimental and control group.

METHODOLOGY

The randomized control trial was conducted in Immunization Clinic of Pediatrics Department at Hitech Medical College and Hospital Bhubaneswar over a 6 months period from 1st June 2022 to 30th November 2022.

Inclusion Criteria - Infants eligible for study were between birth to 5 years age who presented to Immunization clinic at our hospital for intramuscular vaccination. All hemodynamically stable babies irrespective of their gestational age or birth weight were included.

Exclusion Criteria -

1. Babies on IV or oral sedatives/ analgesics
2. Babies who were subjected to any painful procedure within 30 minutes prior to this study.
3. Babies with altered physiological status like cerebral palsy, seizure or neurological disorder.
4. Babies with contra-indication to dextrose.

The benefits and risk of study was explained to parents arriving at immunization clinic. A written informed consent was taken. Anonymity and confidentiality of the study subjects were assured.

Tools And Data Collection -

1.Socio-demographic profile - The data was collected after an interview with the child's caregiver. It consisted of age,

gender, birth weight, and gestational age of babies.
2.FLACC Behavioural pain scale - It was used to measure pain in children between 2 months to 5 years in 5 categories of behavior. Each category scored from 0-2, resulting in a total of 10. The higher the score, the greater the pain response. And NIPS pain scale was used for newborns.
3.Procedure of oral dextrose administration - Assignment to control or treatment group was randomized using a computer generated blocked randomization scheme and it was a double blind study.

Intervention -
After randomization, each infant allocated in the experimental group, was given 1 ml of 25%dextrose via a dropper, 1 min before the vaccination by a particular trained nurse and placed over 30 sec on the anterior aspect of tongue by the researcher. Similarly, in the control group, the baby was given 1ml of distilled water orally 1 min before the vaccination. All children received standard doses of intramuscular injection of volume 0.5 ml using 23 gauze needle. Then, they were observed for 1 min using FLACC score and their duration of cry was measured using a stopwatch by the nurses working in the study settings. We did videography and it was analyzed by real time analysis. The researchers evaluated the pain induced by the needle using FLACC score at 0min and at 1min and NIPS score for newborns both for experimental and control group.

RESULTS

The age wise distribution of study population revealed that majority of children in both experimental(80%) and control group (75%) were infants. Majority were males in experimental group, ie, 56%(28) vs 46% (23) in control group while majority were females in control group, ie 27(54%) as compared to 22 females in experimental group(44%).

Table 1: FLACC Score Denoting Pain Scale

	FLACC 0MIN		P Value	FLACC 1MIN		P Value
	Expt	Cont		Expt	Cont	
Mild	0	1	-	8	2	0.070
Moderate	13	6	0.035	32	18	0.002
Severe	37	43	0.552	10	30	0.004
Total	50	50		50	50	
	Chi-Square=9.936, p value =0.127, Not Sig			Chi-Square=23.900, p value =0.004,Sig		

Table 1 showed more children were experiencing severe pain in control group (30/50) with p value (0.004) being significant. It depicted a high statistical difference (chi square-23.9) with regards to degree of pain in experimental vs control group when FLACC score was seen at 1min.

Table 2: Comparison Of Level Of Pain In Experimental And Control Group In 2 Months To 5 Years

Level of pain FLACC 1	Mean ± SD	Mean Difference	t	df	P value
Expt	5.08±1.83	0.98	-2.856	98	0.005(S)
Cont	6.06±1.58				

The median FLACC score at 1 min was 5 in experimental group vs 6 in control group. There was significant difference in the level of pain as denoted by FLACC score between experimental and control group with the mean difference being 0.98 and p value being 0.005 which was statistically significant. The tabulated value at 98df was 1.98.

Table 3: Duration Of Cry In Children 2 Months To 5 Years

Duration of Cry (Seconds)	Mean ± SD	Mean Difference	T	df	P value
EXPT	41.44±13.72	-11.48	-4.139	98	0.001
CONTROL	52.92±14.01				

The median duration of cry was 55 sec in control group as compared to 40 sec in experimental group.

In relation to the duration of cry in FLACC score, the mean crying time of experimental group was 41.44+-13.72 seconds as compared to 52.92+-14.01 seconds in control group with a significant statistical difference between both groups (p value=0.001).

Table 4: NIPS Scoring Corelating With The Severity Of Pain

	NIPS 0MIN		P Value	NIPS 1MIN		P Value
	Expt	Cont		Expt	Cont	
0_2(Mild)	2	2	0.701	7	5	0.456
3_4(Mod)	0	0	-	5	6	0.881
≥4(Severe)	13	13	0.308	3	4	0.885
Total	15	15		15	15	
	Chi-Square=3.60, p value =0.463, Not Sig			Chi-Square=0.733, p value=0.947, Not Sig		

The sex wise distribution of children taken for NIPS score was 11 females out of a total of 15 in experimental group and 12 females out of a total of 15 in control group.

The median NIPS score at 1min in both experimental and control group was 3. The mean NIPS score at 1min for experimental group was 2.47 which was less compared to 3.13 for control group.

Table-4 showed that 4 children out of 15 were experiencing severe pain (score more than or equal to 4) in control group which was calculated by using NIPS scoring in infants. Similarly, 3 out of 15 children were experiencing severe pain in experimental group. The overall calculated "p" value for NIPS score at 1min was 0.947 with chi square value being 0.733 which was not statistically significant

Table 5: Comparison Of Level Of Pain In Experimental And Control Group In Newborns

Level of pain_NIPS 1	Mean ± SD	Mean Difference	t	df	P value
Expt	2.47±2.64	0.66	0.743	28	0.497(NS)
Cont	3.13±2.66				

The level of pain was 2.47+-2.64 in experimental group and 3.13+-2.66 in control group with the mean difference being 0.66 .The mean score of level of pain is higher in control group. However the results are not statistically significant.

When given oral dextrose, 5 newborns cried for 20-30 sec as compared to 3 in control group. 2 infants in both experimental n control group cried for 30-40 seconds. 8 infants cried for 40-50 sec when given oral dextrose as compared to 10 infants who cried for 40-50sec when given distilled water. It was inferred that 66% of infants cried for 40-50 seconds in the control group as against 53% in the experimental group.

Table 6: Duration Of Cry In Newborns

Duration of cry	Mean±SD	Mean Difference	t	df	P value
EXPT	35.00±11.80	-3	-0.716	28	0.464
CONTROL	38.00±11.14				

The mean duration of cry amongst newborns in control group was higher (38+-11.14 seconds) as against the experimental group (35+- 11.80 seconds) with the mean difference being -3 and p value being 0.464 which was statistically insignificant.

DISCUSSION

Our triple blinded study was conducted to assess the effectiveness of oral dextrose(25%) in reducing pain due to intramuscular injection during immunization in children from birth to five years of age. The effectiveness was evaluated using standardized pain evaluation score (FLACC score in children and NIPS in newborn). The study findings showed that 20%of children in experimental group experienced severe pain, as compared to 60%in control group. Mean level of pain as per FLACC score was 5.08 1.83 and 6.06 1.58 in

experimental and control group respectively. Similar results have been observed by different researchers (**Rouben N et al[4]). Chermont et al (2010)[5]** compared skin to skin contact, which can be a confounding factor with oral sucrose and concluded that the latter is more effective in reducing pain.

The most prominent visible presentation resulting from painful procedures is duration of cry. We observed that the duration of crying was more prolonged in control group (52.92±14.01sec) vs experimental group (41.44±13.72sec). **Shadkam & Lotfi (2008)[6]** had similar experiences and additionally they found that pain is better controlled with oral dextrose in comparision to local anaesthetic agent. **Morelius et al (2009)[7]** assessed infants' stress at 3 months immunization and found that glucose did not have significant effect on crying behaviour.

Our study among small group of newborns showed that 4 of them experienced severe pain as per NIPS in control group as compared to 3 children in experimental group. However, this was not statistically significant (p value=0.947). Similar study done by **Taddio et al (2010)[8]** recommended that an administration of a sweet-tasting solution during vaccination reduced pain at the time of injection among infants up to 12 months of age who cannot be breastfed during vaccination.

Our study determined that 25% dextrose had an analgesic effect upon children from birth till 5 years during immunisation procedure. Advantages of using 25% dextrose are easy availability in hospital set up, acceptance of taste by the infants and the ease of administration.

The strengths of our study is use of triple blinded RCT and standardised scales like FLACC and NIPS. Drawbacks of this study is relatively small sample size, especially in newborns. We failed to enrol more newborns in the specified period due to several confounding factors.

RECOMMENDATIONS

Based on our study findings, it can be suggested to use oral dextrose(25%) in paediatric units to alleviate pain during minor needle related procedures for children.

Replication of this study with larger sample size and different settings is recommended so that the results could be generalised and applied at a community level.

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