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EFFICACY OF SENSORI-MOTOR INTERVENTIONS ON NON-NUTRITIVE SUCKING AND WEIGHT IN PRETERM INFANTS

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Abstract: BACKGROUND: Sensori-motor intervention is one type of early intervention based on the concept that brain development used to optimize preterm infant's growth and development. **OBJECTIVES:** The effect of Oral and Non-Oral Sensory-Motor Intervention on Oral Feeding Performance and Weight in Preterm Infants. **METHODOLOGY:** 30 preterm infants both males and females between Gestational Age 28-34 weeks, feeding by Gavage tube were included in the study. Cleft palate, Cleft lip, Broncho-Pulmonary Dysplasia, Asphyxia, Jaundice and Infants who are on ventilator/life support were excluded. **PROCEDURE:** With Simple Random Sampling, two groups were made. Sensory-Motor intervention was given to Experimental group (Group A) and hand was placed inside the incubator and routine nursery care was continued for Control group (Group B). Interventions were started 3rd day of life. Non-Nutritive sucking Score (NNS) and Weight was noted as pre-test score. Then Sensory-Motor intervention were given to preterm infants for period of 10 day, 30 mins, 1 session /day. Non-Nutritive sucking Score (NNS) and weight was noted as post test score on 1st, 3rd, 5th, 7th and 10th, data was analyzed. **RESULTS:** Non-Nutritive sucking score and Weight showed significant improvement for 10th day of intervention ($p=0.000$) and ($p=0.003$). **CONCLUSION:** Sensory-Motor intervention helps in improving Oral feeding performance in preterm infants.

Keywords: Non-Nutritive Sucking Score, Oral feeding performance, Preterm Infants, Sensory-motor Intervention, Weight.



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INTRODUCTION

World Health Organisation (WHO) defines 'Premature infants as neonates born before 37 weeks (258 Days) gestational age' ⁽¹⁾⁽²⁾. A preterm baby cannot be relied upon demand feeds as baby may be unable to suck or swallow and is liable to regurgitate inhales the feeds resulting into cyanotic attacks while being fed. Inefficient feeding may lead to excessive fatigue in the infant and contribute to weight loss or inadequate weight gain in this medically fragile population. Because infants with sucking or swallowing problems are at increased risk of aspiration, safety of infant feeding is also an important consideration of this transition. Throughout the last two decades findings have suggested that preterm infant's demonstrate an improvement in their behavioural state organisation, feeding progression and length of hospitalisation of which tactile stimulation is reported to play an integral role. Advances in newborn intensive care have dramatically improved the survival of infants born preterm however, many present with oral feeding difficulties. These difficulties are of concern to health professionals because they often impede the transition to independent oral feeding and thus delay hospital discharge, negatively affecting mother-infant interactions and potentially leading to childhood feeding disorders⁽³⁾.

Preterm infants have poor suck, including the unexpected and often maladaptive extra-uterine environment of the Neonatal Intensive Care Unit (NICU) ⁽³⁾. Sensory deprivation and motor restriction can disrupt development of the motor cortex and cerebellum, which are essential for normal sensori-motor control ⁽⁴⁾⁽⁵⁾⁽⁶⁾⁽⁷⁾. Such atypical input to the trigeminal sensory system is unexpected and detrimental during this critical period of Oro-motor development in infancy. Hence, facilitation of oral feeding skills is typically a key focus in the Neonatal Intensive Care Unit (NICU) and attainment of oral feeding is frequently a primary criterion for discharge from the NICU for healthy preterm infants. Sensori-Motor intervention is based on the concept that brain development (i.e., neuronal organization and connections) is primarily regulated by genetics but is also influenced by environmental inputs through various senses ⁽³⁾.

Notably, the sensori-motor intervention provided must be developmentally suitable (i.e., it must meet the needs of the infant) and not cause undue stress. Thus, provision of positive sensori-motor input to the oral structures and whole body is needed to optimize preterm infant's developmental outcomes ⁽⁸⁾.

Hence we aimed to study the effect of Sensori-Motor intervention on Oral Feeding Performance in Preterm Infants.

OBJECTIVES 1) To study the effect of Oral and Non-Oral Sensori-Motor Intervention on Oral Feeding Performance in Preterm Infants.

2) To study the effect of Oral and Non-Oral Sensori-Motor Intervention on Weight in Preterm Infants.

MATERIALS AND METHODS

STUDY DESIGN: In this experimental design infants were randomized into two groups Oral Tactile/Kinaesthetic intervention combined and control. Ethical Approval was taken from institutional ethical committee. After written parental consent was obtained, 30 preterm neonates from the NICU, who had (1) GA between 28 to 34 weeks (2) Infants receiving all feedings by tube (3) Both male and female infants (4) Infants having APGAR score more than 6 were included in study. Infants having (1) Congenital malformations like Cleft lip, Cleft palate (2) Medical illnesses Bronchopulmonary dysplasia, Jaundice, Asphyxia, Respiratory Distress and (3) Infants on Ventilatory support were excluded from study.

PROCEDURE: The oral intervention consisted of sensorimotor input to the oral structures, peri-oral stimulation to the cheeks, lips, and jaw for 7 minutes and intra-oral stimulation to the gums and tongue for 8 minutes. The infants were in supine position in the incubator throughout the oral intervention. The 15-minute oral intervention was administered once a day. The Tactile kinaesthetic intervention consisted of stroking the body starting from the head, followed by the neck, shoulders, back, legs, and arms for ten minutes and passive range of motion of the arms and legs for five minutes. The infants were in the incubator, in prone and supine positions, respectively, during the intervention. The 15-minute tactile/kinaesthetic intervention was administered once a day (total session of 30 minutes per day). The Oral and tactile / kinaesthetic intervention consisted of the same 15-minute oral and 15-minute tactile/ kinaesthetic interventions. Each type of intervention was administered once a day. The control intervention involved placing her hands in the incubator but not touching the infant for 30 minutes once a day and routine nursery care was continued⁽⁸⁾. The interventions were administered for a total of 10 days, starting from 3rd day of life.

RESULTS

DATA ANALYSIS

Weight and NNS score was noted on 1st, 3rd, 5th, 7th and 10th day. The NNS and weight was documented as post treatment score. Student “t” test was used to analyse difference between groups. Repeated measure ANOVA was used to compare the effect of intervention on NNS and weight for 10 days of intervention.

TABLE 1: Comparison of Mean Difference Of NNS Between Group A And Group B.

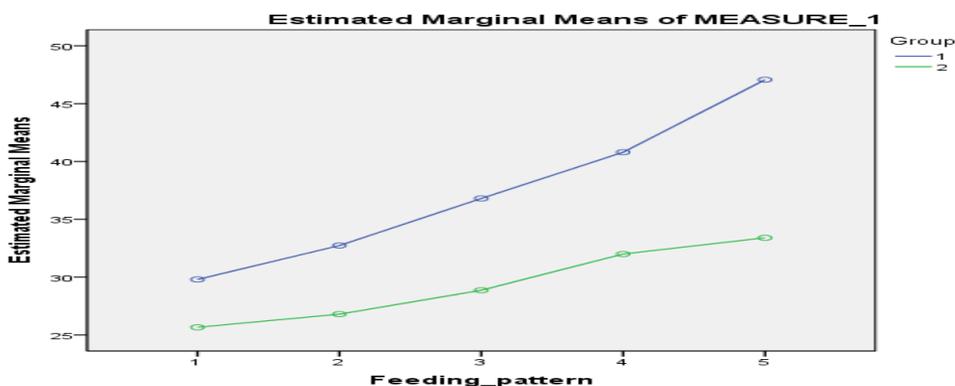
NONNUTRITIVE SUCKING SCORE				
GROUP	PRE TREATMENT	POST TREATMENT	MEAN DIFFERENCE	p VALUE
GROUP A	29.8	47.07	17.27	0.000

GROUP B	25.6	33.4	7.8
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TABLE 2: Comparison of Mean Difference Of Weight Between Group A And Group B.

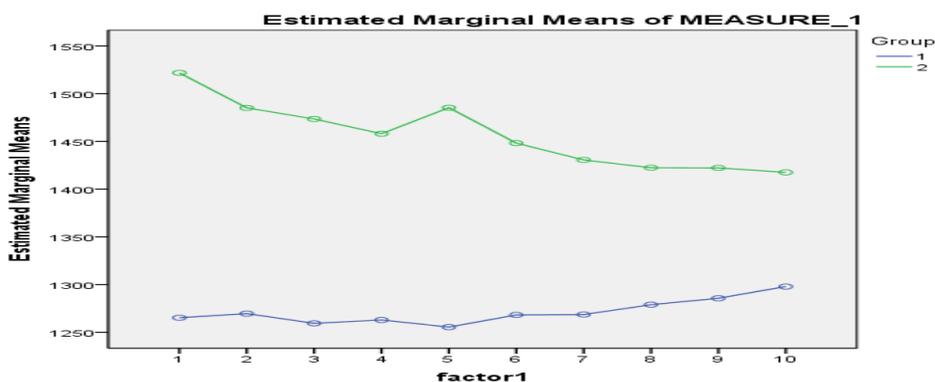
WEIGHT (IN GRAMS)				
GROUP	PRE TREATMENT	POST TREATMENT	MEAN DIFFERENCE	p VALUE
GROUP A	1265	1299	33.53	0.003
GROUP B	1526	1418	-108.7	

GRAPH 1: Comparison Of Estimated Marginal Means Of Non-Nutritive Sucking Score (Feeding Pattern /NNS) Between Group A (1) And Group B (2).



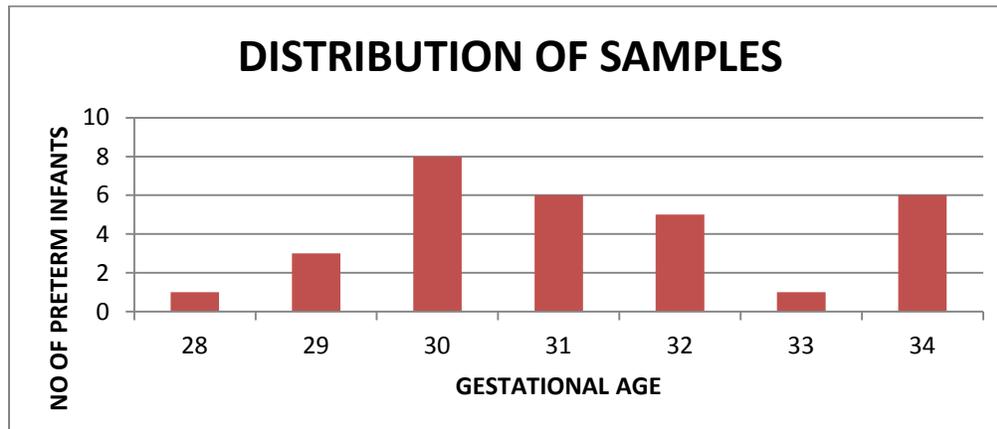
GRAPH 1: NNS shows statistical improvement in given duration.

GRAPH 2: Comparison Of Estimated Marginal Means Of Weight Between Group A (1) And Group B (2).



GRAPH 2: The weight gain is statistically not significant for given duration.

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Paired 't' test was used to compare the NNS and Weight in Group A. When compared, NNS showed highly significant difference ($p=0.000$), whereas weight showed no significance ($p=0.193$).

Paired 't' test was used to compare the NNS and Weight in Group B. When compared, NNS showed significance ($p=0.000$), and weight showed significant difference ($p=0.009$).

Unpaired 't' test was used to compare the NNS and Weight between Group A and Group B showed highly significant difference ($p=0.000$) and ($p=0.003$).

A Repeated Measure ANOVA was done and it shows that NNS score has significant improvement over defined duration but increase in weight is not statically significant for given duration of intervention.

DISCUSSION

The preterm infant has poor oral-motor control related partly to weaker muscle tone around the mouth, less sensation and less tongue strength than the full term infant. The improved oral feeding performance after early oral sensori-motor stimuli may be due to enhanced sucking skills, such as a more mature sucking pattern⁽⁹⁾. Preliminary evidence suggests that oral stimulation given prior of feedings to preterm infants 32-36 weeks PMA (born 30-34 weeks PMA) can increase weight gain, decrease transition time from gavage to total oral feedings, and decrease length of hospital stay⁽¹⁾.

Infants who received Sensori-Motor intervention showed significantly higher sucking pressures over the entire experiment suggests may be the result of the tactile programme enhancing the maturity of the sucking reflex⁽¹⁰⁾. As a consequence of improved and accelerated sucking, tactile stimulation may enhance digestion through increased lingual lipase secretion and activity⁽¹⁰⁾.

The oral and peri-oral stimulation decreases hypersensitivity, increases ROM, Strength, increases oro-motor organisation and active reflex behaviour that facilitate independent oral feedings in preterm infant's⁽⁴⁾. These improvements may be due to the direct sensorimotor input to the oral musculoskeletal system involved in sucking. The oral intervention probably facilitated the neuro-motor development of the oral musculoskeletal system. The oral intervention may also have enhanced suck–swallow–respiration coordination by providing a patterned input to the brainstem central pattern generator circuitry, promoting its neuronal development⁽⁴⁾.

The Tactile/ Kinaesthetic (T/K) intervention probably facilitated motor development of the trunk and limbs, which may have contributed to the advancement of oral feeding performance. Proper trunk control and Postural alignment provided a stable base for sucking, swallowing, and respiration and thereby may facilitate their function and coordination. Increased Vagal activity, increased gastric mobility and weight gain⁽¹²⁾ are observed after tactile stimulation to preterm neonates. Preterm infants who received tactile stimulation lost significantly less weight during the first week of life and gained more weight overall than controls. The possible mechanisms through which preterm infants gained more may be due to significant and enhanced sucking behaviour and greater acidity of stomach. Concentrations and progression to all suck feeds were earlier as compared to their controls⁽¹²⁾.

The changes are not significant in Control group may be due to their immaturity and/or decreased endurance. Very premature infants prior to about 32 weeks of gestation have a suck–swallow pattern that differs from that of the term infant as they are not able to coordinate sucking activities during the swallowing process. Feeding directly into the stomach and/or intestine by gastric and transpyloric feeding, respectively, bypasses the immature suck–swallow coordination in these infants, but remains subject to other immaturities such as poor gastric emptying and immature small intestinal motility. The immature suck–swallow coordination, poor gastric emptying, immature small intestinal motility, decreased Gastro-Anal transit period and absent motilin receptor leads to decreased oral feeding performance in preterm infant receiving only enteral feeds by Gavage tube in the control group⁽¹³⁾.

Thus Sensori-Motor Intervention provided to optimize preterm infant's growth by proper neuronal organization and connections, leading to mature Suck–Swallow-Breathe pattern, release of hormones like Gastrin, Insulin, improved Gastric Emptying.⁽⁸⁾

Thus improves oral feeding performance in preterm infants.

RECOMMENDATIONS

1. Duration can be increased for the intervention.
2. Can be done in different geographical areas.

3. Study can be conducted on larger population.

CONCLUSION

Preterm infants who had decreased co-ordination between Suck-Swallow-Breathe benefit from Oral and Non-Oral Sensori-Motor intervention. Non-Nutritive sucking score and Weight increased significantly for given duration of 10 days. Thus the study concludes that Oral and Non-Oral Sensori-Motor Intervention improves Oral Feeding Performance in Preterm Infants.

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