



Effectiveness of Vestibular Stimulation on Weight Gain in Preterm Infants

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(Received: 07 January 2024

Revised: 12 February 2024

Accepted: 06 March 2024)

KEYWORDS

vestibular stimulus,
weight gain,
premature infant,
NICU

Abstract: Premature infants undergo a lot of stressful procedures during care and treatment procedure, which may lead to weight changes. Vestibular stimulation is an intervention designed to improve the developmental and physiological outcomes of preterm infants admitted to the neonatal intensive care unit (NICU). The aim of this study was to evaluate the effect of vestibular stimuli on weight gain in preterm infants admitted to the NICU. Quasi experimental study design was used in this study; Total 10 Preterm infants admitted to the NICU who met the inclusion criteria were selected. All 10 preterm infants under went weight monitoring as a pre-test measurement. The intervention method was a vestibular stimulation program which was performed by the researcher for 30 minutes twice daily for 2 weeks. End of 1st week and second week weight measurement was taken as a post test intervention. All the data's were tabulated and statistically analyzed. Post intervention weight gain was significant in the group compared to the pre-intervention ($p < 0.005$). This indicates that the vestibular intervention improves weight gain in premature infants. Since premature infants are usually hospitalized in the NICU for a long time due to their low weight and poor physical condition. Hence, considering its positive outcomes, besides specialized care, this effective and very low cost method could be used by physiotherapist to promote weight gain and early discharge of preterm infants.

Introduction

One of the major health indicators of a country is its infant mortality rate (1). A preterm infant is a live neonate born before 37 full weeks of pregnancy (2). Despite advances in the medical sciences, the rate of preterm births is still on rise (3). According to the latest statistics released by the World Health Organization, premature infants account for 11.1% of births (4). Four million babies born in the United States each year, an average of 5.12% is premature (5). Iran is also one of the countries with a high prevalence of preterm labour so that premature infants comprise about 10% of births (6). One of the most common problems in infants is low birth weight, which is a key indicator of health in the society (7, 8). Weight is one of the main determinants of physical and cerebral growth in infants, especially premature infants. Infants represent a highly vulnerable group of the society, and the lower birth weight makes them even more susceptible to various factors. Thus, birth weight is one of the leading causes of neonatal mortality in the world (9, 10). Infants with low birth weight are particularly prone to problems such as sensory-neurological disorders, cerebral palsy, cognitive and speech delays, neuromotor and visual

impairments, hearing loss, behavioural, psychosocial, and school dysfunction (11). Most low birth weight infants suffer from multiple disabilities (12), which may persist until school age and beyond (13). Premature infants also have an extremely vulnerable nervous system that undergoes the fastest period of brain development in the extra uterine environment (14). The growth rate of the central nervous system (CNS) is considerably fast in the third trimester of fetal development (15). Given that with premature birth, CNS growth is inevitably sustained outside the uterus and in the NICU, it may be significantly affected by the environment (16). These infants had to be admitted to NICU in the first weeks of months of life due to a plethora of problems related to prematurity, such as breathing, nutritional, body temperature, jaundice, and other disorders (17). Maintaining physiological stability and weight gain are vital for premature infant discharge (18). Since the digestion system of premature infants is weak, it must be improved through various interventions.

Non-pharmacological methods such as vestibular stimulation, skin-to-skin contact (19), breastfeeding (20) and non-nutritive sucking (21) can be used to



avoid the harmful effects of pharmacological methods. These techniques can effectively improve infant responses through the involvement of various tactile, balance-motor, tactile, or olfactory systems (22, 23). Since 1960, researchers have proposed different types of multi sensory stimulation for hospitalized preterm infants in order to simulate the intrauterine environment in the first weeks of life, and therefore maintain and facilitate development of the preterm infant.

The stimulation programs include a combination of auditory, motor, and visual stimulation, with reported positive outcomes in both healthy preterm infants and infants suffering from premature complications (24). So far, several evolutionary models for neonatal care have been proposed for physiotherapist. The professional position of physiotherapist should not be constrained to specialized clinical work such as arterial blood sampling intubation, etc., Therefore, one of the proposed strategies for weight gain and stabilization of the physiological state of preterm infants is vestibular stimulation program. The aim of this study was to determine the effect of vestibular stimuli on weight gain in preterm infants admitted to the NICU.

Method

The Quasi experimental method and convenient sampling method was used to collect the pre and post intervention data's. The study samples were selected by the following inclusion criteria both sexes born at 28 - 36 weeks of gestation (mild preterm), Birth weight of 1000gms -2500gms within the first 48 hours, Apgar score > 7 at 1st and 5th minute with no resuscitation required at birth and Infants who are medically stable with medical conditions primarily related to immaturity such as elevated bilirubin and mild hypoglycaemia and hypocalcaemia. The following are excluded from the study are Premature infants with genetic and congenital anomalies, any infections, such as, HIV, syphilis,

hepatitis B, septicaemia and intracranial, IUGR, Hypothyroidism, inborn errors of metabolism, Any evidence of intraventricular haemorrhage/ central nervous system dysfunction and Maternal history of high blood pressure, diabetes.

The informed consent obtained from the parent/guardian after the explanation about the intervention program and its benefits. The subjects were taken in a single group, Quasi experimental study. Samples were further divided as per the gestational age. (28.0- 32.6 weeks and 33.0- 36.6 weeks). The stimulation given for half an hour, twice a day, according to the infant feeding and sleep- time schedules, for 10 consecutive days. The mother trained simultaneously and advised to follow the same, twice daily. The baby's weight gain is monitored at end of each week, like 1st, 2nd week of life. Finally the weight measurement from pre and post intervention is tabulated and analysed

Results

According to the findings, the pre test values the mean gestational age was 32.1±32.07 weeks in the intervention group. According to the Paired t-test, there was statistically significant difference between the two weeks of interventional study and birth weight. The mean weight of infants on the first week pre-intervention was 1861.8±5.1gm in the pre test group, which increased to 1933.5 ± 21.3 gm after intervention. The mean weight of infants on the second week pre-intervention was 1933.5 ± 21.3 gm in the pre test group, which increased to 2030.8± 7.78gm after intervention. According to the paired t-test, Weight changes on the first and second week in the intervention group demonstrated a significant Weight changes. Post intervention weight gain was significant in the group compared to the pre-intervention (p < 0.001). This indicates that the vestibular intervention improves weight gain in premature infants.

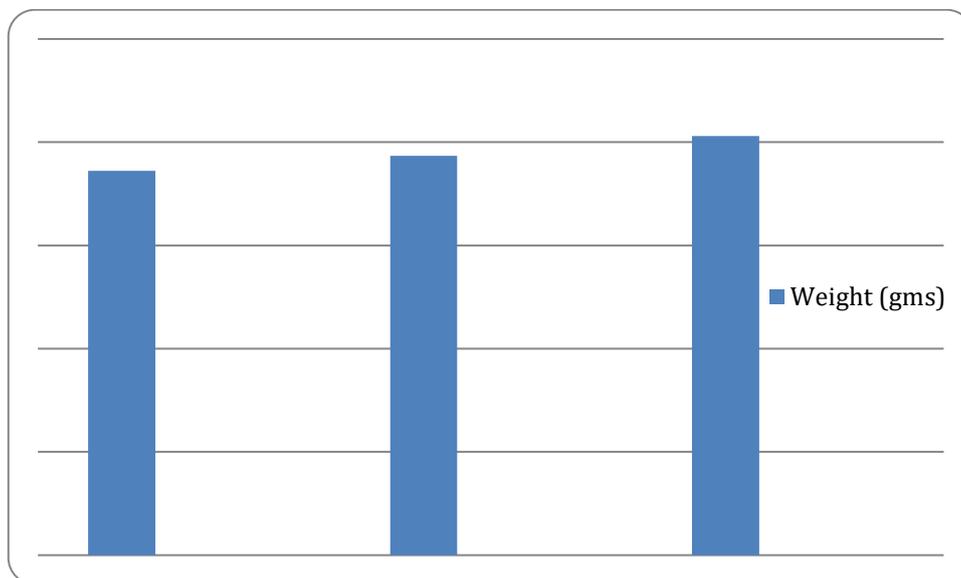
Table 1: Pre and Post test mean values of weight gain (gms) in preterm infants

Parameter	Pre test		Post test			
			1 st week of intervention		2 nd week of intervention	
Weight gain(gms)	Mean	SD	Mean	SD	Mean	SD
		1861.8	5.1	1933.5	21.3	2030.8



Table 2: Table showing the weight in the sample infants pretest and post-test in first and second week

Sl.No	Pre test	Post test 1 st week	Post test 2 nd week
1.	1864	1964	2024
2.	1864	1920	2036
3.	1866	1965	2036
4.	1869	1922	2020
5.	1862	1920	2038
6.	1859	1920	2034
7.	1856	1915	2039
8.	1857	1917	2034
9.	1856	1936	2011
10.	1869	1934	2034
11.	1854	1944	2035
12.	1866	1920	2036
13.	1867	1986	2034
14.	1864	1930	2031
15.	1854	1910	2021
16.	1864	1964	2024
17.	1864	1920	2036
18.	1866	1965	2031
19.	1869	1922	2021
20.	1862	1920	2011
21.	1859	1920	2034
22.	1856	1915	2034
23.	1857	1917	2036
24.	1856	1936	2035
25.	1869	1944	2034
26.	1854	1920	2039
27.	1866	1986	2038
28.	1867	1930	2020
29.	1864	1910	2034
30.	1854	1934	2036



Graph1: Pre and Post test mean values of weight gain (gms) in preterm infants

Discussion

Vestibular stimulation intervention had a significant effect on weight gain in premature infants. In this study, although weight comparison within the groups show a significant difference, that is, intervention had brought about a remarkable weight gain, which is consistent with the present study. This study recommended vestibular stimulation as a low-cost and effective method to improve premature infant weight gain. In Nasimi's study, vestibular stimulation intervention was provided by the mother of each infant. Considering that the intervention provided by different people may interfere with the effectiveness of the intervention, in the present study, a vestibular stimulation intervention was provided by a trained physiotherapist by controlling possible intervening variables. According to the results, the significant weight gain largely due to the vestibular stimulation intervention. Fucile and Gisela (2010) studied the effect of sensory-motor interventions on improving motor development and motor function in premature infants (26). In this study, the impact of oral stimulation, tactile motor stimulation and a combined multi-sensory intervention (oral, sensory-motor) on weight gain and motor function of preterm infants was investigated. The results showed that oral, sensorimotor and vestibular stimulation groups experienced more weight gain and improved motor function during the intervention compared to the control group, which is aligned with the present study. Nadar et al. (2018) study on the effect of physiotherapy intervention versus vestibular

stimulation on neurobehavioral growth and weight gain in preterm infants showed that the mean scores of neural development, behaviour and weight in the vestibular stimulation group spiked significantly, which is compatible with the present study. The only difference is that in Nadar's study physiotherapy interventions were considerably more effective than vestibular stimulation in improving the coordination of sucking, weight gain, and nerve growth (27). However, the present study only looked into the effects of vestibular stimulation. It seems that stimulating more receptors on the body surface using physiotherapy lays the ground for weight gain in infants (25). Fontana et al. (2018) also reported that kangaroo care has positive effects on breastfeeding in preterm infants by promoting maternal self-efficacy and triggering vestibular stimulation, which can accelerate oral feeding (28). Medoff-Cooper et al. (2015) also examined the impact of vestibular stimulation on improving sucking skills in 183 healthy preterm infants who were 24-29 weeks old. The results of this study showed that vestibular stimulation improves feeding behaviours, sucking and oral feeding. These studies support the findings of the current study by demonstrating the positive effects of vestibular stimulation intervention. Here, both intervention and control were homogeneous in terms of underlying variables and pre-intervention weight and lacked physical disorders such as congenital anomalies and infection. Also, unlike other studies, the intervention was provided by trained professionals by controlling all



the intervening variables, so that the remarkable weight gain in the intervention group. In light of the positive outcomes of vestibular stimulus on preterm infant weight gain, preterm infant weight gain could be improved by training physiotherapist working in the NICU and regular vestibular stimulation in preterm infants(29). Finally, changes related to an intervention may appear over time, but in the present study, like other long-term follow-up studies, we were unable to assess long-term outcomes due to time constraint.

Conclusion

Premature infants are usually hospitalized in the NICU for a long time due to their low weight and poor physical condition, and they usually receive routine care by physiotherapist. Therefore, informed by the results of this study about the effectiveness of vestibular stimulation on weight gain in preterm infants, it seems that physiotherapist can, in addition to their specialized care, employ this effective and low-cost technique to promote weight gain and expedite discharge of infants.

Limitations and Recommendations

This is a small sample study. This study should be done in larger samples and further experimental studies can be conducted. Further studies are recommended for vestibular stimulation on physiological parameters, neurological deficits, and low birth infants.

Acknowledgement Authors acknowledge the immense help received from the scholars whose articles are cited and included in references of this manuscript. The authors are also grateful to authors / editors / publishers of all those articles, journals and books from where the literature for this article has been reviewed and discussed.

Ethical Consideration

This pilot study was approved by Research committee and Institutional Review board in the College University and study start-up at Saveetha Medical College. Great care will be taken to fully explain the study to the patient before fully inform consent is taken from parents.

Financial Supports And Sponsorship / Funding we did not receive any specific grant from founding agencies in the commercial or public sectors.

Conflict of Interest

There are no conflicts of interest to declare.

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