

## Original Research Article

# Weight gain in preterm low birth weight infants with multisensory intervention

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### ABSTRACT

**Background:** Birth weight is a significant determinant of newborn survival. In neonatal deaths, LBW is the underlying cause in 60-80% cases. This study was aimed to assess whether preterm infants receiving Multisensory intervention had more rapid weight gain compared to control group infants during NICU stay.

**Methods:** Subjects for the study were preterm infants between 32 to 37 weeks of gestation age with birth weight between 1500 g to 2500 g and staying in NICU. Participants meeting inclusion criteria were randomly divided into either experimental group (n=15) or control group (n=15). The experimental group received Multisensory stimulation such as Auditory, Tactile, Visual and Vestibular stimulation for 10 consecutive days (15 min./day) in NICU. Control group received routine NICU care. Weight was measured using an electronic weighing scale at day-1, day-5 and day-10 of intervention in both the groups and collected data was analysed.

**Results:** The preterm infants of the experimental group had shown better growth than those in the control group with statistically significant differences ( $p < 0.05$ ) between the study and the control group at end of 10 days of intervention.

**Conclusions:** From Analysed data, it is concluded that 5-day of Multisensory intervention could not elicit statistically significant improvement in weight gain, but 10 days intervention could elicit significant improvement. The result supports the use of multisensory intervention as a cost-effective therapy to promote growth.

**Keywords:** Low birth weight, Multisensory intervention, NICU, Preterm

### INTRODUCTION

WHO has defined Preterm birth as babies born alive before 37 weeks of pregnancy are completed or fewer than 259 days since the first day of the woman's last menstrual period (LMP).<sup>1</sup> Causes of preterm birth are complex, and the pathophysiology is largely unknown, but contributing factors includes maternal, foetal as well as environmental. The most common at these includes antepartum haemorrhage or abruption, uterine overdistention and cervical incompetence, hormonal

changes and bacterial infection and inflammation.<sup>2</sup> Because of prematurity, these babies are having higher rates of developing cerebral palsy, sensory deficits, learning disabilities and respiratory illness, resulting in various physical, psychological as well as economical costs.<sup>3</sup>

Low birth weight (LBW) has been defined as weight of baby at birth of less than 2,500 grams (up to and including 2,499 grams).<sup>1</sup> Birth weight is also a significant determinant for survival of new-born babies. Infants

having LBW are approximately 20 times more likely to die, compared with normal birth weight babies.<sup>4</sup> Many even are important risk factors for adult diseases.<sup>5</sup>

The environment of the premature infant staying in NICU is differs in important ways from normal intrauterine environment. They are often isolated in incubators and deprived of optimal sensory stimulation. There may be the exposure of excessive noise and light in the nursery environment which is often continuous. Causes of excessive noise may include the conversations of staff and family members, equipment alarms, monitor beeping. Further, the premature infant will experience unnatural stimulation with excessive handling and intravenous procedures that may be painful, random, and lacking in interrelated interaction. Long-term effects of such stimulation could include psychological concerns, inattentive and school difficulties and lower IQ in children.

Previous studies in this area have suggested that early sensory information and motor experiences can enhance brain development by affecting the structure of brain.<sup>6</sup> Early interactions create a context as well as it directly affects the way the brain is integrated.<sup>7</sup> Environmental modifications to control negative stimuli like excessive light and noise are generally being used in NICU. Apart from that, numerous interventions supplemented are also available to optimize growth and development of preterm infants. Which includes Kangaroo mother care (KMC), therapeutic handling, positioning, massage therapy, kinaesthetic and proprioceptive stimulation as well as swaddling.<sup>8,9</sup> These stimulations are given in an effort to enrich the environment of NICU or to accelerate development of infant. One study had shown that the children who received tactile stimulation were more active, had quicker weight gain and were physically healthier in terms of growth and motor development.<sup>10</sup>

Instead of giving every stimulation separately, Multisensory stimulation provides simultaneous application of various stimulations. It is proposed that it assist preterm infants to cope up with unfavorable environment and help in growth. Aims of Multi-sensory stimulation are:

- To provide specific sensory input to infants deprived of coordinated, positive sensory experiences due to effects of medical interventions, prolonged stay in NICU or both.
- To facilitate occurrence of more mature development patterns through specific stimulation approach.
- To effect change in Muscle tone, movement patterns or both.<sup>11</sup>

For preterm infants, weight gain after birth and before reaching term is critical for neurodevelopmental function.<sup>12,13</sup> One of the commonly required elements before getting discharge from the NICU includes sustained pattern of weight gain.<sup>14,15</sup> Studies have showed

that Preterm infants exhibit higher rate of behavioural problems mainly related to internalizing and dysregulation problems like less behavioural alertness and hypersensitivity to stimulation. But there is lacuna of researches which provide us information regarding benefits of Multisensory intervention on weight gain in preterm low birth weight infants. Thus, the present study is an attempt to see effect of Multisensory intervention weight-gain of preterm LBW infants who took part in a multisensory stimulation program during their hospital stay in NICU.

## METHODS

Institutional ethical clearance for conducting study in NICU was obtained. Written informed consent was taken from the parents of participant meeting the inclusion and exclusion criteria.

### *Inclusion criteria*

- infants born between 32 to 37 weeks of gestational age
- birth weight from 1500 g to 2500 g.

### *Exclusion criteria*

- mechanically ventilated infants
- infants with congenital anomalies
- infants diagnosed with CNS infection or injury.

Sample of 30 preterm LBW infants was selected according to inclusion and exclusion criteria of the study. The participants were randomly divided into 2 groups: Either Group A - Multisensory intervention group or Group B- Control group by simple random sampling. Baseline data was collected including Gestational Age, Gender and Mode of delivery. Pre-intervention evaluation was carried out in which weight of infants was measured using electronic weighing scale with accuracy of  $\pm 5$  grams.

### *Multisensory intervention for experimental group A*

Infants included into Group A received the multisensory intervention in the form of Auditory, tactile, visual and vestibular stimulation. It was given 15 minutes per day for 10 consecutive days. A soothing voice of therapist was presented to the infant for a minimum of 30 seconds, using infant directed speech (Auditory stimulation) to alert the infant. Then, the tactile component of the intervention was added for 10 minutes. The infant was first placed in a supine position and then into prone, and the head and face, chest, abdomen, legs, and arms are massaged with moderate pressure. Following 10 minutes of auditory and tactile stimulation, the infant was horizontally rocked into therapist's arm for last 5 minutes providing vestibular stimulation. Throughout the intervention, eye contact was attempted with the infant in attempt to provide visual stimulation.

A behavioural stress sign of infant was observed during intervention period. This includes yawning, finger splaying, startles, tremors, tone changes, gaze aversion, cry, and hiccups. The intervention was modified (particular stimulation can be paused for 15 sec. and resumed if parameter recovered) based on infant's physiological and behavioural stress responses in order to

prevent overloading of inputs. Infants into Group B received conventional NICU care including positioning, swaddling and handling by nurses. As Post-intervention evaluation weight was measured again at 5<sup>th</sup> day and 10<sup>th</sup> day of the intervention by same instrument and observer. It was measured on naked infant and at the same time during every evaluation (Figure 1).



**Figure 1: Multisensory intervention.**

**RESULTS**

Data were collected, tabulated and analysed using SPSS 16.0. Weight gain at pre, at 5th day and at 10th day was analysed using repeated measures ANOVA. Gender distribution has been explained in Figure 2. Mean baseline Weight in experimental group was 1781.33±271.448 g and in control group was 1629.33±128.922 g.

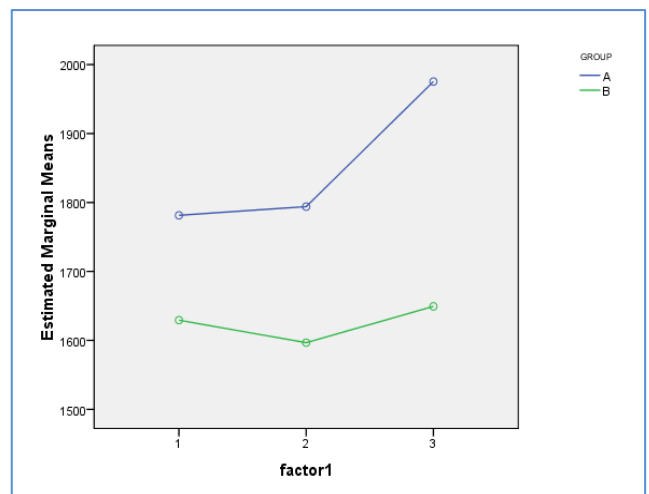
**Table 1: Gender distribution for group A and B.**

	Male (N)	Female (N)	Total
GROUP A	9	6	15
GROUP B	5	10	15
TOTAL	14	16	30

In group A out of 15 subjects 9 were male infants and 6 were female infants whereas in Group B, there were 5 male infants and 10 female infants. Hence group A had 60% male infants and 40% female infants and group B had 33% male infants and 67 % female infants (Table 1).

**Table 2: Values of weight gain at day-1, day-5 and day-10 in both group-A (experimental) and group-B (control).**

Mean±SD	Group-A	Group-B
DAY-1	1781.33±271.448	1629.33±128.922
DAY-5	1794±327.301	1596.67±173.973
DAY-10	1975.33±407.323	1649.33±160.378



**Figure 2: The comparison of weight gain at day-1, day-5 and day-10 in both group-A (experimental) and group-B(control).**

From the values of mean and SD, Group A showed progressive increase in weight gain over period of 10 days while Group B showed decline in weight during first 5 days and then improvement from day-1 and day-10 but it is less compared to experimental group. Repeated measures ANOVA showed significant difference in weight gain between day-1 and day-10 (p=0.007), and between day-5 and day-10 (p<0.001). But No significant difference in weight gain between day-1 and day-

5(p=1.000). Therefore, we can conclude that 5 days of intervention could not elicits statistically significant improvement in weight gain, but 10 days intervention could elicit significant improvement (Table 2).

## DISCUSSION

The standard care in Neonatal intensive care unit provides warmth, hygienic environment but it is failed to provide same sensory environment which infant should receive as intrauterine environment. These stimuli are provided by amniotic fluid and various maternal and foetal movements and they are being experienced by the fetus during his maturation. Infants born premature are lacking in sensory stimuli like tactile, vestibular, auditory and proprioceptive stimuli. This Intervention is an attempt to provide such sensory stimulation to preterm low birth weight infants.

Despite the difference in weight at baseline (152 gm more for the experimental group), the experimental group infants weighed consistently more than the control group infants thought-out the study period.

Study done by Dieter et al had concluded in his study that even 5 days of massage was also effective in improving weight instead of 10 days.<sup>16</sup> But present study did not find such improvement. Though weight gain was there at day-5 but it was not statistically significant. A possible underlying mechanism for greater weight gain has been explained by Field et al.<sup>8</sup> Authors propose that tactile component of this intervention produces effect by the similar mechanism. They said that tactile stimulation causes increase in vagal activity; increase in gastric motility was related to greater weight gain in experimental group. Increased production of insulin and insulin-like growth factor-1 (IGF-1) also related to greater weight gain independent of previous two pathways. For control group, greater calorie consumption was the only related to greater weight gain. Reduction in level of cortisol and catecholamine in plasma also contributes in gaining extra calories. Kramer et al had did study on preterm infants to see the effect of rocking waterbeds and auditory stimuli to enhance their growth. In that they gave vestibular and proprioceptive stimuli by rocking the infants on mechanical waterbed and auditory stimulation was given by playing of a taped heartbeat and women's voice.<sup>4</sup> Result of that study showed that stimulated group gained significantly more weight than did the control group. Similar findings were also found in the study of Caine et al suggesting that auditory stimulation in form of music promotes growth of preterm infants<sup>17</sup>. Possible mechanism stated by Standley et al is might be the reduction in stress, regulation of sleep/wake cycle and improvement in oxygen saturation.<sup>18</sup> Present study has also found weight gain in preterm infants following supplemental stimulation.

A limitation of this study is its small sample size, which did not allow for an examination of possible confounding

factors such as gender and age at entry etc. Another limitation can be the use of one NICU set-up which did not allow generalization of the findings to a larger population.

## CONCLUSION

Multisensory intervention is an enrichment of armamentarium for promoting Growth of preterm low birth weight infants. It is a cost-effective, non-pharmacological way to improve weight of infants who are at higher risk for poor developmental and neurobehavioral outcome.

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