Effectiveness of multistimulation approach on feeding habits of low-birth-weight babies- A randomized control trial

Deepa Negi\textsuperscript{a}, Dharitri Swain\textsuperscript{a,\textast}, Tapas Kumar Som\textsuperscript{b}

\textsuperscript{a} College of Nursing, AIIMS Bhubaneswar, Odisha, India
\textsuperscript{b} Department of Neonatology, AIIMS Bhubaneswar, Odisha, India

\textbf{ARTICLE INFO}

Keywords: Feeding habits, LBW babies, Preterm babies, Multistimulation, Oromotor stimulation

\textbf{ABSTRACT}

\textbf{Introduction:} Low-birth-weight neonates face oral feeding difficulties due to hemodynamic instability, immaturity of central nervous systems, and incomplete development of oral functions. Use of several interventions might help in improvement of the feeding ability of neonates. The objective of the study was to evaluate the effect of the multistimulation approach in low-birth-weight babies on the oral feeding performance, oral intake volume, weight gain and transition time from tube to total oral intake.

\textbf{Methods:} A Randomized, parallel-group, multiple arm trial study was conducted, and a total of 44 low birthweight babies were randomized into three parallel groups with a 2:1:1 ratio. Babies who are Hemodynamically stable were included in the trial. In two Intervention groups, one received an oral stimulation program, another intervention group received tactile stimulation, and the control group received routine newborn procedures for the same duration of time. Oral feeding performance was determined by Oral Feeding Skills (OFS) on a daily basis for five days after providing ten days of intervention. Neonates were monitored until hospital discharge.

\textbf{Results:} Infants in the stimulation groups had significantly better oral feeding performance than infants in the control group in terms of mean proficiency, transfer rate and overall transfer of feeding volume. There was a substantial increase in mean feeding score, daily weight, oral intake volume, and early transition time in both intervention groups compared to control. There was no significant difference in feeding behaviours between the oromotor and multistimulation groups, but the multistimulation group gained more weight compared to the oromotor group.

\textbf{Conclusions:} Infants exposed to the stimulation programme had better feeding skills and a shorter transition period from tube feeding to oral feeding; however, the babies who received multistimulation gained greater weight than babies who received only oromotor stimulation. The study recommends multi stimulation in the form of oromotor, and tactile stimulation can be used as an effective NICU procedure for maintaining an infant’s ability to take feeds orally before being discharged from the hospital.

1. \textbf{Introduction}

Low birth weight (LBW) babies are babies with a birth weight of less than 2500 gm regardless of gestational age \cite{1}. According to the National Family health survey-4, the prevalence in India is 18.2\% \cite{2}. Odisha contributes to 20.8\% of LBW babies in India \cite{2}.

Oral feeding difficulty is the primary concern for LBW babies. Immature oromotor skills and incoordination of sucking, swallowing, and breathing is the causes of feeding difficulties in LBW babies. Ineffective and disorganized feeding may lead to exhaustion in the infant and further contributes to weight loss or inadequate weight gain.

Oromotor intervention includes manipulative actions that activate muscle contractions, enhance movement, and help in building the strength of the oral cavity. There are two main objectives of the oromotor stimulation; one is to increase functional response to pressure and movement, and the other is to maintain the rhythm in sucking-swallowing activity \cite{3}. Oromotor stimulation has a positive effect on oral feeding performance in preterm infants, which is proved by many studies \cite{4-6}.

The greatest sense organ and the first sensory system to function is
the skin. Touch is the best modality to ensure and strengthen the ever-lasting mother-infant bond [7]. A touch experience is also essential for physical and cognitive development [8]. Tactile stimulation involves gentle stroking massage for a specified period in a sequence of upper and lower body parts in the supine position. A review has indicated that massage has various beneficial effects on weight gain, better sleep-wake patterns, more neuromotor development, emotional bonding, and decreased nosocomial infection in neonates and preterm babies [9].

A persistent unorganized suck-swallow pattern is a barrier to the early beginning of breastfeeding in low-birth-weight babies admitted to the NICU. Stimulation is the best key to success in achieving oral feeding performance and sustaining breastfeeding. Many studies have been done on oromotor stimulation, but few studies have been done on the multistimulation approach for improving the feeding ability of preterm babies. Therefore, the present study was aimed to evaluate the effectiveness of the multistimulation approach in LBW babies on the oral feeding performance, the first oral feeding and transition time from tube to total oral intake.

2. Methods

2.1. Trial design

A double-blinded with three parallel groups was conducted to compare the effect of multistimulation technique on the feeding habits of low-birth-weight babies. The Institutional Ethics Committee approved the study protocol, and the local authorities in the study setting had granted authorization. The study followed the Consolidated Standards of Reporting Trials (CONSORT) guidelines, and the Clinical Trials Registry was used to register the study.

2.2. Eligibility of participants and study setting

The recruitment period was from October 2020 to December 2020. Eligibility criteria were hemodynamically stable babies with weight ≥ 1500 gm to < 2500 gm. Babies with other co-morbidities like congenital malformations, intracranial haemorrhage and necrotizing enterocolitis were excluded from the study. The study was conducted in the special newborn care units (SNCU) of the District Headquarters Hospital, Khurda, Odisha, located in rural south-eastern India.

2.3. Sample size calculation

Based on a prior study [10], the minimum sample size in each group was determined using the standard accepted method for a randomized control trial, given a significance level of 5 % and power of 80 %. However, the final sample size in each group was taken 22, including a 10 % attrition rate.

2.4. Randomization and blinding

Following the screening for inclusion criteria, the participants’ parents were informed regarding the study’s goals, and informed consent was taken by detailing the care involved in the routine, oromotor, and multistimulation groups and assuring confidentiality of the information submitted. The statistician performed the randomization process using the Random Allocation Software environment (www.randomizer.org/form.htm (2018)) to prepare the numbered sealed opaque envelopes. Concealment was done through sealed, opaque envelopes. Participants were randomly assigned to three parallel groups with a 2:1:1 ratio. The control group received routine care, one experimental group received oromotor group, and another group received multistimulation (oromotor and tactile stimulation). The nursing officer opened the consecutively numbered envelope to allocate the participants into intervention groups and informed the investigator of the assigned treatment. The used envelopes were discarded after the allocation of participants. Double blinding was ensured to minimize the bias. The parents of the study were unaware of the treatment received by the baby as the babies were in NICU. The nursing officer assessed the outcomes who didn’t know about what type of intervention was welcomed by which baby.

2.5. Procedures

The study intervention was started according to the clinical stability of newborn babies. All 22 infants were taken away from parents and nursing staff during the intervention periods, 15–30 min before tube feeding. The intervention group (G I) received an actual oral stimulation programme, as proposed by Fucile et al. [11], consisting of stroking the cheeks in a circular motion and stroking the vestibular region of the lips, gums, and tongue with the fingertips in an anteroposterior direction for the first 12 min of stimulation. Non-nutritive sucking was used for the last three minutes of stimulation. Another intervention group (G II) had received tactile stimulation followed by oral stimulation one minute apart. Tactile stimulation consisted of gentle rubbing with each step for 5 s period in the sequence of gentle rubbing of the infant’s neck, gentle rubbing of the back or chest (from the neck to the waist), gentle rubbing of the infant’s legs (from thigh to foot), rubbing of infant’s arms (from shoulder to hand), lastly gentle rubbing of the infant’s head (from forehead to ear). All neonates received standard care, and the intervention was administered for 10 consecutive days for blinding purposes. The control group (G III) received routine newborn care that consisted of staying near the incubator for the same amount of time as the intervention group, positioning the newborn in the proper posture, and providing breastfeeding support, but without giving any stimulation procedures. This routine intervention was also administered for 10 consecutive days.

The investigator had undergone skill training from a speech therapist and occupational physiotherapist for oromotor and tactile stimulation. The same therapist reassessed the accuracy of performing the procedure while performing the pilot study intervention. The feeding procedures were identical for all the groups. Feeding habits were assessed daily for 5 days, including feeding habit score, intake volume, transition time, and daily weight by the nursing officer through an observational checklist. Infirmed written consent was taken from all the parents of babies before administering the procedures, and it was assured that confidentiality would be maintained.

2.6. Outcome assessment

Once the neonate was clinically stable, primary outcome parameters were assessed at 33 weeks or older postmenstrual age (regardless of weight). The feeding assessment was performed during the first attempt at oral feeding, as prescribed by the attending physician. The primary feeding outcome in terms of oral feeding performance and daily oral intake was measured on a daily basis for five days after providing ten days of intervention.

The oral Feeding Skills (OFS) checklist was administered to measure the infants’ oral performance, which included total volume prescribed (ml), total volume taken during feeding (ml), volume taken during the first 5 min of feeding (ml), duration of oral feeding (min), and any episodes of adverse events, such as cough, oxygen desaturation, apnea, and/or bradycardia. Neonates’ feeding performance was timed with a stopwatch. Infants were fed for a maximum of 20 min; the assessment was early discontinued if adverse events occurred. Feeding outcomes such as proficiency (PRO, % volume taken during the first 5 min/total volume prescribed), overall transfer (OT, % volume taken/total volume prescribed) and rate of transfer (RT, ml/minute) were calculated from the datasheet. A nursing officer of the NICU filled the oral feeding checklist.
2.7. Statistical analysis

The collected data were coded and entered into an excel spreadsheet, cleaned, and checked for missing values. SPSS Statistics version 20 (IBM, Armonk, NY) analyzed the data. The baseline neonatal characteristics and clinical parameters were expressed in frequency (%), mean, and standard deviation. One-way ANOVA (mean and standard deviation), Kruskal–Wallis test (median and interquartile range) and Fisher’s exact test were used to determine the significant improvements in the feeding outcome parameters.

3. Results

3.1. Sample characteristics

During the study period, 117 LBW babies were admitted to the NICU. Of these, 109 preterm neonates were considered to be eligible, among which eight babies were excluded; hence 44 were randomized into three groups. There were three samples lost, and 41 remained in the study until hospital discharge (Fig. 1).

The newborn characteristics of the study population are shown in Table 1. Three groups were comparable in terms of gestational age, birth weight, Apgar score at 5-minutes or 10-minutes and use of mechanical ventilation. During the clinical assessment of OFS, the mean gestational age was 34.25 ± 2.78 in the control group, 35.2 ± 0.919 in oromotor stimulation group and 34.55 ± 1.572 g in the multistimulation group ($P = 0.535$). Mean weight at oral feeding assessment was 2182.5 ± 259.02 g in the control group, 1930.91 ± 269.6 g in the oromotor stimulation group and 1965.5 ± 279.27 g in the multistimulation group ($P = 0.077$). There was no significant difference in gestational age, birth weight, heart rate or oxygen saturation before or after assessment, or between the three groups.

3.2. Comparison of oral feeding performance among LBW babies

Table 2 shows a significant difference in oral feeding performance among the three groups. Infants in the intervention groups had significantly better rates than infants in the control group in: mean proficiency

---

Fig. 1. Consolidated Standards of Reporting Trials (CONSORT) flow diagram of the study.
Table 1
Base line comparison of neonatal characteristics and clinical characteristics.

| Neonatal characteristics | GI (Control) (n = 22) | GI (Oromotor stimulation) (n = 11) | GI (Multistimulation) (n = 10) | P-value |
|--------------------------|-----------------------|-----------------------------------|---------------------------------|---------|
| Baseline assessment      |                       |                                   |                                 |         |
| Gender                   | Male                  | 12 (50 %)                         | 9 (81.8 %)                      | 6 (60 %) | 0.441 |
|                          | Female                | 8 (40 %)                          | 2 (18.2 %)                      | 4 (40 %) |       |
| Gestational Age          | (wk)                  | 30.25 ± 1.87                      | 30.55 ± 1.57                    | 31.2 ± 0.919 | 0.535 |
| 28–32                    | (%)                   | 4 (18.18)                         | 2 (18.18)                       | 2 (20.00) | 0.960 |
| 30–31                    | (%)                   | 8 (36.36)                         | 4 (36.36)                       | 3 (30.00) |       |
| 32–33                    | (%)                   | 10 (45.45)                        | 5 (22.72)                       | 5 (50.00) |       |
| Birth weight (gm)        | (%)                   | 1923.5 ± 315.03                   | 1868.2 ± 271.986                | 2076 ± 248.471 | 0.077 |
| Apgar score at 5min      | (%)                   | 7 (4–8)                           | 5 (6–8)                         | 7 (5–8) | 1.000 |
| Apgar score at 10min     | (%)                   | 8 (8–9)                           | 8 (7–9)                         | 8 (8–9) | 0.684 |
| Mechanical ventilation²  |                       | 6 (27.27)                         | 4 (36.36)                       | 3 (30.00) | 1.000 |
| Clinical assessment of OFS|                       | 34.25 ± 35.2 ± 0.919              | 34.55 ± 1.572                   | 0.535   |
| Gestational Age          | (wk)                  | 32.78 ± 15.7                      | 32.8 ± 15.7                     |         |
| Birth weight (gm)        | (%)                   | 1965.5 ± 279.27                   | 1930.91 ± 269.6                | 2182.5 ± 259.02 | 0.067 |

*a Fisher’s exact test (frequency and percentage)  
*b One-way ANOVA (mean and standard deviation)  
² Kruskal–Wallis test (median and interquartile range)

Table 2
Comparison of oral feeding clinical assessment between the groups.

|                | GI (Control) (n = 22) | GI (Oromotor stimulation) (n = 11) | GI (Multistimulation) (n = 10) | P-value |
|----------------|-----------------------|-----------------------------------|---------------------------------|---------|
| PRO (%)³      | 12.3 ± 11.6           | 39.5 ± 17.3                       | 44.5 ± 16.4                     | < 0.001 |
| RT (ml/min)b  | 2.3 (1.6–2.9)         | 1.3 (0.6–1.9)                     | 1.1 (0.9–2.5)                   | < 0.001 |
| OTR (%)³      | 35.0 ± 15.7           | 54.2 ± 16.7                       | 58.2 ± 14.5                     | < 0.001 |
| Initial heart rate³ | 162 ± 8.5           | 162 ± 8.3                        | 162 ± 8.4                       | 1.300   |
| Final heart rate³ | 168 ± 9.7            | 166 ± 9.0                        | 166 ± 9.0                       | 0.526   |
| Initial oxygen saturation³ | 97 (97–99)          | 98 (96–98)                        | 97 (96–98)                      | 0.365   |
| Final oxygen saturation³ | 98 (95–99)          | 98 (97–100)                       | 98 (96–100)                     | 1.952   |

³ PRO (proficiency) RT (rate of milk transf) OTR (overall transf).  
*b One-way ANOVA (mean and standard deviation)  
² Kruskal–Wallis test (median and interquartile range)

3.3. Comparison of oral intake volume and daily weight gain among LBW babies

Table 3 illustrates the mean difference in the percentage of volume taken via the oral route in the first 5 days after the initial assessment. Infants in the oromotor and multistimulation group were less likely to achieve 100 % oral feeding than those in the control group, over the same period (P = 0.024).

Fig. 2 shows Fisher LSD Post hoc tests to compare the weight gain among three groups, which revealed no statistically significant difference in mean weight gain between the control and Oromotor group (Mean difference = 37.25 g and P = 0.728). In contrast, the mean weight in the multistimulation group showed a significant improvement as compared to the oromotor group (Mean difference = 272.67 g and P = 0.033) and control group (Mean difference = 235.42 g and P = 0.033).

3.4. Comparison of transition time to independent oral feeding

Table 4 indicates the difference in the mean transition time between the three groups using one-way ANOVA. Transition time in feeding was achieved early among babies who had received multistimulation followed by babies who had received oromotor stimulation as compared to babies who had received only routine newborn care with respect to 1–2feeds/day (F = 10.271, P < 0.001), 4feeds/day (F = 19.7911, P < 0.001) and 8 feeds/day (F = 44.484, P < 0.001).

4. Discussion

The present study revealed that improvement of mean feeding scores was significantly greater in the multistimulation group followed by the oromotor group as compared to babies who received only routine care. The results were supported by a quasi-experimental study done in Kolkata that showed the breastfeeding efficiency score among preterm babies in the experimental group receiving oromotor stimulation was higher than that of the control group, which was statistically significant [12]. A meta-analysis proved the improvement of feeding efficiency in preterm infants after receiving oromotor intervention [13]. A quasi-experimental study in Indonesia revealed a significant increase in sucking frequency and duration in the interventional group (massage) compared to the non-interventional group [14]. On the contrary, a quasi-experimental study in Lebanon reported no significant difference in breastfeeding duration between the two groups, i.e., massage and control [15]. An RCT done in Korea demonstrated no significant difference in breastfeeding rate between the massage group and the control group among premature infants [16]. Thus, oromotor and multistimulation have a similar effect on the feeding habit score of LBW babies.

There is considerable evidence that the provision of oromotor intervention through non-nutritive sucking or sensory stimuli to the oral structures has beneficial effects on volume intake in hemodynamically stable preterm infants [17]. The intraoral stimulation applied to the upper and lower gum might have improved the movement of the tongue, which strengthens suction ability during sucking and maintain the swallow pattern, which increases the intake per suck [18]. Tactile stimulation given to babies might have resulted in an inactive state during feeding and increased oral intake [14]. The present study reported that as time progressed, babies of each group had increased oral intake volume. The oral intake volume had increased from day 0 to day 5 within all groups, but this increase was significantly higher within the multistimulation group, followed by the oromotor group than the control group. These findings were consistent with the meta-analysis done in China revealed that 5-minutes prefeeding oromotor intervention had significantly increased feeding intake volume [13]. A quasi-experimental study conducted in NICUs of Cairo University reported an increase in total oral intake rate following the second session.
of oromotor stimulation compared to the control group [19]. However, the evidence generated by an RCT done in Chandigarh had refuted the increased oral intake in the group who received oromotor intervention [20].

The early transition to independent feeding was demonstrated by regular intervention with specific perioral and intraoral stimulation [11]. The present study also resulted in enhanced oral feeding skills. The intake volume increased rapidly and progressed to full independent oral feeding earlier in the oromotor and multistimulation groups compared with the control group. An RCT done in Chandigarh reported that significantly less median transition time (days) taken to reach partial spoon feed and full spoon feed by the intervention group (oromotor stimulation) as compared to the control group, which is consistent with the results of the present study [20]. Some studies have shown no significant difference in the transition time between the oromotor and control groups, which contradicts the result of the present study [21,22]. In comparison, some literature had found that preterm infants who received 15 min of tactile/kinaesthetic stimulation thrice a day, for 10 days had better motor activity, weight gain, gastrointestinal motility, more alert behavioural states, and better neurobehavioral organization than those who did not receive the intervention [23,24]. Thus, our study supports that multistimulation is an essential intervention for improving infants’ growth and motor development and might also have a synergic effect on enhancing oral feeding skills.

4.1. Study limitations

Although the multistimulation programme in the double-blinded RCT study presented significant effectiveness for improving the feeding outcomes among premature babies, the study had some limitations. These include the small sample size, which may limit the generalizability of the findings.

Table 3
Comparison of oral intake volume (ml/feed) of LBW babies within the groups across the days.

| Group               | Oral Intake volume (ml/feed) (Mean difference) | P-value |
|---------------------|-----------------------------------------------|---------|
|                     | Day 0  | Day 11 | Day 12 | Day 13 | Day 14 | Day 15 |         |
| Oromotor vs Control | 8.3 ± 7.09 | 9.95 ± 7.2 | 12.95 ± 6.1 | 15.25 ± 6.46 | 19.25 ± 5.91 | 22.5 ± 5.26 | < 0.001 * |
| Multistimulation vs Control | 8.3 ± 4.735 | 12.73 ± 7.198 | 17.27 ± 6.604 | 20.91 ± 6.252 | 25.27 ± 7.536 | 28.27 ± 6.405 | < 0.001 * |
| Multistimulation vs Oromotor | 6.7 ± 2.98 | 12.8 ± 6.29 | 20.2 ± 5.6 | 22.2 ± 5.12 | 25.7 ± 4.9 | 30.2 ± 3.86 | 0.008 |

Fig. 2. Fishers LSD Post Hoc comparison of weight (grams) between experimental and control groups across time.

Table 4
Comparison of transition time (number of days to reach independent oral feeding) across the groups (n = 41).

| Parameters (Breastfeeding) | Transition time | F-test | P-value |
|---------------------------|----------------|--------|---------|
|                           | GI (Control)   | GIH (Oromotor stimulation) | GIH (Multistimulation) |
| 1-2 feeds/day             | 2.80 ± 0.410   | 2.10 ± 0.568 | 2.20 ± 0.422 | 10.271 | < 0.001 |
| 4 feeds/day               | 5.40 ± 0.883   | 3.90 ± 0.568 | 4.00 ± 0.471 | 19.791 |
| 8 feeds/day               | 9.25 ± 1.293   | 6.20 ± 0.632 | 6.30 ± 0.483 | 44.484 |

F: One-way ANOVA, level of significance P < 0.05
limitations which should be cautiously considered when interpreting the results. First, all of the babies in the study were recruited from the NICU of a single health centre. Thus, the results may not be generalized to the population in different centres. Another limitation was multistimulation programme only covered oromotor and tactile stimulation, whereas auditory, olfactory, gustatory, or kinaesthetic stimulation, among other things, could be included for a better outcome.

5. Conclusion

Based on our findings, significant improvement in feeding habits and weight was seen in the LBW babies who had received oromotor and multistimulation compared to the babies who had received only conventional NICU treatment. It concludes that oromotor stimulation or a combination of oromotor with tactile stimulation (multistimulation) are equally beneficial and effective approaches for the improvement of feeding habits of LBW babies. Furthermore, when comparing newborns who had received only oromotor stimulation to babies who had received multistimulation (oromotor and tactile stimulation), the study found that multistimulation resulted in a substantial improvement in mean weight gain. The study suggested the provision of multistimulation (oromotor and tactile stimulation) to LBW babies to get maximum output in their feeding ability and growth.

Ethical Approval

This study was approved by the Institutional Review Committee of AIIMS, Bhubaneswar, Odisha, India (Ref No: IEC/ AIIMS BBSR/ Nursing / 2019–20 /29).

CRediT authorship contribution statement

Deepa Negi: Conceptualization, Methodology, Investigation, Formal analysis, Data curation, Resources, Writing – original draft. Swain Dharitri: Conceptualization, Methodology, Formal analysis, Writing – original draft. Tapas Kumar Som: Methodology, Software, Writing – review & editing.

Conflict of interest

No conflict of interest has been declared by the authors.

Acknowledgments

We would like to acknowledge our esteemed institution, the All India Institute of Medical Research, Bhubaneswar, Odisha, India for ethical clearance to conduct this research. We would like to acknowledge Khurda district hospital administration for all managerial support during study period and labour unit nursing staff of Khurda district hospital for their timely help.

References

[1] Jin J. Babies with low birth weight. J Am Med Assoc 2015;313(4):432.
[2] NFHS-4. National Family Health Survey (NFHS-4) 2015–16 India. International Institute for Population Sciences (IIPS) and ICF. 2017;1-192.
[3] Lessen BS. Effect of the premature infant oral motor intervention on feeding progression and length of stay in preterm infants. Adv Neonatal Care 2011;11(2): 129–39.
[4] Da Rosa PK, Levy DS, Prociancyo RS, Silveira RC. Impact of a pre-feeding oral stimulation program on first feed attempt in preterm infants: double-blind controlled clinical trial. Plos One 2020;15(9):e0237915.
[5] Bertonecchi N, Cuomo G, Cattani S, Mazzi C, Pugliese M, Cicoloni E, et al. Oral feeding competences of healthy preterm infants: a review. Int J Pediatr 2012, 2012.
[6] Tenhaaf JJ. Critical Review: the Effects of Oral Stimulation on Feeding Behaviours in Preterm Infants. School of Communication Sciences and Disorders, the University of Western Ontario. 2008, p. 230–6.
[7] Nöcker-Ribaupierre M. Premature infants. Guidelines for music therapy practice in pediatric care. 2013;66–116.
[8] Field T. Touch for socioemotional and physical well-being: a review. Dev Rev 2010; 30(4):367–83.
[9] Dhar S, Banerjee R, Malakar R. Oil massage in babies: Indian perspectives. Indian J Paediatr Dermatol 2013;14(1):1.
[10] Thakkar PA, Rohit HR, Ranjan Das R, Thakkar UP, Singh A. Effect of oral stimulation on feeding performance and weight gain in preterm neonates: a randomised controlled trial. Paediatr Int Child Health 2018;38(3):181–6.
[11] Fucile S, Gisel EG, Lau C. Effect of an oral stimulation program on sucking skill maturation of preterm infants. Dev Med Child Neurol 2005;47(3):158–62.
[12] Nath A, Mukherjee A, Gaha S. Effect of oromotor stimulation on feeding performance and weight gain of preterm babies in selected hospital, Kolkata. J Paediatr Nurs Sci 2020;7(3):30.
[13] Tian X, Yi LJ, Zhang L, Zhou JG, Ma L, Ou YX, et al. Oral motor intervention improved the oral feeding in preterm infants: evidence based on a meta-analysis with trial sequential analysis. Medicine 2015;94:31.
[14] Gultom L, Sinaga R, Stanjapir K. The effects of infant massage on the physical development of baby in indonesia rural areas. Indian J Public Health Res Dev 2019; 11(10):142.
[15] Abdallah B, Badr IK, Hawwari M. The efficacy of massage on short and long term outcomes in preterm infants. Infant Behav Dev 2013;36(4):662–9.
[16] Kim HY, Bang KS. The effects of enteral feeding improvement massage on premature infants: a randomised controlled trial. J Clin Nurs 2018;27(1–2): 92–101.
[17] Lau C. Interventions to improve oral feeding performance of preterm infants. Perspect Swallowing Swallowing Disord (Dysphagia) 2014;23(1):23–45.
[18] Calo P. Best practices for oral motor stimulation to improve oral feeding in preterm infants: a systematic review. Ann Physiother Occup Ther 2019;2:5.
[19] Amer HW. Effect of prefeeding oral stimulation program on preterm infants’ feeding performance. J Biol Agric Healthc 2015;5(16):39–46.
[20] Bala P, Kaur R, Mukhopadhyay K, Kaur S. Oromotor stimulation for transition from gavage to full oral feeding in preterm neonates: a randomized controlled trial. Indian Pediatr 2016;53(1):36–8.
[21] John HB, Padankatti SM, Kuruvilla KA, Rebekah G, Rajapandian E. Effectiveness of oral motor stimulation administered by mothers of preterm infants: a pilot study. J Neonatal Nurs 2018;24(5):261–5.
[22] Govindarajan K, Sarani VK, Kadirvel K, Palanisamy S. The effects of combined modalities of prefeeding stimulation on feeding progression, length of stay and weight gain in early preterm babies. J Neonatal Nurs 2020;26(6):330–4.
[23] Niemi AK. Review of randomized controlled trials of massage in preterm infants. Children 2017;4(4):21.
[24] Ferber SG, Feldman R, Kohelet D, Kunt J, Dollberg S, Arbel E, et al. Massage therapy facilitates mother–infant interaction in premature infants. Infant Behav Dev 2005;28(1):74–81.