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Effect of Prefeeding Oromotor Stimulation on Preterm Infants: A Systematic Review

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ABSTRACT

Background: Oromotor stimulation is currently preferred intervention for influencing oral skills in preterms. Thus, this review is carried out to generate evidence showing efficacy of prefeeding oromotor stimulation among preterm babies.
Methods: PRISMA guidelines are followed and searched in PubMed, Cochrane library, Clinical trials database, and reference list of related articles which were published from Jan. 2000 to 31 Dec. 2020 in English language. We included only randomized controlled trials.
Results: Twelve eligible studies out of 88 studies were screened and included for qualitative synthesis. It was found that prefeeding oromotor stimulation initiates early achievement of independent oral feeding though the treatment protocol is not standardized.
Conclusions: Practice of prefeeding oral stimulation has variety of protocol thus results should be comprehended carefully.

Keywords: prefeeding, oromotor stimulation, preterm, effect

INTRODUCTION

Global estimates show that approximately 10.6% of all live births are preterm and in India approximately 13.61% preterm babies are born out of all live births. [1-2] The earliest published literature found on neonatology by Dr. Pierre Budin in1890 has highlighted feeding difficulty as one of the three major problems of preterm babies. Oral feeding is a complex task that depends upon central patterns generated by brain stem, actively influenced by chemosensory and oral tactile input. Although oral and gag reflexes develop at about 12-16 weeks, sucking, swallowing, and breathing coordination is achieved between 32-34 weeks. [3-6]

Oromotor stimulation (OMS) is the manipulative actions of the lips, jaw, tongue, soft palate before feeding with or without Nutritive sucking (NS) or non-nutritive sucking (NNS) events, intended to improve preterm infants sucking and feeding.[11] It has shown to have various benefits related to preterm neonates feeding such as reduced transition time, weight gain acceleration.[6-32]

This systematic review aims to answer the following questions: What are the effects of prefeeding OMS on preterm neonate's transition towards oral feeding during hospitalization and in later life? does prefeeding OMS has any effects on preterm neonate's weight gain and duration of hospitalization?

OUTCOME MEASURE SELECTION

A Cochrane Review [32] conducted in 2016 reviewed RCTs to find out effect of oromotor stimulation for promoting oral feeding in preterm infants. It has reported methodological

Weaknesses in almost all studies though found that oromotor stimulation is

effective in reducing the time to transition to oral feeding, duration of hospital stay in comparison to routine care.

Initiation and maintenance of exclusive breastfeeding among preterm babies is a challenge for the mother and health care professionals. Preterms are generally placed on full gavage feeding before 32 weeks of gestation and then oral feedings are initiated based on their sucking-swallowing and breathing coordination. This transition period is a challenge for them. Prolonged gavage feeding may lead to oral hyposensitivity or hypersensitivity which might be the cause of poor exclusive breastfeeding rates among preterm babies, ranges from 49% to 63.8%. [8,9] Thus effects their nutritional growth and development along with non-nutritional growth and development such as neuro motor, neurophysiological and neuro behavioral areas.[6] Oral feeding when persists for prolonged time, it leads to longer hospital stay and higher healthcare costs ranges from $620- $4,950 based on the weight of preterm babies at birth, lower the birth weight, higher the cost.[33]

Thus, the reviewers considered the following outcomes relevant to this review: feeding progression, time to achieve full oral feeding, weight gain, duration of hospitalization and effect of OMS in later life.

SEARCH STRATEGY

Electronic databases PubMed / MEDLINE, Embase, CINAHL, MEDLINE, PsycINFO, Science Direct, LILACS, SciELO were searched in August, 2020 combining MeSH terms and free text words, such as, (Infant Premature OR Premature Infant OR Preterm Infant OR Neonatal Prematurity OR Infant, Preterm) AND (prefeeding OR before feeding) AND (oral motor intervention OR oromotor exercise OR oral motor stimulation OR OMI OR oral stimulation OR PIOMI) AND (randomized controlled trial OR controlled clinical trial OR clinical trial OR nonrandomized controlled trials). Study search was limited to RCTs performed on hospitalized preterms; English language published in peer reviewed journals between January 2000 to December 2020.

Title and abstracts were screened thoroughly to ascertain that they meet inclusion criteria. Studies were included if, it reported an original RCT in which effect of manually provided OMS on preterms is examined. Articles were excluded if they didn't report a review article, full text is not available, RCTs with cross over design, published in language other than English, didn't measure feeding outcomes of preterms, if the OMS was provided other than manual method.

RESULTS

Table 1: Summary of RCT evidence of prefeeding oromotor stimulation in preterm infants

Author, Country	Sample size, sample characteristics, exclusion criteria	Experimental intervention	Comparator	Outcome measure	Findings
Pimenta HP et al.[10] 2008 Brazil	N= 96 (IG- 49, CG- 47) Clinically stable and being fed complete diets, receiving > 100 mL of milk per Kg per day via orogastric tube, gestational age between 26 wks. and 32 wks. and 6 days, birth weight < 1,500 grams Chromosomal disorders, malformations of head and face and multiple malformations, severe asphyxia, presence of 3rd or 4th degree ICH or suffered from a hospital infection at the time of the study.	15 min. of perioral and intraoral stimulation once a day for at least 10 days and a pacifier during gavage	Simulated intervention	Length of stay in terms of admission time Breastfeeding frequency at discharge, 3 and 6 months of corrected age.	Increased probability of breastfeeding upon discharge. Significantly higher rate of breastfeeding at 3 months and 6 months.
Lessen BS[11] 2011 Illinois	N= 19 (IG- 10, CG-9) Stable Infants born between 26 0⁄7 and 29 0⁄7 weeks PMA with or without high flow nasal cannula. Infants with documented or suspected congenital anomalies, experiencing necrotizing enterocolitis, a brain injury (including IVH > grade 1, a history of prenatal illicit drug exposure, or who were receiving assistive ventilation (other than high-flow nasal cannula)	5 min. PIOMI once daily for consecutive 7 days	Developmentally supportive intervention (Sham intervention)	Feeding progression Length of hospital stay, PIOMI tolerance of infants with 29weeks PMA	PIOMI was well tolerated by 29 weeks PMA. Infants of IG achieved total oral feeding 5 days sooner and were discharged 2.6 days earlier than CG.

Author, Country	**Sample size, sample characteristics, exclusion criteria**	**Experimental intervention**	**Comparator**	**Outcome measure**	**Findings**
Bache M et al.[12] 2014 Luxembourg	N= 86 (IG- 40, CG- 46) Born between 26 - 33 weeks GA, stable and tube-fed, receiving more than 100 ml/kg/day of milk with or without respiratory support, either by nasal continuous positive airway pressure or high-flow oxygen therapy. Infants with congenital malformations, severe asphyxia, presence of third- or fourth-degree ICH, severe periventricular leukomalacia, chronic lung disease, if they suffered from a hospital infection, necrotising enterocolitis, if they were transferred to another hospital before discharge or died during hospitalisation.	15 min. oral stimulation programme 15-30 min prior to tube feeding, once daily for at least 10 days.	Routine care	Assessment of feeding transition (Including partial or full breastfeeding at discharge) and length of hospital stay.	Significantly higher breastfeeding rate in intervention group. No significant difference in terms of hospital stay.
Lyu TC. et al.[13] 2014 China	N= 72 (IG= 36, CG= 36) Stable infants born between 29- and 34-weeks gestational age (GA) receiving all feedings through a tube and nasal CPAP must have been discontinue for 48 hrs. Infants with medical complications, such as grade III or IV intraventricular hemorrhage or periventricular leukomalacia; congenital diseases such as chromosomal or genetic abnormalities, neurological abnormalities, complex congenital heart disease, congenital gastrointestinal malformations or bronchopulmonary dysplasia; severe asphyxia; severe infections; severely undersized for GA; other serious complications such as necrotizing enterocolitis.	15 min. oral stimulation once a day until the newborn began an exclusive oral diet.	Routine nursery care	Feeding progression. Length of hospital stay and weight gain.	Significantly shorter time to achieve full oral feeding in experimental group. No effect on weight gain and length of hospital stay.
Bala P. et al.[14] 2016 India	N= 51 (IG- 25, CG- 26) Haemodynamically stable inborn babies between 28-34 weeks, reached full gavage feeding and in transition from gavage to spoon feeds. Babies with respiratory distress, on continuous positive airway pressure/ ventilator and having congenital anomalies	Oromotor stimulation prior to feeding administered by mothers 5 times per day till discharge or till full direct breastfeeding achievement.	Routine care	Transition time from full gavage feed to partial and full spoon feed.	Significantly higher achievement of partial breastfeeding at discharge in experimental group.
Arora K. et al.[15] 2018 India	N= 30 (IG- 16, CG- 14) Medically babies born between 28-32 wks. GA with no respiratory support for at least 48 hours and on full gavage feeds of 150 cc/Kg/day Infants with respiratory distress and those with chronic medical conditions like BPD, IVH, PVL, NEC, chromosomal anomalies, craniofacial malformations	5 minutes of PIOMI three times daily for 7 consecutive days.	Sham intervention (Unstructured stroking in and around oral cavity)	Neonatal characteristics. Neonatal Oromotor Assessment Scale (NOMAS). Transition time to reach full oral feeds, hospital stay after enrolment.	Improvement in NOMAS score and weight gain in intervention group. No significant difference in terms of hospital stay.
Ghomi H. et al.[25] 2019 Iran	N= 30 (IG- 15, CG- 15) Born with a gestational age of 26–29 weeks, physiological stability at the time of receiving oralstimulations, Apgar score of 6 at 5 min after birth, and parental consent for participation. During the stimulations, the infants could receive oxygen by continues positive airway pressure (CPAP) or nasal prong, if needed. Congenital disorders and chromosomal abnormalities, chronic medical conditions, such as broncho-pulmonary dysplasia, intraventricular hemorrhage grade III & IV, necrotizing entero-colitis, asphyxia and seizures, neonatal jaundice necessitating exchange transfusion, and proven sepsis with positive blood culture; infants with these conditions and those who were diagnosed with them during the course of the study, infants who were transferred to other treatment centers, and those who had been prescribed with gavage feeding before week 29 were excluded.	5 minutes of PIOMI (Premature Infant Oro-motor Intervention) Once a day for 10 consecutive days	Routine care	Comparison of PMA and weight at the time of achieving one, four and eight oral feedings. Weight gain trend, Duration of hospitalization	Intervention group reached first oral feeding and eight oral feeding earlier, discharged earlier. No difference in weight gain in both groups during discharge.

Author, Country	Sample size, sample characteristics, exclusion criteria	Experimental intervention	Comparator	Outcome measure	Findings
Thakkar P. et al.[26] 2019 India	N= 102 (IG- 51, CG- 51) Preterm neonates born at 30–34 weeks gestation, hemodynamically stable and receiving at least 100 ml/kg of mother's milk as gavage feeds, were included. Neonates with medical complications such as grade III or IV intraventricular haemorrhage, severe perinatal asphyxia, severe sepsis, congenital disease, or malformation and those on formula feeds, who deteriorated or became unstable during the study period were excluded.	5 minutes of PIOMI (Premature Infant Oro-motor Intervention) twice a day from day of initiation of oral feeding to the day of independent oral feeding, 15 min prior to feeding schedule	Routine care	Feeding performance (overall volume intake, rate of milk transfer, number of days to make transition from complete tube feeding to independent oral feeding) Weight gain, Duration of hospitalization	Better feeding performance, shorter transition to independent oral feeding, better weight gain and shorter length of hospital stay in the intervention group.
Li XL. et al.[27] 2019 China	N= 151 (IG- 78, CG- 73) Gestational age at birth of 26 to36weeks' gestational age and a birth weight more than 1,500 g. Patients with congenital malformations or hereditary metabolic diseases as well as those whose parents dropped out of the trial were excluded from the study	PIOMI once a day for consecutive 14 days 15-30 min prior feeding as per Fucile method of 15 min duration	Routine care	Preterm Infant Oral Feeding Readiness Assessment (PIOFRA) for oral feeding ability assessment Infant Neurological International Battery (Infanib) scale (for assessment of neurodevelop ment) score at 3 months and 6 months Body weight gain.	Intervention group had higher feeding efficiency, a shorter transition time from assisted oral feeding to independent oral feeding, and a lower body weight at while achieving independent oral feeding. Higher percentage of normal score on the Infanib scale at 3 and 6 months of age among infants of intervention group.
Mahmoodi N. et al.[28] 2019 Iran	N= 40 (IG- 20, CG- 20) Infants with 28 to 32 weeks' gestation based on the first-trimester ultrasound findings were fed with at least 10CC/KG food by gavage. Newborns with any disorders, such as cleft palate, cleft lip, and congenital disorder who suffered from sepsis, heart disease, necrotizing enterocolitis, severe asphyxia, and grade 3 and 4 intraventricular hemorrhage diagnosed by ultrasound findings.	5 mins. PIOMI once daily 15 min. before gavage for seven days	Routine care	Score on Premature Oral Feeding Readiness Assessment Scale after 7 days of intervention Duration of hospital stay.	The intervention group achieved independent feeding significantly earlier than the control group (P=0.034). In addition, the duration of hospitalization was shorter in the intervention group, compared to that of the control group.
Lessen BS et al.[29] 2019 Indonesia	N= 30 (IG- 15, CG- 15) Clinically stable preterm newborns born between 26-34 weeks PMA, with therapy started between 32 - 34 weeks PMA, not receiving mechanical ventilation or positive pressure oxygen cannula of greater than 1 L/minute, and an Apgar score of greater than 4 at 5 minutes after birth. Any diagnosed abnormalities that would affect sucking, swallowing, or digestive absorptive ability, such as congenital anomalies (cleft lip/palate, congenial heart disease) and/or necrotizing enterocolitis and newborn's whose condition no longer met inclusion criteria before or during the intervention period was excluded.	5 mins. PIOMI once daily for 7 consecutive days	Routine care	Mean volume (MV) of oral intake of two consecutive oral feedings on Days 1, 3, and 5.	The MV of oral intake was significantly greater in the experimental group versus the control group on all days of measurement. The rate of improvement was also accelerated in the intervention group.
Skanning D et al.[30] 2020 Denmark	N= 211 (IG- 108, CG- 103) Maternal age ≥ 18yrs, delivery of singleton or twins, ability to breastfeed and to read, speak Danish/English. Clinically stable preterms ≥ 32 weeks gestational age Mothers unable to breastfeed due to illness as HIV, cancer, drug abuse or if infants suffered from severe bronchopulmonary dysplasia or necrotising enterocolitis.	5 mins. PIOMI (slightly modified) twice daily for 14 consecutive days	Routine care	Duration of exclusive breastfeeding and duration of any breastfeeding at 6 months	No difference in exclusive breastfeeding duration in both groups. Duration of any breastfeeding was significantly shorter for infants of intervention group (P=0.03)

The results of search strategy and inclusion of studies based on PRISMA-P is summarized in Figure 1. Total 124 records were searched through electronic database (PubMed = 74, CINHAL= 32, Cochrane library = 2, International Clinical Trials Registry Platform = 4, Google scholar = 12. Out of them, 37 were found as duplicates due to database overlap, remaining 87 references were screened and 40 studies, not relevant were excluded. Further, 29 full-text articles were assessed for eligibility and 36 of them were excluded because they did not meet the inclusion criteria. Finally, pre-specified inclusion criteria were met by only 12 studies which are included for this systematic review (Table 1) and all of them were found to be of high quality as assessed by modified Jadad scale (Picture 1). In this scale scores range from 0 to 7 (studies scoring <3 is considered as low quality; 3- 4 points is of moderate quality and >4 points are classified as high quality).

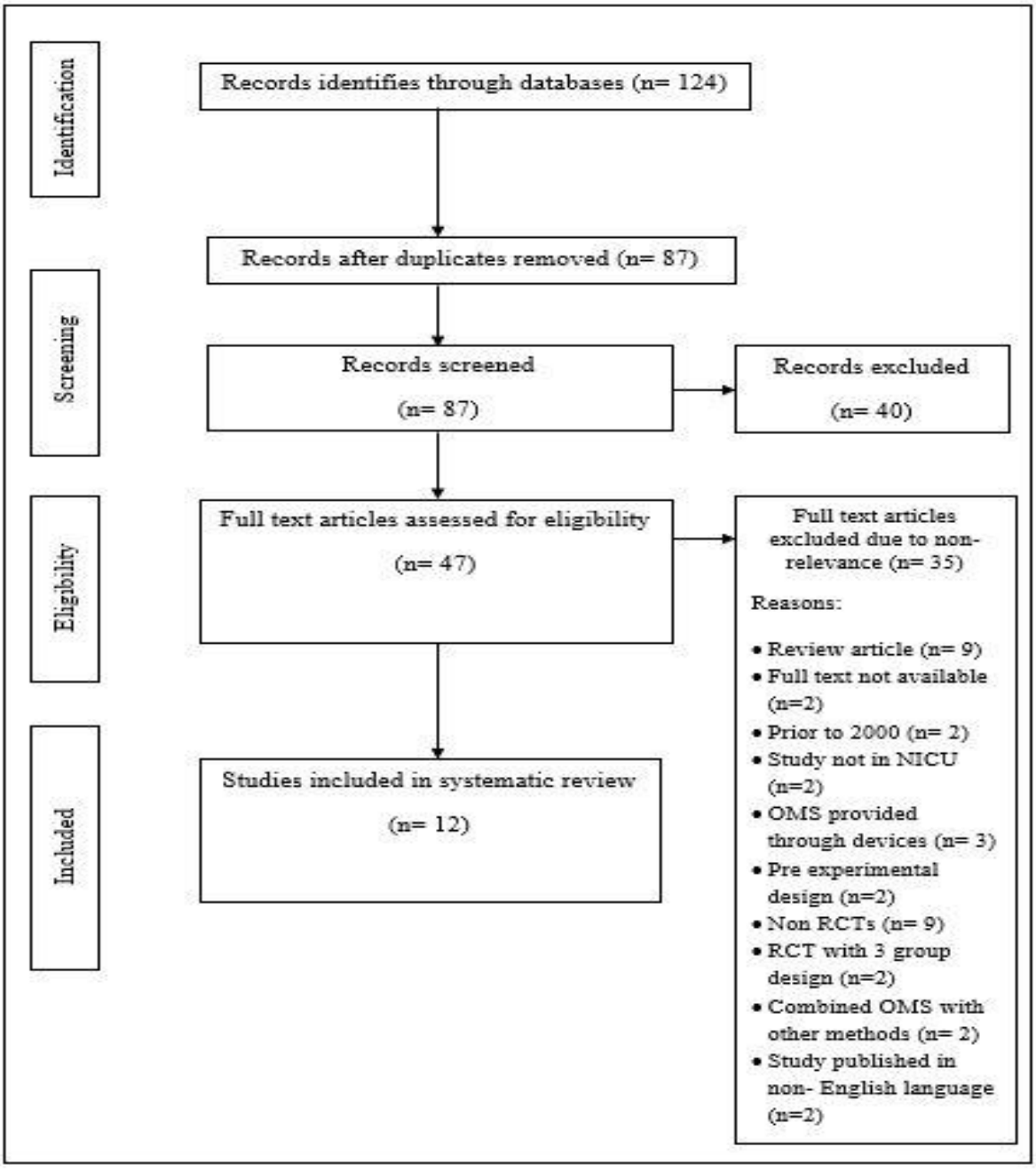

Figure 1 PRISMA flow chart of literature search

Modified Jadad score of the included Clinical trials

Sl. No.	Author Year of publication	Was the research described as randomized ?	Was the approach of randomization appropriate?	Was the research described as blinding	Was the approach of blinding appropriate?	Was there a presentation of withdrawals and dropouts?	Was there a presentation of the inclusion/ exclusion criteria?	Was the approach used to assess adverse effects described?	Was the approach of statistical analysis described?	Total
1.	Pimenta HP, 2008	1	1	1	1	0	1	0	1	6
2.	Lessen BS, 2011	1	0	1	1	1	1	1	1	7
3.	Bache M, 2014	1	1	0	0	1	1	1	1	5
4.	Lyu TC, 2014	1	1	1	1	1	1	1	1	8
5.	Bala P, 2016	1	1	0	0	0	1	1	1	5
6.	Arora K, 2018	1	1	1	0	1	1	1	1	7
7.	Ghomi H, 2019	1	1	1	1	1	1	1	1	8
8.	Thakkar P, 2019	1	1	1	0	0	1	1	1	6
9.	Li XL, 2019	1	1	1	0	1	1	1	1	7
10.	Mahmoodi N, 2019	1	1	1	1	1	1	1	1	8
11.	Lessen BS, 2019	1	1	1	1	1	1	1	1	8
12.	Skaaning D, 2020	1	1	1	1	1	1	1	1	8

Figure 2 depicts the quality assessment of included RCTs by Modified Jadad score

Feeding progression

Three studies have reported statistically significant (p=0.01) changes in oral feeding readiness scores among preterm. Li XL et al [27] and Mahmoodi N et al [28] used POFRAS score (Premature Oral Feeding Readiness Assessment Scale) whereas NOMAS score (Neonatal Oro Motor Assessment Scale) was used by Arora K and colleagues. [15]

Studies have reported total duration of intravenous nutrition [13, 27] and duration of gavage feeding is measured [22,27] but no statistically significant difference was found among receivers of OMS and routine care. Days of life at introduction to oral feeding is recorded in only one study. Thakkar PA et al[26], Lessen BS and colleagues[29] measured mean volume intake as a measure of outcome and found statistically significant improvement in OMS group over time (p<0.001).

Four studies have measured mean time to achieve oral feeding at each stage of progression such as 1-2 feeds/day, 4 feeds/day, 8 feeds per day is which were found to be statistically significant.[11-13, 26] Feeding mode at discharge is assessed in studies by and have reported OMS group to achieve higher breastfeeding

Rate of milk transfer on the day of feeding initiation and on 5th day of treatment is considered in only study.[26]

Breastfeeding rates upon discharge were significantly higher in three studies Pimenta HP et al.[10] (p=0.03), Bala P. et al.[14] (p=0.01) and Bache M. et al [12] (p=0.02), partial breastfeeding was significantly higher at discharge among OMS group by Bala P and colleagues (p=0.03).[14]

Days to achieve full oral feeding

Eight studies have reported on days to achieve full oral feeding among preterm babies and seven of them have found statistically significant shorter duration among OMS group.

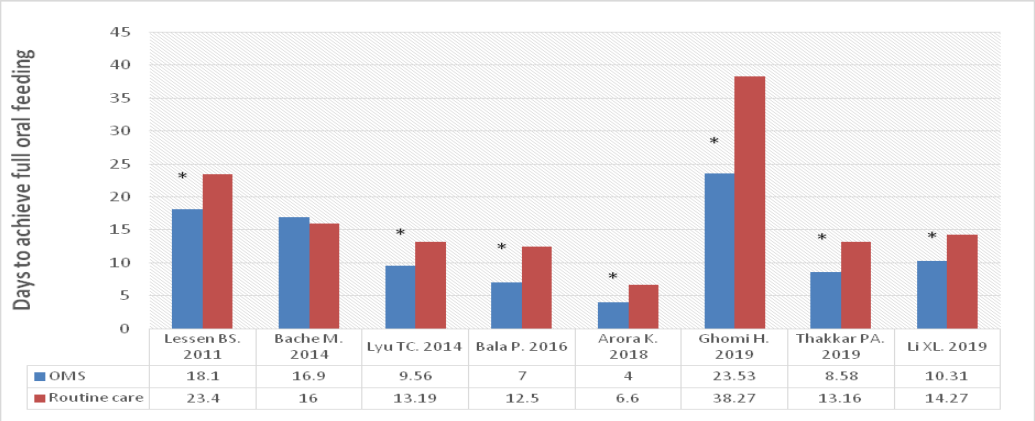

Figure 3 Results of studies reporting effect of OMS on days to achieve full oral feeding. Studies reported statistical significance (P <0.05) are marked in asterisk (*). The mean or median values reported in original study are represented in the bars.

Studies by Lyu TC et al.[13] and Li Xl et al.[27] have reported statistically significance (p=0.04) in achievement of independent oral feeding at lower body weight which is not presented in Figure 3.

Weight gain

Only four studies have analyzed body weight as a secondary measure. Arora K and colleagues [15] found significant increase in weight after enrolment of preterm babies to OMS group, but they didn't provide any numerical data. Thakkar PA et al.[26] reported statistically significant weight gain among OMS group (p<0.001) whereas Lyu TC and colleagues [13] reported no statistical significance in relation to weight gain among receivers of OMS and routine care.

Ghomi H et al.[25] reported that repeated measure ANOVA (RMA) didn't found statistically significant difference between OMS group and routine care in terms of body weight but within group ANOVA for OMS group had statistical significance for weight which might be due to interaction of weight and time.

Duration of hospital stay

Eight studies reported on duration of hospital stay as an outcome of OMS; all of them have reported raw values related to duration of hospitalization (Figure 4). Of the eight studies, only five of them have found statistically significant decrease in duration of hospitalization between OMS and routine care.

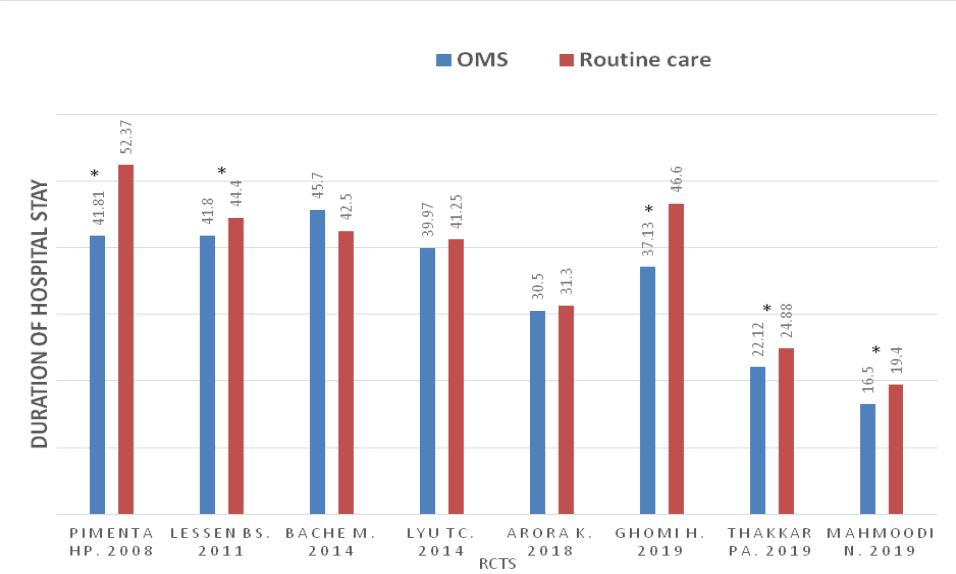

Figure 4 Results of studies reporting effect of OMS on duration of hospitalization. Studies reported statistical significance (P <0.05) are marked in asterisk (*). The mean or median values reported in original study are represented in the bars.

Effect of OMS in later life

Only three of the existing studies have assessed effect of OMS in later life. Pimenta HP and colleagues [10] reported statistically significant higher breastfeeding rates among OMS receivers (p=0.003 and p=0.029 respectively) at 3 months and 6 months.

Li XL.et al.[27] reported that higher percentage of infants in OMS group had normal Infanib (Infant Neurological International Battery) scores of at 3 months (p=0.03) and 6 months (p<0.01) of old and abnormal ratio was lower among them (p<0.01). Whereas, Skaaning D. et al. [30] found no long lasting effect of OMS on healthy preterms.

DISCUSSION

Strength and limitations of the currently available RCT evidence

Summarization of the current evidence support that prefeeding OMS has positive effects on feeding outcomes of preterm babies when compared to care provided in routine to support developmental needs among them. The mixed findings in terms of feeding outcome, weight gain might be due to the differences in the study procedures such as frequency and duration of application of OMS, sample size, data collection and its analysis. Most of the studies have found lack of statistical significance in terms of duration of hospital stay which likely to be due to small sample size, variation in the application of OMS, inclusion criteria, data collection and analysis.

Variations in the application of OMS

In most of the included studies, OMS is provided to the preterm neonates by trained researchers, speech therapists, neonatal occupational therapist, pediatric physiotherapist.[10,15,25-29]

Only two study has reported that the OMS was administered by experienced neonatal nurses [11-12], mothers, parents of neonates were trained to provide OMS in the study by Bala P. et al.[14] and Skaaning D. et al. [30] Only one study didn't clearly mention the provider of OMS.[27]

Total seven studies reported application of 5 minutes of PIOMI (Premature Infant Oro-motor Intervention) as an intervention, and only three studies reported 15 mins of OMS on preterms [10,12-13] Duration of OMS is not clearly mentioned in one study.[14]

Frequency of OMS administration varied widely from once a day [10-13,25,27-29], twice a day [26,30] thrice a day [15] and five times a day [14]. Duration of administration varied from 7-14 days in most of the studies, whereas three studies didn't clearly mention the duration of intervention application as it depended on the neonate's achievement of full oral feeding [13-14,26].

Variations in sample, inclusion, and exclusion criteria

There is significantly variability among studies in terms of sample characteristics. Only seven studies had total sample size over 50, and only five studies reported power analysis to support the sample size. Statistical significance; There is wide variation in gestational ages of preterm babies on whom OMS was applied leading to limited generalizability of study findings. Most of the studies excluded the vulnerable preterm as their condition might interfere with study.

Variations in the control conditions

Inconsistencies are found across studies as in most of the studies the control group received developmentally supportive routine care. Some studies have used sham intervention (to blind the unit staff and primary care providers) which includes standing by the bedside for the exact same duration and while putting a curtain. Few studies even avoided using pacifier during gavage, some used NNS before feeding and unstructured stroking in and around oral cavity.

Variations in the measures of feeding outcome

There is lack of consensus across studies regarding measurement of feeding progression of preterm babies. Only three studies have considered assessing feeding readiness, and limited number of studies emphasized on daily changes in mean volume intake during gavage or paladai feeding and feeding pattern at the time of discharge as outcome measure.

Recommendations for the practice of OMS

OMS is found to be effective in improving feeding progression of preterm neonates across studies. Though there are mixed findings in terms of its effect on weight gain and duration of hospitalization. Statistically significant difference is not found by few studies even in feeding

improvement along with the other two specified variables which are mentioned earlier; might be affected because of the small sample size. There is almost no evidence on effect of OMS on preterm babies with medical complications; even no adverse effects are also reported.

Despite of being rapidly growing area of interest, OMS is still a procedure of choice in most of the NICUs and are provided mostly by health care professionals other than nurses as reported by the studies. Although PIOMI is a procedure which is developed reported in studies by Lessen BS [11] first in 2011. Existing studies also reported evidence that OMS is also effective in improving feeding outcome of preterms even if it is provided by mothers. [22] Thus nursing administrators of NICUs must consider OMS as a regular practice at their units and must also involve parents or primary care givers after adequate training. Keeping the benefits of OMS in view, it should be considered as an essential component of preterm care specifically during the critical period of neurodevelopment.

Recommendations for research

This review shows that recent studies mostly have utilized PIOMI as an intervention for OMS. But the existing studies don't provide any clear data on ideal frequency, duration of application of OMS. Future studies should ensure power analysis and utilization of sophisticated data collection and analysis strategy must be directed towards coming to a consensus for ideal dose of OMS.

Only three studies have evaluated long term effect of OMS on preterms feeding in later life [10,30] and neurological development [27], thus studies should be planned to identify effect of OMS in later life, if any.

RCTs included in this review excluded preterms with congenital anomalies, chromosomal disorders intraventricular hemorrhage from this study. But future studies need to include these infants to explore the effect of OMS in preterms with medical complexity.

Summary of Recommendations for Practice and Research	
What is known:	The existing evidence support that, OMS has significant effect on improving feeding progression of preterm neonates, though there are mixed findings related to effect of OMS on weight gain and duration of hospitalization.
What needs to be studied in future:	• Studies should be conducted further to find out effect of OMS on preterm babies with medical complications. • Studies evaluating the effect of OMS must have adequate sample size based on power analysis. • Future studies should measure appropriate variables to determine the effect of OMS on feeding outcomes of preterms • Studies are needed to determine the ideal timing of OMS initiation, duration, and its frequency.
What can be done today?	• OMS should be considered as an essential component of preterm care in the NICU and neonatal nurses must be trained and involved for this. • Neonatal nurses must also facilitate early initiation of OMS once the babies are hemodynamically stable and encourage involvement of parents for providing OMS.

This broad systematic review was performed to generate evidence of effect of prefeeding oromotor stimulation on preterms. Fourteen studies were included which confirmed that prefeeding oromotor stimulation reduces time to reach to

independent oral feeding. Though there are very few studies that show effect of it on weight gain and duration of hospital stay. Some studies have focused that it has effect on breastfeeding and neurodevelopment in later life. Nurses or primary caregivers should perform pre feeding oromotor stimulation to reduce the transition time for attainment of independent oral feeding in preterm.

Limitation of this review is that majority of the studies doesn't follow a standard treatment protocol for application of prefeeding oromotor stimulation. This review is a detailed search which has targeted on different domains of oromotor intervention and its outcome which is the strength of this review.

CONCLUSION

It is evident from this review that, prefeeding oromotor stimulation leads to early transition to independent oral feeding among preterms. There is no or little effect of oromotor stimulation on duration of hospitalization though effect on weight gain is in very few studies. Long term effect of oromotor stimulation on feeding abilities is not assessed clearly among preterms in the existing literature. Even variation in intensity of treatment protocol is also found. Thus, large scale RCTs with standard methodology should be carried out to produce clear evidence so that effect of prefeeding oromotor stimulation can be better understood in terms of feeding performance betterment, weight gain, duration of hospitalization and effect of it on feeding later life.

Abbreviations

RCT: Randomized Controlled Trial;
IG: Intervention group;
CG: Control group;
NNS: Nonnutritive sucking;
PIOMI: Premature Infant Oromotor Intervention;
OMS: Oromotor stimulation;
PRISMA-P: Preferred Reporting Items for Systematic reviews and Meta-Analyses for Protocols

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