

Aromatherapy as a Nutrition Improvement Approach in Premature Infants: A Short Review

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Abstract

Background: Literature presented numerous methods to promote nutrition in premature newborns. The aim of the review is to promote nutrition in premature newborns using numerous methods which have been suggested by systematic review.

Materials and Methods: Online databases including Scopus, Medline, Web of Science, EMBASE, and Cochrane Library were systematically searched to perform the present review. In this search date of publication was not considered and articles from the beginning until February 10, 2019 were included. The keywords of choice were "aromatherapy OR smell OR olfactory" AND "infants OR baby OR preterm OR premature". To evaluate the quality of the studies obtained by searching, Jadad scoring was utilized.

Results: Finally, four studies were included for review. In the first study, babies in milk-odor group showed more bursts consisting of more than seven sucking attempts, longer sucking bouts and ingesting more volume of milk in comparison to the control group. According to observations in the second study, elevated number of sucks in the presence of breast milk odor was seen in six of 7 infants switched from tube feeding to full enteral feeds in less time. In the third study, olfactory stimulus shows gestational age-related variations in premature infants babies born prior to 31th week of gestation receiving mother's own milk stimulation were able to feed prior to the control group. In the fourth study, babies born after 31th week of gestation did not show significantly different in response to receiving MOM than control group.

Conclusion: Aromatherapy improved feeding behavior by more sucking attempt, longer sucking bouts, greater volume of milk, elevated number of sucks, earlier switches to full enteral feeds.

Key Words: Aromatherapy, Nutrition, Premature Infants, Review.

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1- INTRODUCTION

About 15 million preterm births are recorded each year worldwide. According to the World Health Organization (WHO), there has been an increase in the incidence of preterm births over the past 20 years in 62 of the 65 countries with available trend data. Over one million children die from preterm birth-related complications annually. Preterm births are the leading cause of newborn deaths and, after pneumonia, the second leading cause of death, in children under the age of 5 years. Furthermore, survivors of preterm birth are at a higher risk of adverse developmental disabilities (1). Premature infant refers to a baby born earlier than gestational age of 37 weeks, probably resulting in high mortality and morbidity (2, 3). One of these complications is oral feeding problems because of incomplete oral activities and dissonance of breathing, sucking and swallowing (2, 4).

The oral feeding capability during meandrous developmental process is achieved by association among oral motor, gastrointestinal, sensory and neuromuscular systems (5). Limited reports are available on the smell and taste functions in preterm infant care. It should be noted that the gustatory and olfactory receptors appear approximately on the gestational age of 8 weeks and start to work between weeks 17 and 24 gestational age (6). The hospitalized infants are positively sensitive to maternal odor, an improvement can be seen in their mouth movements and nipple acceptance, and even their stress, crying duration and pain can be relieved (7). Infants in the first days of their life are able to find mother's nipples through smell which helps in breast feeding (8). Infants' mouth movements could be elevated by sensing the odor of their mother's nipple, raising the chance of nipple acceptance, this fact could be useful for hospitalized infants. Furthermore, crying or stressed newborns

could be calmed down by this odor. It has also been claimed to have pain relief effects on premature newborns (8). In Raimbault et al.'s study, infants exposed to milk- odor showed more sucking attempts, longer sucking bouts and consumed greater volume of milk in comparison to control group (9). Bingham et al., elevated number of sucks in the presence of breast milk odor was seen in six of seven infants (10). In Beker et al.'s study, infants switched from tube feeding to full enteral feeds sooner (6). In Davidson et al.'s study, infants of 31 weeks of gestation receiving mother's own milk (MOM) stimulation learned to feed sooner (5). As far as we know, the methods were applied by health care providers who were lacking review of introduction of the methods. The aim of this review is to introduce numerous methods to health providers to promote feeding behavior in premature infants.

2- MATERIALS AND METHODS

2-1. Strategy search

Online databases including Scopus, Medline (via PubMed), Web of Science, EMBASE, and Cochrane Library were systematically searched to perform the present review. In addition, a manual search was conducted in Google Search, Google Scholar, and bibliography of related articles and reviews. In this search date of publication was not considered and articles from the beginning until February 10, 2019 were included. Search words were single or combination of: (aromatherapy OR smell OR olfactory) AND (infants OR baby OR preterm OR premature). The search was done independently in duplication by two reviewers, and any disagreement between the reviews was dissolved by the supervisor. Abstracts and titles of the papers were independently reviewed by two different researchers and articles detected to be related to the subject of the study were collected and fully reviewed.

Finally, quality evaluation was performed on the papers meeting the inclusion criteria.

2-2. Data extraction

Preferred Reporting Items for Systematic review and Meta-Analysis (PRISMA) checklist (<http://www.prisma-statement.org>) was used as a template for this review (**Figure.1**). Data collected from the selected studies included: name of first author, study design, publication year, study population, intervention applied, number of individual of interventions and control, and outcomes (**Table.1**).

3-2. Inclusion criteria

All kinds of articles (Randomized controlled trials (RCT), clinical studies both randomized and non-randomized,

retrospective or prospective, case-control, etc.) evaluating newborn's feeding behavioral following aromatherapy were included in this study. Pilot, preliminary and case report studies were not included due to limited sample size and higher risk of bias. Studies published in English from the beginning until February 10, 2019 were included the year 2000 to May 2019.

3-4. Quality evaluation of studies

To evaluate the quality of the studies obtained by searching, Jadad scale (11) was utilized which consists of randomization techniques, randomization, blinding, blinding techniques, and withdrawals and omissions (**Table.2**). The assessment was carried out by two reviewers independently and in duplication, any discrepancies were resolved by the third reviewer.

Table-1: Some of characteristics of four studies included.

| Study, Year, Country, (Reference) | Design | Intervention group | Control group | Main results |
|------------------------------------|----------------|---|---------------------|--|
| Davidson et al., 2019, USA, (5) | RCT | Mother's own milk (MOM) (n=17) | Water (n=16) | Babies born prior to 31st week of gestation receiving mother's own milk (MOM) stimulation were able to feed prior to the control group. But it was not observed in babies born after 31st. |
| Beker et al., 2016, Australia, (6) | RCT | Scent and taste of their milk before of start each feed (n= 28) | No expose (n=23) | Infants switched from tube feeding to full enteral feeds at a median of 13.5 (group A) and 15.5 days in control group, respectively. |
| Raimbault et.al, 2007, France, (9) | Case - control | Milk-odor condition (n=7) | Water (n=6) | Babies in milk-odor group showed more bursts consisting of more than seven sucking attempt, longer sucking bouts and ingesting a greater volume of milk in comparison to control group. |
| Bingham et al., 2007, USA, (10) | Cross over | Breast milk odor (n=9) | Formula odor (n=29) | Babies in milk-odor group showed more bursts consisting of more than seven sucking attempts, longer sucking bouts and ingesting a greater volume of milk in comparison to control group. |

RCT: Randomized control trial.

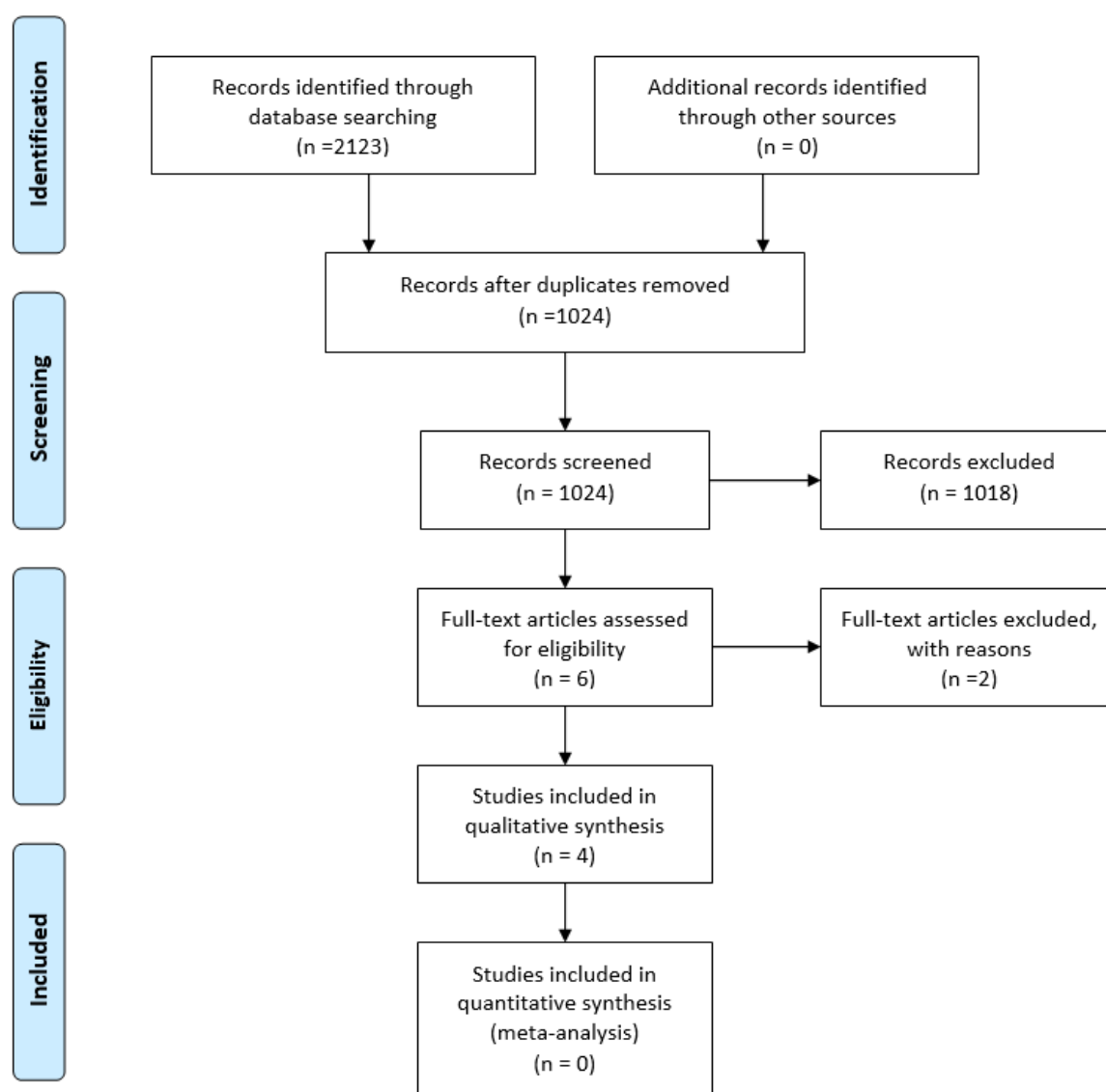


Fig.1: PRISMA flowchart of present study.

Table-2: Quality Assessment using Jadad scale (11).

| Authors, Reference | Randomization | | | Blinding | | |
|-----------------------|-----------------------|--------------------|----------------------|------------------|--------------------|----------------------|
| | Mention randomization | Appropriate method | Inappropriate Method | Mention blinding | Appropriate method | Inappropriate method |
| Davidson et al., (5) | 😊 | 😊 | 😞 | 😊 | 😞 | 😞 |
| Beker et al., (6) | 😊 | 😊 | 😞 | 😊 | 😞 | 😞 |
| Raimbault et al., (9) | 😊 | 😊 | 😞 | 😞 | 😞 | 😞 |
| Bingham et al., (10) | 😊 | 😊 | 😞 | 😊 | 😞 | 😞 |

😊 : Yes; 😞 : No.

3- RESULTS

Finally, four studies were included for review. In the first study, within the learning stages of oral feeding of newborns in a research conducted by Davidson, water stimulus (sham) or mother's own milk (MOM) were randomly fed to 36 babies born between 28 0/7th and 33 6/7th week of gestation. Learning to oral feed in newborns born after 31st week of gestation occurred later than in the control group; this time difference between the dichotomized GA (MOM) and stimulus (sham) was statistically significant ($p=0.02$) (<31 vs. ≥ 31 weeks); while this parameter in newborns born prior to 31st week of gestation happened faster in babies receiving MOM stimulation compared to the control group ($p=0.06$). Olfactory stimulus responses did not show any gender-related variations. Babies born prior to 31st week of gestation receiving MOM stimulation were able to feed prior to the control group. Babies born after 31st week of gestation did not show significantly different response to MOM, which indicates a possible optimum time to use mother's milk to accelerate oral feeding ability in premature infants (5).

In the second study, Beker et al., randomly categorized babies born prior to 29th week of postmenstrual age in two groups receiving either the smell or the taste of milk before of breastfeeding, respectively. Infants switched from tubal feeding to full enteral feeds at a median of 13.5 (group A), and 15.5 days in control group, the following data confirms that the scent and taste of milk could enhance weight and milk tolerance in premature newborns. Further studies are required to fully understand the effect of taste and smell of milk on enhancing growth rate and nutrition (6).

In a study conducted by Raimbault et al., 13 preterm newborns were randomly divided into the milk-odor and the water-

control groups. Before trying to breastfeed, babies smelled the milk odor for 120 seconds on 5 days in row. Babies in milk-odor group showed more bursts consisting of more than seven sucking attempt, longer sucking bouts and ingesting a greater volume of milk in comparison to control group. The milk-odor group was shown to have remarkably less length of hospital stay with a median of 43 days in milk-odor group compared to 55.5 days for control group (9).

In the fourth study, Bingham et al., introduced an infant olfactometer and tested seven premature infants tube-fed in neonatal intensive care unit (NICU), and evaluated the breast milk odor impact on nonnutritive sucking that reduces the time needed for weaning from tube-feeding. According to observations, an elevated number of sucks in the presence of breast milk odor was seen in six of seven infants (10). Maternal milk odor exposure efficiently and positively affected breastfeeding behavior development among the preterm neonates (10).

4- DISCUSSION

The aim of the review is to summarize all reviews to promote nutrition in premature newborns using numerous methods which have been suggested by systematic review. Failure to provide the necessary amounts of all of the essential nutrients to preterm infants has produced not only growth failure, but also increased morbidity and less than optimal brain growth that would limit neurodevelopment (12, 13). In Raimbault et al.'s study, babies in the milk-odor group showed more bursts consisting of more than seven sucking attempts, longer sucking bouts and ingesting a greater volume of milk in comparison to control group (9). According to observations by Bingham, number of sucks in the presence of breast milk odor was seen in 6 of 7 infants (9). In

Beker et al.'s study, infants switched from tube feeding to full enteral feeds at a median of 13.5 (group A) and 15.5 days in control group (6). In Davidson et al.'s study, babies born prior to 31st week of gestation receiving mother's own milk (MOM) stimulation were able to feed prior to the control group. Babies born after 31st week of gestation did not show significantly different in response to receiving MOM than the control group (5). Previous findings demonstrated that tube-feeding weaning towards successful oral feeding may occur rapidly due to olfactory stimulation with anise or cinnamon among premature newborns. Analgesic and anesthetic properties have been reported for cinnamon. The cinnamon extract could mimic the insulin function, enhancing insulin activity in the isolated adipocytes as well as improving insulin receptor function in the in vitro condition (14).

The long history of human applications of cinnamon goes back to its potent medicinal, aromatic, sweet and warm odor properties. The essential oils from different cinnamon species have been used as food additives and medicine, but limited information exists regarding its chemical composition. Therefore, we analyzed five species of cinnamon. Anise, *Pimpinella anisum* L. has white flowers with small seeds, cultivated in Egypt, India, Iran, Turkey and Iraq. There are various therapeutic functions for this annual plant, such as galactagogue, diuretic, antiasthma, anticonvulsant and digestive activities. Diuretic activity, facilitating milk secretion and breast milk quantity could reportedly be increased by the anise essential oil.

The milk production was significantly enhanced by the anise ethanol (1 g/kg) and aqueous (1 g/kg) extracts in rats. Anethole (also known as anise camphor) as a weak estrogenic substance plays a role of dopamine receptor antagonist, so it enhances the secretion of prolactin. One of the digestion stimulants and galactagogues

is Star anise (SA), containing proteins, essential oils, fatty acids, carbohydrates and choline. The main bioactivities of anise essential oil are the increased production of digestive enzymes, enhanced appetite and elevated estrogenic function that causes better milk secretion (15, 16). The results of a study showed that the preterm infants exposed to maternal milk odor had longer sucking bouts, higher bursts (>7 sucking movements), and greater milk consumption, probably due to more competent sucking patterns in the test condition (9).

4-1. Study Limitations

The first limitation was the small sample sizes in several searches. Unbalanced sex distribution may affect the outcomes according to Van et al., because 43% of the control group were boys and only 28% of the experimental group were boys, the gender sub-analysis revealed shorter hospitalization for boys (16).

5- CONCLUSION

Aromatherapy improved feeding behavior such as more sucking attempt, longer sucking bouts and ingesting a greater volume of milk, elevated number of sucks, earlier switches to full enteral feeds. Because of cost-effectiveness and low side effects of this treatment, it is highly recommended that health providers apply in treatment in their care of infants.

6- CONFLICT OF INTEREST: None.

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