Received: 20 September 2023 | Revised: 22 April 2024 | Accepted: 6 May 2024

DOI: 10.1111/jspn.12428

ORIGINAL ARTICLE

WILEY

The effect of position on feeding performance in infants with cleft lip and palate: Quasiexperimental study

Şerife Kartal Erdost PhD, RN[1] | Duygu Gözen PhD, RN[2]

[1]Health Science Faculty, Department of Nursing, İstanbul Kültür University, Istanbul, Turkey

[2]Pediatric Nursing, School of Nursing, Koç University, Istanbul, Turkey

Correspondence
Duygu Gözen, PhD, RN, Pediatric Nursing, School of Nursing, Koç University, Istanbul, Turkey.
Email: duygugozen@gmail.com and dugozen@ku.edu.tr

Abstract

Purpose: This single-group, quasiexperimental study was conducted to determine the effect of feeding position on the physiological parameters and feeding performance of term-born infants with cleft lip and palate (CLP) in the preoperative period.

Methods: The study sample consisted of 45 infants aged 0–6 months with CLP followed up preoperatively in our outpatient clinic between January 2021 and 2022. Infants who were being fed with a specialty bottle for babies with CLP and whose families consented to participate in the study were included. After 2 h of fasting, the infants were fed in the elevated supine (ESU) position for the first meal, then in the elevated side-lying (ESL) position for the second meal after another 2 h of fasting. The infants' heart rate and oxygen saturation values before, during, and after each feed and indicators of feeding performance were compared between the positions.

Results: There was no significant difference between the positions in terms of heart rate and oxygen saturation before, during, or after feeding ($p > .05$). There was no statistically significant difference in measures of feeding performance according to the infants' feeding position ($p > .05$).

Conclusion: According to the findings obtained in this study, infants with CLP showed no statistically significant differences in heart rate, oxygen saturation, or feeding performance when fed in the ESL and ESU positions.

Practice Implications: However, despite the lack of statistical significance, both physiological values and feeding performance tended to be better when the infants were fed in the ESL position, nurses can practice ESL position according to the infant's opposite direction of the side of the cleft lip or palate.

KEYWORDS

cleft lip, cleft palate, feeding, nurse, position

WHAT IS CURRENTLY KNOWN?

- Infants with CLP (cleft lip and palate) often face challenges in breastfeeding,
- Bottle-feeding in the ESU (elevated supine) position is the preferred method for feeding infants with CLP in the preoperative period.
- Bottle-feeding plays a crucial role in ensuring adequate nutrition and supporting their growth and development.
- Specialized bottles and an ESU feeding position at a 45°–60° angle are common feeding approaches for infants with CLP.
- Typically, infants with CLP experience slow feeding and fatigue due to prolonged oral feeding, resulting in suboptimal feeding performance.

WHAT DOES THIS ARTICLE ADD?

- Infants with CLP can feed in ESL (elevated side-lying) position, where the infant is positioned opposite to the side of the cleft lip or palate during feeding.
- Feeding the infants with CLP in ESL position showed better feeding performance compared to feeding in ESU position.
- Infants with CLP have higher oxygen saturation while they feed in ESL position than in ESU position.

1 | INTRODUCTION

Clefts of the lip and palate (CLP) are one of the most common congenital anomalies in the world and negatively impact infants' nutritional status (Kadir et al., 2017; Katge et al., 2014). CLP varies in incidence according to geographical origin, race, ethnicity, environmental factors, and socioeconomic status, but the global frequency is estimated to be 1 in 700–1000 live births (Fan et al., 2018; Raghavan et al., 2018). Approximately 46% of infants with CLP have both cleft lip and palate, 33% have isolated cleft palate, 21% have isolated cleft lip, 10%–12% have complete unilateral cleft lip, and 2% have bifid uvula (Crockett & Goudy, 2014).

A multidisciplinary approach is required for the individualized care of infants with CLP, who have the highest rate of feeding problems (Da Silva et al., 2012; Madhoun et al., 2021; McComish et al., 2016; Redford-Badwal et al., 2003). Due to their position, nurses are key team members that meet the infant and family first and spend the most time with them (Searle et al., 2018). Nurses are closely involved in infant monitoring, treatment, and care starting at birth, and also play an important role in educating parents about feeding (Bannister, 2008; Bessell et al., 2011; Da Silva et al., 2012; Penny et al., 2021; Searle et al., 2018; Vinson, 2016).

The primary challenge in the nursing care of infants with CLP is to establish regular feeding (Masarei et al., 2007). Although breastfeeding is known to be the best method of feeding newborns, most infants with CLP cannot be breastfed (McKinney et al., 2016). Babies with cleft palate have normal swallowing function but are unable to create sufficient negative pressure in the mouth, making it difficult to suck from the breast (Boyce et al., 2019; Burca et al., 2016; Gottschlich et al., 2018; Green & Resnick, 2021; Reilly et al., 2013). The absence of an anatomical structure to counter the pressure applied by the tongue results in inadequate nipple compression and poor milk flow (Masarei et al., 2007). Therefore, the infant cannot express enough milk from the breast and/or formula from the bottle (Arvedson & Brodsky, 2002; Green & Resnick, 2021). Infants with lip deformities also have difficulty grasping the nipple and are unable to suck. Infants with CLP who cannot breastfeed have insufficient weight gain and may show delayed growth and development (Baylis et al., 2018; Boyce et al., 2019; Duarte et al., 2016; Gottschlich et al., 2018; Green & Resnick, 2021).

Due to these barriers to breastfeeding, infants with CLP are generally fed using special bottles (Duarte et al., 2016; Gottschlich et al., 2018; Katge et al., 2014; Penny et al., 2021). In addition, certain additional strategies and techniques can be used to facilitate and increase the success of feeding (Dailey, 2013; Masarei et al., 2007; Shahzad & Sanati-Mehrizy 2022; Green & Resnick, 2021; Sırıken et al., 2021). Some of these strategies include placing the infant in a 45°–60° elevated supine (ESU) position while feeding, manually supporting the jaw, cheeks, and lips, increasing the consistency of liquid feeds, positioning the nipple of the bottle away from the cleft part of the mouth, using a bottle or nipple suitable for the infant's age, adjusting the food flow rate, feeding at a pace consistent with feeding cues, burping the infant frequently, using pacifiers (Azimi Jahed et al., 2017; Dailey, 2013; Green & Resnick, 2021; Katge et al., 2014; Masarei et al., 2007; Turner et al., 2001), and limiting feeding time to 30 min (Burca et al., 2016; Dailey, 2013; Masarei et al., 2007; Reid et al., 2006; Shahzad & Sanati-Mehrizy 2022). The important aspect of choosing a feeding method is to present systems incorporating techniques that increase weight gain while minimizing the stress on the infant and parents/caregivers (Reid, 2004; Snyder & Ruscello, 2019). Infants with CLP are usually bottle-fed in the ESU position.

Feeding methods are vital for supporting adequate nutrition and the growth and development of infants. As bottle-feeding is the method most preferred by families for feeding infants with CLP in the preoperative period (Alperovich et al., 2017; Kaye et al., 2017; Gottslich, 2018), we conducted a single-group, quasiexperimental study of the elevated side-lying position (ESL) to determine the effect of feeding in this position on the infants' physiological parameters (oxygen saturation and heart rate) and feeding performance.

2 | METHODS

This quasiexperimental study was carried out with a single group in the Plastic, Reconstructive, and Aesthetic Surgery Outpatient Clinic of Cerrahpaşa Medical Faculty Hospital to determine the effect of bottle-feeding infants with CLP in the ESL position on their physiological values (oxygen saturation and heart rate) and feeding

performance (feeding duration, amount of food taken per minute, and percentage of food taken) in the preoperative period.

The population of the study consisted of all infants aged 0–6 months who were followed up in the outpatient clinic between January 2021 and 2022 ($n = 46$). The study sample included 45 infants who were being fed with a specialty bottle (Medela Special Needs [Haberman] Bottle) and whose families volunteered to participate in the study.

2.1 | Sample selection criteria

- Infants aged 0–6 months with congenital CLP.
- Unilateral CLP.
- Born after 37 weeks' gestation.
- Having no other disease.
- Currently being bottle-fed and followed up in the clinic.
- Feeding with a specialty bottle for babies with CLP.
- Having undergone no medical intervention before the study.

2.2 | Exclusion criteria

- Infants who are breastfeeding.
- Infants fed by methods other than bottle-feeding.
- Infants with other feeding-related disorders.
- Postoperative infants.

2.3 | Data collection instruments and forms

2.3.1 | Informed voluntary consent form

Before starting the study, this form was used to inform the infants' parents of the purpose, procedures, and duration of the study and how the obtained data would be used and to obtain their written informed consent.

2.3.2 | Data collection form

This form was prepared by the researchers in line with the literature and consisted of a total of 26 questions (12 open-ended and 14 multiple-choice) about the infant's gestational age at birth, body weight, head circumference, recumbent length, and feeding characteristics, as well as sociodemographic information about the family.

2.3.3 | Feeding observation form

This form was prepared by the researchers in line with the literature and included two separate observation tables for the ESU and ESL feeds that encompassed all assessments performed before, during, and after feeding and three open-ended items for recording the infants' physical characteristics. The form contained a total of 13 questions, including the amount of food prescribed by the physician, bottle-feeding duration, amount of food and percentage of prescribed amount taken, feeding efficiency rate, heart rate and oxygen saturation before, during, and after oral feeding, food type, formula brand, and any complications that occurred during feeding. The infant's feeding performance was assessed based on the percentage of food taken, feeding efficiency, and bottle-feeding duration (Lau & Smith, 2011; Lau et al., 1997; Pickler et al., 2005; Pickler et al., 2006). Feeding duration was defined as the time from the moment the bottle was first placed in the infant's mouth until the moment it was removed from the infant's mouth (Clark et al., 2007; Park et al., 2014). Short pauses during feeding to allow the baby to rest were also included in the feeding duration (Park et al., 2014) The total feeding duration was limited to 30 min (Clark et al., 2007; Dawson et al., 2013; Park et al., 2014). The percentage of food taken was determined based on how much of the recommended feed amount the infant had taken by the end of the feeding period (Lau & Smith, 2011; Lau et al., 1997). Feeding efficiency was determined as the volume of food taken per minute, calculated by dividing the total volume taken by the total feeding duration (Lau & Smith, 2011; Lau et al., 1997; Pickler et al., 2005).

2.3.4 | Pulse oximeter

An SP-20 Handheld Pulse Oximeter was used to measure the infants' heart rate and oxygen saturation before, during, and after bottle-feeding.

2.3.5 | Chronometer

A smartphone stopwatch application was used to time the infants' feeds (MRY62B/A Model iPhone XR, software version 13.5.1).

2.3.6 | Bottle and nipple

To eliminate observation differences during the oral feeding of CLP infants resulting from variations in flow rate that can occur with different types of bottles, participants in our study were being fed with the specialty Medela Haberman bottle designed for CLP infants. This bottle was preferred because it is suitable for infants with CLP, helps control flow rate, prevents the infant from expending excessive effort and sucking power, has a silicone teat, and does not contain latex. The one-way valve system of the bottle prevents excessive air swallowing (Katge et al., 2014; Kaye et al., 2020).

2.4 | Data collection

Data collection and feedings were performed during the day (8:00 a.m. to 4:00 p.m.). It was ensured that the infants received no medical or invasive

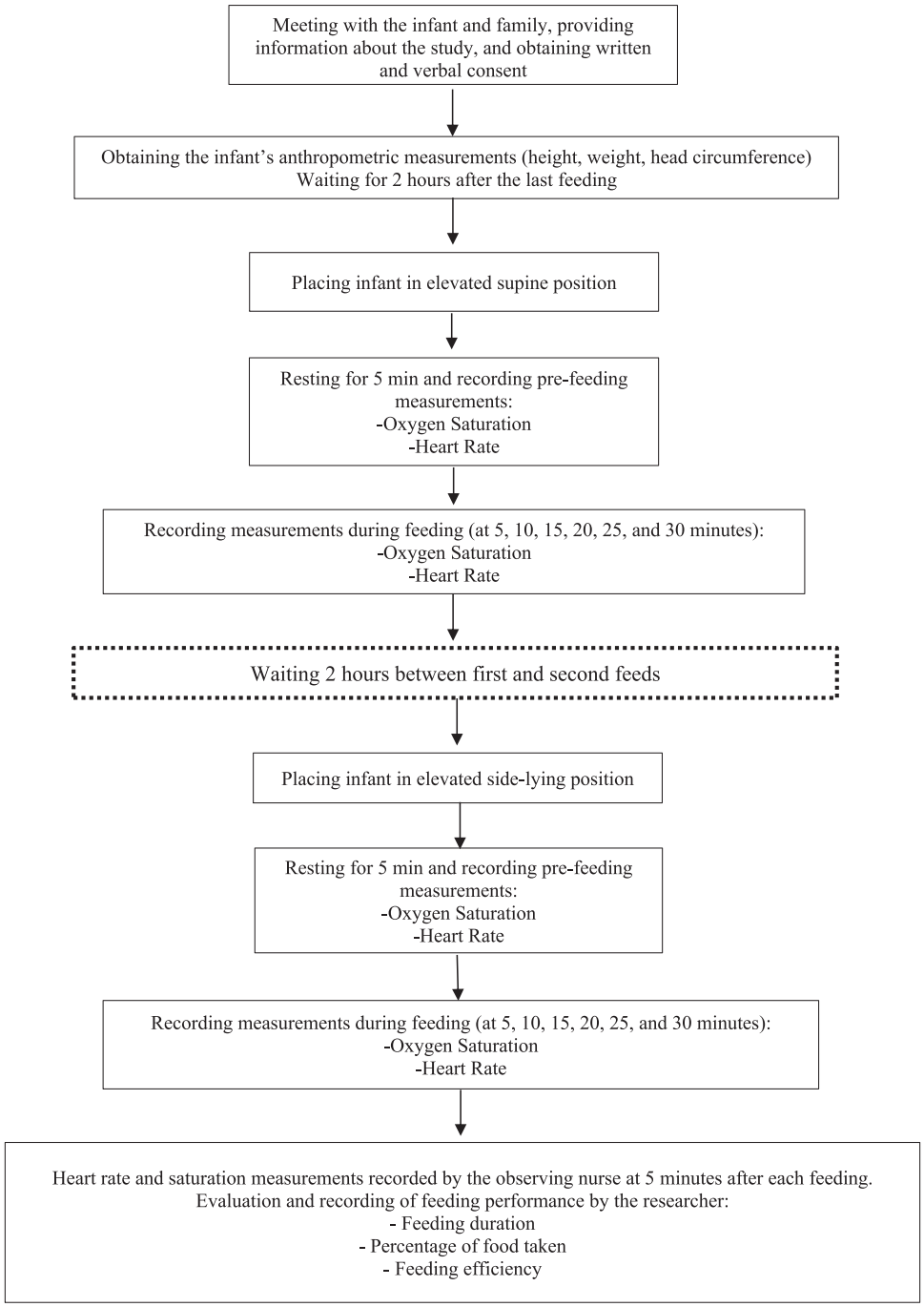

FIGURE 1 Study design.

interventions in the half-hour before the feeding interventions and that the families and infants were allowed to rest in a quiet, calm, private room in the ward reserved for infant feeding education. The following study protocol was then carried out (Figure 1).

2.4.1 | Before feeding

The nurse researcher completed a data collection form regarding the infants' sociodemographic information and feeding habits together with the parent before feeding. The weight, recumbent length, and head circumference of all infants were measured and recorded in the Feeding Observation Form. For infants coming from home, the first feeding was started 2 h from the time of the last feeding. There was another 2-h interval between the two feedings performed for the study. All infants in the study were placed in the relevant feeding position and allowed to rest in that position in the mother's arms for 5 min. The infants' heart rate and oxygen saturation values were measured using a pulse oximeter by another nurse working in the ward and recorded.

FIGURE 2 Elevated supine position.

2.4.2 | First meal in ESU position

The 45°–60° ESU position is routinely used and traditionally preferred by mothers (Figure 2). After the prefeeding assessments were completed, the chronometer was started as soon as the mother placed the bottle in the infant's mouth. During feeding, the infants' heart rate and oxygenation values were recorded by the observing nurse at 5-min intervals (at 5, 10, 15, 20, 25, and 30 min). As feeding duration was limited to 30 min, the last measurement was made at 30 min and the bottle was removed from the infant's mouth. After feeding, the infant was allowed to rest on the mother's lap in the same position for 5 min, then postfeeding heart rate and oxygenation measurements were obtained and recorded in the data collection form. The nipple was positioned on the opposite side of the cleft (lip and/or palate) to prevent the food from leaking. The infant was burped after feeding, then the infant and mother were allowed to rest together until the next meal.

2.4.3 | Second meal in ESL position

The infants lay on their side facing the mother, supported with a pillow placed on the mother's knees that elevated the infant's upper body by 45°–60°. The infant's direction was determined based on the side of the cleft (lip +/− palate). Infants with right-sided cleft were positioned on their left side and vice versa, thus ensuring that the cleft was above the nipple. All data collected for the ESU position at the first meal were obtained in the same way and at the same time points for the ESL position (Figure 3).

2.5 | Data analysis

As a result of power analysis for a single-group quasiexperimental study design, the minimum total number of subjects needed for a type 1 error probability (significance level) of 0.05, 80% power (type 2 error of 20%), and estimated effect size of 0.60 was calculated as 24 infants. Given the minimum sample size of 24 infants and the possibility of data loss, all infants ($n = 45$) who met the sample selection criteria were included in the study. After post hoc power analysis, paired-samples t test and other basic analyses were performed to determine the distribution of heart rate and other variables and compare repeated measures within the groups. With a study sample of 45 infants, type 1 error probability (significance level) of 0.05, and estimated effect size of 0.60, the test power was found to be 99%.

FIGURE 3 Elevated side-lying position.

Statistical analyses were performed using a licensed copy of IBM SPSS Statistics version 22 (IBM Corp.) software package. As the study data did not show normal distribution, the Mann–Whitney U test was used for comparisons between paired groups. A "p value" less than .05 was considered statistically significant.

2.6 | Study limitations

This study is limited to the findings obtained from a single center. Due to the small sample size, the infants could not be grouped according to the type of food they received (breastmilk or formula), and their physiological characteristics and feeding performance were evaluated as a single group according to feeding position only.

3 | RESULTS

The mean age of the infants in the study was 68 ± 55 days. The mean birth weight was 3256 ± 439 g, mean recumbent length at birth was 50.7 ± 2.9 cm, and mean head circumference at birth was 34.9 ± 2.1 cm. At the time of the study the infants had a mean body weight of 4791.3 ± 1790.9 g, mean recumbent length of 56 ± 6 cm, and mean head circumference of 36.5 ± 2.7 cm. Of the infants, 46.7% ($n = 21$) were female and 53.3% ($n = 24$) were male. Nineteen infants (42.2%) had cleft lip and palate, 22 (48.9%) had only cleft palate, and four (8.9%) had only cleft lip.

Several feeding-related characteristics of the family and infant were evaluated. Most of the families ($n = 38$, 84.4%) stated that they received training from nurses on how to feed their infants. Fourteen (31.1%) of the infants were fed breast milk, 18 (40.0%) received formula, and 13 (28.9%) were fed both breast milk and formula.

TABLE 1 Home feeding characteristics of participating infants with cleft lip and/or palate ($N = 45$).

Feeding characteristics	*n*	%
Source of feeding education		
Nurse	38	84.4
Physician	4	8.8
Other	3	6.6
Type of food given		
Breast milk	14	31.1
Formula	18	40.0
Breast milk and formula	13	28.9
Feeding position used		
Elevated supine	42	93.2
Elevated side-lying	3	6.6
Difficulties experienced during feeding		
Prolonged feeding	6	35
Food coming out of the nose	2	10
Vomiting	2	10
Poor appetite	2	10
Gas	2	10
Insufficient breast milk	1	5
Difficulty sucking	1	5
Difficulty breathing	1	5
Financial difficulties	1	5

Nearly all families ($n = 42$, 93.2%) fed their infants in the ESU position, while three (6.6%) used the ESL position. Eighteen families (40%) reported having difficulty during feeding, whereas the other 27 (60%) reported having no difficulty. The most common problem related to feeding the infants was slow and prolonged feeding ($n = 6$, 35%), followed by milk spilling from the nose ($n = 2$, 10%), vomiting ($n = 2$, 10%), poor appetite ($n = 2$, 10%), gas ($n = 2$, 10%), insufficient breast milk ($n = 1$, 5%), sucking difficulty ($n = 1$, 5%), apnea ($n = 1$, 5%), and financial difficulties ($n = 1$, 5%) (Table 1).

The infants' mean number of meals per day was 9 ± 3 (median: 10). The mean amount of food recommended by physicians per meal was 87 ± 46 mL (median: 75 mL).

The mean heart rate measured in the ESU position was 137.7 ± 14.8 beats per minute (bpm) before feeding, 152.1 ± 14.2 bpm during feeding, and 143.3 ± 16.4 bpm at 5 min after feeding. In the ESL position, these values were 134.4 ± 15.4, 151.1 ± 11.0, and 140.8 ± 14.8 bpm, respectively. There was no significant difference in heart rate values between the positions in any of the assessments ($p > .05$) (Table 2).

Mean oxygen saturation measurements in the ESU position were 97.4 ± 2.8% before feeding, 96.4 ± 2.1% during feeding, and 97.1 ± 1.9% at 5 min after feeding. For the ESL position, these values were 97.7 ± 1.8%, 96.9 ± 2.2%, and 97.5 ± 1.8%, respectively. There were also no statistical differences between the feeding positions in terms of oxygen saturation values at any time point ($p > .05$) (Table 2).

During the study, breast milk was prepared for 15 (33.3%) of the infants, and formula was prepared for 30 infants (66.7%), as per the type of food they received at home.

The infants' feeding performance was compared according to feeding position. The mean total feeding duration was 14.87 ± 6.68 min in the ESU position and 13.77 ± 6.14 min in the ESL position. The mean amount of food taken was 72.84 ± 34.02 mL in the ESU position and 81.27 ± 42.48 mL in the ESL position. The amount of food remaining in the bottle in the ESU and ESL positions was 16 ± 22 and 9 ± 15 mL, respectively. The mean percentage of food taken by the infants per meal was 85.40 ± 15.62% in the ESU position and 89.97 ± 15.84% in the ESL position. Feeding efficiency was 6.07 ± 4.14 mL/min in the ESU position and 7.21 ± 5.14 mL/min in the ESL position. There was no statistically significant difference in measures of feeding performance according to the infants' feeding position ($p > .05$) (Table 3).

4 | DISCUSSION

Recent studies on preterm infants have investigated the effects of feeding in the ESU and ESL positions on physiological parameters and feeding performance. These studies reported that preterm infants fed in the position had higher oxygen saturation levels (Clark et al., 2007; Girgin et al., 2018), lower and less variable heart rate (Girgin et al., 2018; Park et al., 2014), shorter feeding duration (Dawson et al., 2013; Girgin et al., 2018), and better feeding performance (Girgin et al., 2018). Based on these results, this study was conducted to evaluate the effect of feeding position in infants with CLP, in whom feeding is the most important problem.

In the literature, it has been stated that suck-swallow-breathing coordination in infants with CLP is essential for oral feeding (Miller, 2011). Infants with both cleft lip and palate are reported to have more feeding problems than infants with isolated cleft lip (Kaye et al., 2017). Of the infants included in this study, 42.2% had cleft lip and palate, 48.6% had cleft palate, and 8.9% had cleft lip. Due to the limited number of cases that could be reached within the scope of our study, the majority of the sample in this single-group study consisted of infants with cleft palate.

As in the rest of the world, the number of infants with CLP in Turkey is limited. Although there are studies on these infants' nutritional status (Allori et al., 2017; Bessell et al., 2011; Duarte et al., 2016) and guidelines on feeding recommendations (Dailey 2012, Boyce et al., 2019), these studies focused on the effectiveness of the tools used in feeding, such as syringes and bottles. To our knowledge, there is no previous study evaluating the effect of the infant's position during feeding on physiological or feeding performance parameters. Although this adds to the novelty of our study, it poses a limitation in terms of discussing our results.

All infants in this study comprised a single group ($N = 45$) that were fed in the ESU position for the first meal and ESL position for the second meal, and their mean heart rate and oxygen

TABLE 2 Comparison of mean heart rate and oxygen saturation according to feeding position ($N = 45$).

Measurement time	ESU mean ± SD (range), median	ESL mean ± SD (range), median	Test[a]	*p*
Heart rate (beats per minute)				
5 min before feeding	137.7 ± 14.8 (100.0–166.0), 137.0	134.4 ± 15.4 (103.0–171.0), 132.0	849.0	.187
During feeding	152.1 ± 14.2 (92.0–178.0), 154.2	151.1 ± 11.0 (124.0–174.7), 151.5	887.0	.311
5 min after feeding	143.3 ± 16.4 (110.0–167.0), 146.0	140.8 ± 14.8 (112.0–170.0), 142.0	858.5	.363
Oxygen saturation (%)				
5 min before feeding	97.4 ± 2.8 (84.0–100.0), 98.0	97.7 ± 1.8 (92.0–100.0), 98.0	998.5	.908
During feeding	96.4 ± 2.1 (92.5–100.0), 95.8	96.9 ± 2.2 (90.0–100.0), 97.2	883.0	.147
5 min after feeding	97.1 ± 1.9 (92.0–100.0), 97.0	97.5 ± 1.8 (92.0–100.0), 98.0	837.0	.268

Abbreviations: ESL, semielevated side-lying; ESU, semielevated supine position; SD, standard deviation.

[a]Mann–Whitney *U* test.

*$p < .05$.

TABLE 3 Comparison of feeding performance according to feeding position.

Parameter	Position: ESU Mean ± SD (range), median	Position: ESL Mean ± SD (range), median	Test[a]	*p*
Total feeding duration (min)	14.87 ± 6.68 (3.46–30.00), 14.14	13.77 ± 6.14 (2.59–30.00), 13.00	924	.474
Amount of food taken (mL)	72.84 ± 34.02 (30–150), 60	81.27 ± 42.48 (60–180), 60	915.00	.432
Amount of food left in the bottle (mL)	16 ± 22 (0–95), 10	9 ± 15 (0–60), 0	793.5	.057
Percentage of food taken (%)	85.40 ± 15.62 (44.40–100.00), 85.71	89.97 ± 15.84 (89.97–100.00), 100.00	817.5	.091
Feeding efficiency rate (mL/min)	6.07 ± 4.14 (1.06–16.60), 4.45	7.21 ± 5.14 (1.07–25.70), 6.66	896	.347

Abbreviations: ESL, semielevated side-lying; ESU, semielevated supine position; SD, standard deviation.

[a]Mann–Whitney *U* test.

*$p < .05$.

saturation values were compared according to position. As studies examining the effect of feeding position in infants with CLP were not available in the literature, we compared our findings with the results of similar studies of preterm infants (Clark et al., 2007; Dawson et al., 2013; Girgin et al., 2018; Park et al., 2014; Raczyńska & Gulczyńska, 2019).

In our study, we observed that heart rate did not differ significantly but was lower in the ESL position both during and after feeding (Table 2).

This finding suggests that infants exert less effort in the ESL position. Girgin et al. (2018) compared the mean heart rate of preterm infants (32–34 weeks' gestation) held in the ESL and ESU positions during bottle-feeding and also reported that there was no statistically significant difference between the groups (151.16 ± 14.72 and 150.33 ± 18.60 bpm, respectively) (Girgin et al., 2018). Park et al. (2014) compared the effect of feeding in the ESL and ESU positions on physiological findings in preterm infants at 32–38 weeks of gestation. They fed each infant twice, once each in the ESL and ESU positions, at 9-h intervals and reported that heart rate showed significantly less variation in the ESL position before and during feeding (Park et al., 2014).

When we compared oxygen saturations measured in the ESU and ESL positions, there was no significant difference between them before, during, or after feeding (Table 2). In both positions, the infants' oxygen saturations decreased during feeding and did not return to prefeeding values by 5 min after feeding. This finding indicates that infants exert effort in both positions and that their oxygen saturation levels are affected. However, oxygen saturation tended to be higher in the ESL position, suggesting that the infants exerted less effort and consumed less oxygen in the side-lying position (Table 2).

Similar studies in the literature reported no significant difference in oxygen saturation between newborns fed in the ESL and ESU positions (Clark et al., 2007; Dawson et al., 2013; Park et al., 2014; Raczyńska & Gulczyńska, 2019). These results are also consistent with our findings.

Girgin et al. (2018) reported that oxygen saturation was significantly higher during and after feeding in newborns fed in the ESL position. Their results may have differed from ours because our sample consisted of CLP infants, was smaller than the sample in the study by Girgin et al. (2018), and was treated as a single group. A randomized, controlled study including more infants with CLP may provide evidence in favor of the ESL position, as suggested by the tendency for higher oxygen saturation while feeding in the ESL position (Table 2). Similar to our study findings, Park et al. (2014) found that oxygen saturation was not significantly better in infants fed in the ESL position. However, their sample was even smaller than ours, which also suggests that the lack of statistical significance might be related to the sample size.

All infants included in the study were first fed in the ESU position after waiting for at least 2 h after their last feeding, and there was another 2-h interval before feeding in the ESL position for the second meal. When we compared the infants' feeding performance, we observed no significant differences in terms of total feeding duration, amount of food taken, amount of food left in the bottle, percentage of the physician-prescribed amount of food taken, or feeding efficiency according to feeding position. However, in the ESL position, the total feeding duration was shorter (13.77 ± 6.14 min), the amount of food taken was higher (81.27 ± 42.48 mL), the amount of food remaining in the bottle was quite low (9 ± 15 mL), the percentage of food taken was higher (89.97 ± 15.84%), and the feeding efficiency rate was higher (7.21 ± 5.14 mL/min) when compared with the values for the ESU position (Table 3). Although the differences were not statistically significant, they showed that all feeding performance indicators were better in infants fed in the ESL position.

When compared with the findings of Raczyńska and Gulczyńska (2019), our results were similar in terms of supporting the ESL position, despite the lack of statistical significance. Raczyńska and Gulczyńska (2019) reported that there was no difference between the two groups in terms of feeding durations, which were similar to those in our study.

The feeding efficiency rates in our study, 7.21 ± 5.14 mL/min in the ESL position and 6.07 ± 4.14 mL/min in the ESU position, are higher than those reported by Girgin et al. (2018), which we believe can be attributed to the fact that the infants in our study were older (mean 68 days) than the preterm infants in their study. Despite this difference in age, however, the amount of food taken was found to be lower in our study (ESL: 89.97 ± 15.84 mL and ESU: 85.40 ± 15.62 mL). These results suggest that infants with CLP have difficulty swallowing during feeding, because compared with the study of Girgin et al. (2018), the infants in our study had similar oxygen levels that were near normal (97%–98%). This demonstrates that the infants did not have trouble breathing while feeding. Therefore, the lower amount of food taken despite similar oxygen saturations suggests that our study group had difficulty swallowing.

In the study conducted by Park et al. (2014), feeding durations were similar to those in our study while the feeding efficiency rate was lower. However, the percentage of food taken by the infants in their study was higher than that determined in our study. The lower percentage of food taken by the infants in our study despite their older age is another noteworthy finding that demonstrates the presence of a feeding problem.

Although there were no significant differences when feeding performance indicators (feeding duration, amount of food taken, amount of food remaining, percentage of food taken, and feeding efficiency rate) were compared according to feeding position, all findings related to feeding performance were in favor of the ESL position. In addition, the amount of food remaining in the bottle in the ESL position (9 ± 15 mL) was nearly half that in the ESU position (16 ± 22 mL), which was close to statistical significance ($p = .057$). This was confirmed by the greater amount of food taken in the ESL position (81.27 ± 42.48 vs. 72.84 ± 34.02 mL). Although none of these findings reached statistical significance, they suggest that feeding performance is better in the ESL position.

5 | CONCLUSION

According to the findings obtained in this study, infants with CLP showed no statistically significant differences in heart rate, oxygen saturation, or feeding performance when fed in the ESL and ESU positions. However, despite the lack of statistical significance, both physiological values and feeding performance tended to be better when the infants were fed in the ESL position.

6 | HOW MIGHT THIS INFORMATION AFFECT NURSING PRACTICE

According to study findings the infants with CLP can feed in the ESL position in the infant's opposite direction of the side of the cleft lip or palate. In line with these findings and similar results in the literature, we recommend conducting multicenter, randomized controlled trials with larger sample groups.

ACKNOWLEDGMENTS

The authors like to thank to participating families and staff from Plastic, Reconstructive, and Aesthetic Surgery Outpatient Clinic of Cerrahpaşa Medical Faculty Hospital.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

ETHICS STATEMENT

Ethical approval from the Clinical Research Ethics Committees of Cerrahpaşa Faculty of Medicine (ethics committee decision A-03, number: 59491012) and written institution permission (number: 50200903-199) were approved before study initiation. The parents of the participating infants were informed about the study and provided their written and verbal consent.

ORCID

Şerife Kartal Erdost http://orcid.org/0000-0002-7930-5039
Duygu Gözen https://orcid.org/0000-0001-9272-3561

REFERENCES

Allori, A. C., Mulliken, J. B., Meara, J. G., Shusterman, S., & Marcus, J. R. (2017). Classification of cleft lip/palate: Then and now. *The Cleft Palate-Craniofacial Journal*, *54*(2), 175–188. https://doi.org/10.1597/14-080

Alperovich, M., Frey, J. D., Shetye, P. R., Grayson, B. H., & Vyas, R. M. (2017). Breast milk feeding rates in patients with cleft lip and palate at a North American craniofacial center. *The Cleft Palate-Craniofacial Journal*, *54*(3), 334–337. https://doi.org/10.1597/15-241

Arvedson, J. C., & Brodsky, L. (2002). Anatomy, embryology, physiology, and normal development. In J. C. Arvedson, L. Brodsky, & M. A. Lefton-Greif (Eds.), *Pediatric swallowing and feeding: Assessment and management* (pp. 13–79). Plural Publishing.

Azimi Jahed, N., Borimnejad, L., & Haghani, H. (2017). Effect of body position on physiological alteration while feeding infants: A systematic review. *Journal Of Client-Centered Nursing Care*, *3*(2), 119–124. https://doi.org/10.32598/jccnc.3.2.119

Bannister, P. (2008). Management of infants born with a cleft lip and palate. Part 1. *Infant*, *4*(1), 234–237.

Baylis, A. L., Pearson, G. D., Hall, C., Madhoun, L. L., Cummings, C., Neal, N., Smith, A., Eastman, K., Stocker, C., & Kirschner, R. E. (2018). A quality improvement initiative to improve feeding and growth of infants with cleft lip and/or palate. *The Cleft Palate-Craniofacial Journal*, *55*(9), 1218–1224. https://doi.org/10.1177/1055665618766058

Bessell, A., Hooper, L., Shaw, W. C., Reilly, S., Reid, J., & Glenny, A. M. (2011). Feeding interventions for growth and development in infants with cleft lip, cleft palate or cleft lip and palate. *Cochrane Database of Systematic Reviews*, *2011*(2), CD003315. https://doi.org/10.1002/14651858.cd003315.pub3

Boyce, J. O., Reilly, S., Skeat, J., Cahir, P., & Academy of Breastfeeding, M. (2019). ABM clinical protocol #17: Guidelines for breastfeeding infants with cleft lip, cleft palate, or cleft lip and palate-revised 2019 Breastfeeding Medicine (2019). *Breastfeeding Medicine: The Official Journal of the Academy of Breastfeeding Medicine*, *14*(7), 437–444. https://doi.org/10.1089/bfm.2019.29132.job

Burca, N. D. L., Gephart, S. M., Miller, C., & Cote, C. (2016). Promoting breast milk nutrition in infants with cleft lip and/or palate. *Advances In Neonatal Care*, *16*(5), 337–344. https://doi.org/10.1097/anc.0000000000000305

Clark, L., Kennedy, G., Pring, T., & Hird, M. (2007). Improving bottle feeding in preterm infants: Investigating the elevated side-lying position. *Infant*, *3*(4), 154–158.

Crockett, D. J., & Goudy, S. L. (2014). Cleft lip and palate. *Facial Plastic Surgery Clinics of North America*, *22*(4), 573–586. https://doi.org/10.1016/j.fsc.2014.07.002

Dailey, S. (2013). Feeding and swallowing management in infants with cleft and craniofacial anomalies. *Perspectives on Speech Science and Orofacial Disorders*, *23*(2), 62–72.

Da Silva, C. M., Costa, B., & das Neves, L. T. (2012). Nursing habits in cleft lip and palate children. *RSBO Revista Sul-Brasileira de Odontologia*, *9*(2), 151–157.

Dawson, J. A., Myers, L. R., Moorhead, A., Jacobs, S. E., Ong, K., Salo, F., Murray, S., Donath, S., & Davis, P. G. (2013). A randomised trial of two techniques for bottle feeding preterm infants. *Journal of Paediatrics and Child Health*, *49*(6), 462–466.

Duarte, G. A., Ramos, R. B., & Cardoso, M. C. A. F. (2016). Feeding methods for children with cleft lip and/or palate: A systematic review. *Brazilian Journal Of Otorhinolaryngology*, *82*(5), 602–609. https://doi.org/10.1016/j.bjorl.2015.10.020

Fan, D., Wu, S., Liu, L., Xia, Q., Tian, G., Wang, W., Ye, S., Wang, L., Rao, J., Yang, X., Yu, Z., Xin, L., Li, S., Duan, Z., Zhang, T., Wu, S., Guo, X., & Liu, Z. (2018). Prevalence of non-syndromic orofacial clefts: based on 15,094,978 Chinese perinatal infants. *Oncotarget*, *9*(17), 13981–13990. https://doi.org/10.18632/oncotarget.24238

Girgin, B. A., Gözen, D., & Karatekin, G. (2018). Effects of two different feeding positions on physiological characteristics and feeding performance of preterm infants: A randomized controlled trial. *Journal For Specialists In Pediatric Nursing*, *23*(2), e12214. https://doi.org/10.1111/jspn.12214

Gottschlich, M. M., Mayes, T., Allgeier, C., James, L., Khoury, J., Pan, B., & van Aalst, J. A. (2018). A retrospective study identifying breast milk feeding disparities in infants with cleft palate. *Journal of the Academy of Nutrition and Dietetics*, *118*(11), 2154–2161. https://doi.org/10.1016/j.jand.2018.05.008

Green, M. A., & Resnick, C. M. (2021). Feeding considerations for infants with craniofacial malformations. *Seminars in Fetal and Neonatal Medicine*, *26*(6), 101280. https://doi.org/10.1016/j.siny.2021.101280

Kadir, A., Mossey, P. A., Orth, M., Blencowe, H., Sowmiya, M., Lawn, J. E., Mastroiacovo, P., & Modell, B. (2017). Systematic review and meta-analysis of the birth prevalence of orofacial clefts in low- and middle-income countries. *The Cleft Palate-Craniofacial Journal*, *54*(5), 571–581. https://doi.org/10.1597/15-221

Katge, F., Dalvi, S., Shetty, A., & Shetty, S. (2014). Feeding intervention in cleft lip and palate patients: A review. *International Journal of Oral and Maxillofacial Surgery*, *1*(4), 143–147.

Kaye, A., Huff, H., Fetter, B., & Thaete, K. (2020). Cleft lip and palate newborn care and feeding: A primer for bedside nursing providers. *International Journal of Nursing and Health Care Research*, *3*, 1182. https://doi.org/10.29011/2688-9501.101182

Kaye, A., Thaete, K., Snell, A., Chesser, C., Goldak, C., & Huff, H. (2017). Initial nutritional assessment of infants with cleft lip and/or palate: Interventions and return to birth weight. *The Cleft Palate-Craniofacial Journal*, *54*(2), 127–136. https://doi.org/10.1597/15-163

Lau, C., Sheena, H. R., Shulman, R. J. & Schanler, R. J. (1997). Oral feeding in low birth weight infants. *The Journal of Pediatrics*, *130*(4), 561–569.

Lau, C., & Smith, E. O. (2011). A novel approach to assess oral feeding skills of preterm infants. *Neonatology*, *100*(1), 64–70.

Madhoun, L. L., O'Brien, M., & Baylis, A. L. (2021). Infant-driven feeding systems: Do they "normalize" the feeding experience of infants with cleft palate. *The Cleft Palate-Craniofacial Journal*, *58*(10), 1304–1312. https://doi.org/10.1177/1055665620984351

Masarei, A. G., Wade, A., Mars, M., Sommerlad, B. C., & Sell, D. (2007). A randomized control trial investigating the effect of presurgical orthopedics on feeding in infants with cleft lip and/or palate. *The Cleft Palate-Craniofacial Journal*, *44*(2), 182–193. https://doi.org/10.1597/05-184.1

McComish, C., Brackett, K., Kelly, M., Hall, C., Wallace, S., & Powell, V. (2016). Interdisciplinary feeding team: A medical, motor, behavioral approach to complex pediatric feeding problems. *MCN: The American Journal of Maternal/Child Nursing*, *41*(4), 230–236.

McKinney, C. M., Glass, R. P., Coffey, P., Rue, T., Vaughn, M. G., & Cunningham, M. (2016). Feeding neonates by cup: A systematic review of the literature. *Maternal and Child Health Journal*, *20*(8), 1620–1633. https://doi.org/10.1007/s10995-016-1961-9

Miller, C. (2011). Feeding issues and interventions in infants and children with clefts and craniofacial syndromes. *Seminars in Speech and Language*, *32*(2), 115–126. https://doi.org/10.1055/s-0031-1277714

Park, J., Thoyre, S., Knafl, G. J., Hodges, E. A., & Nix, W. B. (2014). Efficacy of semielevated side-lying positioning during bottle-feeding of very preterm infants: A pilot study. *The Journal of Perinatal & Neonatal Nursing*, *28*(1), 69–79.

Penny, C., McGuire, C., & Bezuhly, M. (2021). A systematic review of feeding interventions for infants with cleft palate. *The Cleft Palate Craniofacial Journal*, *59*(12), 1527–1536. https://doi.org/10.1177/10556656211051216

Pickler, R. H., Best, A. M., Reyna, B. A., Wetzel, P. A., & Gutcher, G. R. (2005). Prediction of feeding performance in preterm infants. *Newborn and Infant Nursing Reviews: NAINR*, *5*(3), 116–123.

Pickler, R. H., Chiaranai, C. & Reyna, B. A. (2006). Relationship of the first suck burst to feeding outcomes in preterm infants. *The Journal of Perinatal & Neonatal Nursing*, *20*(2), 157–162.

Raczyńska, A., & Gulczyńska, E. (2019). The impact of positioning on bottle-feeding in preterm infants (≤ 34 GA). A comparative study of the semi-elevated and the side-lying position—A pilot study. *Developmental Period Medicine*, *23*(2), 117.

Raghavan, U., Vijayadev, V., Rao, D., & Ullas, G. (2018). Postoperative management of cleft lip and palate surgery. *Facial Plastic Surgery*, *34*(6), 605–611.

Redford-Badwal, D. A., Mabry, K., & Frassinelli, J. D. (2003). Impact of cleft lip and/or palate on nutritional health and oral-motor development. *Dental Clinics of North America*, *47*(2), 305–317.

Reid, J. (2004). A review of feeding interventions for infants with cleft palate. *The Cleft Palate-Craniofacial Journal*, *41*(3), 268–278.

Reid, J., Kilpatrick, N., & Reilly, S. (2006). A prospective, longitudinal study of feeding skills in a cohort of babies with cleft conditions. *The Cleft Palate-Craniofacial Journal*, *43*(6), 702–709.

Reilly, S., Reid, J., Skeat, J., Cahir, P., Mei, C., & Bunik, M., Academy of Breastfeeding Medicine. (2013). ABM clinical protocol #18: Guidelines for breastfeeding infants with cleft lip, cleft palate, or cleft lip and palate, revised 2013. *Breastfeeding Medicine: The Official Journal of the Academy of Breastfeeding Medicine*, *8*(4), 349–353.

Searle, A., Neville, P., Ryan, S., & Waylen, A. (2018). The role of the clinical nurse specialist from the perspective of parents of children born with cleft lip and/or palate in the United Kingdom: A qualitative study. *Clinical Nurse Specialist*, *32*(3), 121–128.

Sırıken, F., Ertekin, A. A., Aydin, O. E., Akcan, A. B., Ceylan, E., & Pekcan, G. (2021). Approach to feeding problems in babies with cleft lip and/or palate. *Zeynep Kamil Medical Journal*, *52*(1), 53–60.

Snyder, M., & Ruscello, D. M. (2019). Parent perceptions of initial feeding experiences of children born with cleft palate in a rural locale. *The Cleft Palate-Craniofacial Journal*, *56*(7), 908–917.

Turner, L., Jacobsen, C., Humenczuk, M., Singhal, V. K., Moore, D., & Bell, H. (2001). The effects of lactation education and a prosthetic obturator appliance on feeding efficiency in infants with cleft lip and palate. *The Cleft Palate-Craniofacial Journal*, *38*(5), 519–524.

Vinson, L. A. (2016). Presurgical orthopedics in cleft lip and palate care. *Open Journal Of Dentistry And Oral Medicine*, *4*(1), 14–19. https://doi.org/10.13189/ojdom.2016.040102

How to cite this article: Erdost, Ş. K., & Gözen, D. (2024). The effect of position on feeding performance in infants with cleft lip and palate: Quasiexperimental study. *Journal for Specialists in Pediatric Nursing*, *29*, e12428. https://doi.org/10.1111/jspn.12428