

# Comparison of Effect of Prone and Right Lateral Positions on Gastric Residual Volume in Preterm Newborns

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## ABSTRACT

**Background:** Nutritional problems in premature newborns are of great importance for their development. In this regard, the neonatal positioning during and after feeding can have a significant effect on their nutritional tolerance. Therefore, the present study was conducted to compare the effect of two positions (i.e., prone and right lateral) on gastric residual volume in preterm newborns after gavage feeding.

**Methods:** This crossover clinical trial was performed on 52 eligible premature newborns who were selected using purposive sampling. They were randomly assigned into two groups, namely A and B. After gavage feeding, the newborns in group A were placed in the prone position and their gastric residual volume was measured 3 times. Subsequently, after gavage feeding, they were put in the right lateral position and subjected to the same measurement. On the other hand, the newborns in group B were first put in the right lateral and then a prone position. The other procedures and measurements were performed the same as those in group A. The data were analyzed using repeated measure ANOVA.

**Results:** The results indicated a significant difference regarding the mean value of gastric residual volume ( $P=0.001$ ). Moreover, the mean gastric residual volume in the prone position ( $2.152\pm 0.299$ ) was significantly ( $P=0.001$ ) lower than that in the lateral position ( $2.618\pm 0.403$ ).

**Conclusion:** According to the results, The prone position can reduce the mean gastric residual. Therefore, it can be recommended as a suitable position after gavage feeding in premature newborns.

**Keywords:** Gastric, Newborn, Premature, Prone position, Residual volume, Right lateral position

## Introduction

Approximately 15 million premature newborns are born worldwide every year (1). The birth rate of premature newborns throughout the world is estimated within the range of 5-18% (2). According to the World Health Organization report, the rate of preterm delivery is 23% in Iran (3).

Due to preterm labor, premature newborns often face multiple complications, including respiratory, neurologic, gastrointestinal, and nutritional problems (4-7). Despite significant advances in premature newborns' treatment and care, the mortality rate for premature newborns is still remarkable (4).

Nutrition management of premature infants is considered as an essential and important part of their care. If nutrition in premature infants is not

properly addressed, it can have significant side effects (3, 8-10). Premature newborns are highly vulnerable and their successful feeding is vital to their wellbeing leading to the prevention of further problems. Nurses play a key role in the nutrition of preterm newborns. Premature infants are at risk of nutritional problems because of weak sucking ability, ineffective swallowing, breathing problems, and immature organs, especially in the digestive system (11-13).

One of the basic principles of the newborn care is neonatal positioning, which is an important and non-invasive nursing intervention (14, 15). Caregivers should place the newborns in the most proper position based on their conditions. Proper premature neonatal positioning is

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necessary for physiological stability of infants (16, 17).

It is important to select a suitable position for newborns feeding. Studies have shown different results regarding newborns positioning during feeding. Chen et al. (2013) found that premature newborns had a lower gastric residual in a prone position, compared to the supine position (17). Valizadeh et al. (2015) evaluated the effect of nutrition in kangaroo mother care and supine positions on gavage residual volume in preterm newborns. They found lower levels of gavage residual volume during kangaroo mother care (18). However, Hussein (2012) reported no difference between the right lateral position and the semi-sitting position with gastric residual volume after preterm newborns feeding (19).

To the best of our knowledge, there are few studies on the gastric residual volume of premature newborns in different positions during and after feeding, especially in Iran. Therefore, there is a need for further investigation on this important issue which leads to successful feeding and nutritional tolerance of premature newborns. Accordingly, the main purpose of this study was to compare the effect of right lateral and prone positions on the gastric residual volume of the premature newborns after gavage feeding.

## Methods

### Study design and sampling

This crossover clinical trial was conducted on 52 eligible preterm newborns in teaching hospitals of Amir Kabir and Taleghani, Arak, Iran. The newborns were selected purposively and divided into two groups, namely A and B using block randomization. The inclusion criteria were: 1) gavage feeding with breast milk, 2) gestational age of 28-36 weeks, 3) birth age of 2-28 days, 4) birth weight of 800 grams and more, 5) at least 2 days of hospitalization, 6) spontaneous respiration, and 7) lack of mechanical ventilation.

On the other hand, the infants with oral feeding, abdominal distension, residual volume more than one-fourth of the introduced milk in the last feeding, the need for endotracheal intubation and mechanical ventilation, and those whose parents were unwilling to cooperate were excluded from the study.

The sample size was calculated 52 based on a previous study (18) and the mean comparison

formula ( $\alpha=0.05$ ,  $\beta =0.2$ ,  $S_1=1.6$ ,  $S_2=2.3$ , and  $d=1.1$ ).

$$n = \frac{2 \left( z_{1-\frac{\alpha}{2}} + z_{1-\beta} \right)^2 (S_1^2 + S_2^2)}{(d)^2}$$

### Intervention

Gavage feeding was utilized using a well-placed gastric tube (French 6). The newborns gastric residual volume was measured and recorded before gavage feeding. During the gavage feeding, the gavage syringe was held 30 cm above the newborn's head and the prescribed amount of milk was given in supine position with the head slightly up under direct supervision of the attending neonatologist. After feeding, the newborns in the groups A and B were placed in prone and right lateral positions, respectively, in nests. The gastric residual volume was measured and recorded at 30, 60, 90, and 120 min after gavage feeding (stage 1). Newborns were put in the supine position for 1 h after the final measurement (Washout period). Gastric residual volume was measured at the end of this time and the next feeding was done in this position again.

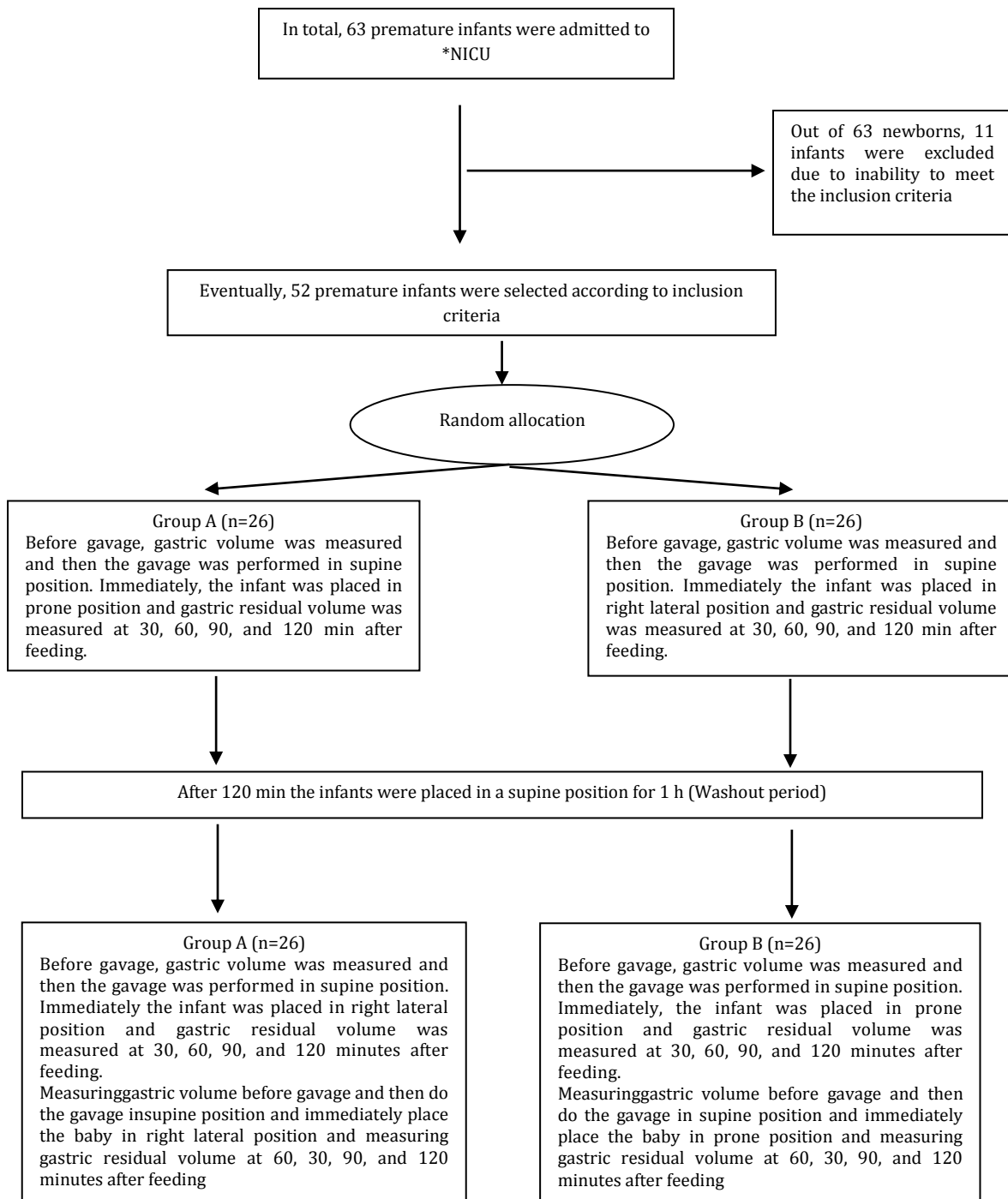
In the next stage, the newborns in groups A and B were placed in the right lateral and prone positions, respectively. Gastric residual volume was measured and recorded at 30, 60, 90, and 120 min after gavage feeding (stage 2) (Figure 1).

### Instrument

A researcher-made checklist was employed in this study. The first part of this instrument consists of demographic information, such as gestational age (week), age (day), birth weight, weight at the time of the study, gender, Apgar score, type of delivery, diagnosis, and duration of hospitalization. In addition, information about the position (prone or right lateral), the amount of prescribed milk, and the gastric residual volume before and at 30, 60, 90, and 120 min after gavage were included in the second part of the questionnaire.

### Statistical analysis

Descriptive statistics were reported using frequencies, percentage, mean values, and standard deviations. Due to the normal distribution of data based on the Kolmogorov-Smirnov test, repeated measure ANOVA was utilized to examine the gastric residual volume



\*NICU: Neonatal Intensive Care Unit

**Figure 1.** Consort Diagram

differences between prone and right lateral positions.

### **Ethical Approval**

Written informed consents were obtained from parents and they were all informed of the

research procedure. The study protocol was approved by the Ethics Committee of Arak University of Medical Sciences, Arak, Iran (IR.ARAKMU.REC.1396.192) and registered in IRCT under the code of IRCT20171203037731N1.

## Results

Table 1 summarizes the characteristics of newborns.

The difference between prone and left lateral positions regarding gastric residual volume is given in Table 2.

**Table 1.** Demographic characteristics of the newborns

Variable	Percent (number)
Gender	
Male	46.2 (24)
Female	53.8 (28)
Type of delivery	
Cesarean section	53.8 (28)
Normal vaginal delivery	46.2 (24)
Diagnosis	
Respiratory distress syndrome	59.6 (31)
Chorioamnionitis	3.8 (2)
Sepsis	19.2 (10)
Pneumonia	17.3 (9)
Gestational age (weeks)	
28-30	59.6 (31)
30-32	17.3 (9)
32-34	19.2 (10)
34-36	3.8 (2)
Mean age (days)	10.38±9.69
Mean birth weight (grams)	1825.4808±568.26
Mean weight at the time of the study (grams)	1902.9231±536.60
5-min Apgar score	
4	0 (0)
5	1.9 (1)
6	0 (0)
7	31.8 (2)
8	27.3 (12)
9	71.2 (37)

**Table 2.** Comparison of the mean value of gastric residual volume between two positions

Variable	Groups	Mean±SD	CI: 95%		P-value
			Lower Limit	Upper Limit	
Gastric residual volume	Prone	2.152	0.299	1.551	0.001
	Right Lateral	2.618	0.403	1.809	

## Discussion

This crossover clinical trial aimed to compare the effect of prone and right lateral positions on gastric residual volume in preterm newborns. According to the results, the mean value of gastric residuals in the prone position was significantly lower than that in the right lateral position even though both positions significantly reduced the mean gastric residuals.

In the same line, Chen et al. (2013) found that gastric residuals were significantly lower in the prone than those in the supine position ( $P<0.001$ ). They also concluded that the first 30 min after feeding is a critical time for a rapid lowering of gastric residuals volume. Therefore, they suggested posing the preterm newborns in the prone position for the first half hour post-feeding and changing their position subsequently according to their behavior cues (17). In contrast, Jebreili et al. (2011) reported the same effect of the right lateral position and prone position on the

gastric residual in preterm infants. Therefore, the utilization of both positions was recommended after gavage feeding (20).

The effect of different positions on gastric residual volume is considered in some studies. Sanger et al. (2013) investigated the effect of four body positions (i.e., left lateral, right lateral, supine, and prone) on gastric residuals in preterm newborns. They found that the frequency of gastric residuals was more in left lateral, compared to right lateral ( $P<0.001$ ), prone ( $P<0.05$ ), and supine positions. However, the difference was not significant in terms of supine position.

Moreover, the amount of gastric residual was higher in left lateral, compared to right lateral ( $P<0.000$ ) and prone ( $P<0.049$ ) positions; however, it was similar to the supine position ( $P<0.226$ ). They found that preterm newborns had less gastric residuals and benefited from being nursed in a

right lateral or prone position. The obtained results seemed to show significant effects of right lateral position (15).

Furthermore, in a study conducted by Hussein (2012), the difference between the right lateral and semi-recumbent positions after feeding was investigated regarding gastric residual volume among newborns. The results revealed no significant difference between the two positions in terms of gastric residual volume (19). Valizadeh et al. (2012) also found that the average gastric residual volume 2 h after feeding in kangaroo mother care position was lower than that in the supine position (18).

Some other studies considered several benefits for a prone position. Pourazar et al. (2018) investigated the effects of prone and supine positions on abdominal distention in premature infants. The results of the mentioned study showed that prone position while feeding could effectively reduce abdominal distension among neonates receiving nasal continuous positive airway pressure (3). In addition, Jarus et al. (2011) found that preterm neonatal positioning in prone position led to longer periods of sleep, and production of adaptive self-regulatory responses (21).

## Conclusion

The results showed that the preterm newborns had lower gastric residuals after gavage feeding in prone position, compared to those in right lateral position. Since preterm newborns benefits from several positive effects of prone position, it is recommended to place infants in prone position while feeding at least in neonatal intensive care units (NICU) and nurseries. There are still different practices regarding premature neonatal positioning in NICUs therefore, it is suggested that similar studies be conducted in this area on a larger sample size.

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## Conflicts of interests

The authors declare no conflict of interest in this study.

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