www.jmscr.igmpublication.org
Impact Factor (SJIF): 6.379
Index Copernicus Value: 79.54
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v6i9.35

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

The effect of nesting placement position on the gastric residual volume after gavage for premature neonates hospitalizedin the neonates intensive care unit (NICU)

Authors
Fatemeh Cheraghi[1], Fatemeh Sargolzaei[2*], Leili Tapak[3], Mehran Hesaraki[4]
[1]Associate Professor, Chronic Disease (Home Care) Research Center, Hamadan University of Medical Sciences, Hamadan, Iran
[2]MSc Student, Nursing and Midwifery School, Hamadan University of Medical Sciences, Hamadan, Iran
[3]Assistant Professor of Biostatistics School of Health, Hamadan University of Medical Sciences, Hamadan, Iran
[4]Pediatric Department, Zabol University of Medical Sciences, Zabol, Iran
*Corresponding Author
Fatemeh Sargolzaei

Abstract
Background: *Nutrition in premature neonates is associated with many problems. Nurses can promote nutritional tolerance in premature neonates through interventions. In this study, we have tried to identify the situation which leads to less residual volume in the stomach of the neonate.*
Materials and Methods: *70 neonates were randomly divided into experimental and control groups. The first group was fed in nesting position in the two first feeding sessions and in supine position in the next two sessions. The second group would be the opposite. In both groups, feeding was done once every one hour for 3 hours and the volume of the prescribed milk by the doctor was 5 ccs. The residual gastric volume after gavage was measured.*
Results: *The results of analyzing repeated measurements in each feeding method and each period indicate that the average of stomach residual volume has significant difference over time* (*P<0.001*).
Conclusion: *The acquired results showed that this position in premature neonates can significantly decrease the amount of gastric volume after gavage in comparison to supine position.*
Keywords: *Nesting Placement; Gavage; Premature Neonates.*

Introduction

Premature neonates include the neonates which have born before 37th week of pregnancy(1). The world health organization has estimated that the birth of premature neonates is more than one-tenth of the total birth of neonates(2). In Iran there are one million and two hundred thousand of births which 7 percent of them are related to birth of premature neonates(3). The overall neonate mortality in the whole world is decreasing. Somehow that it has decreased from 4.4 million deaths of neonates in 1990 to 1.3 million in 2010. But still the complications of early birth are the main cause of 1 million deaths of neonates(4).

Premature neonates often need to be admitted and have long-term care in order to overcome growth insufficiency and prevent nerve disorders. Neonates born before 34 weeks usually are unable to feed from baby feeding bottle or breastfeeding [6]. The main purpose of primary cares is to accelerate the weight gaining of premature neonates and prevent the manifestation of complications due to prematurity. But during long-term cares, feeding premature neonates is usually associated with many problems[7]. Choosing the nutrition method for premature neonates are different based on the position of the neonate and would be selected somehow that doesn't lead to aspiration, regurgitation or fatigue of the neonate[8]. Premature neonates are more in danger of aspiration due to lack of coordination between sucking, swallowing and respiration[9]. As the neonate grows stronger, she will be able to receive breast milk or formula milk through gavage. The amount of gavage gradually increases. This gradual process reduces the risks of infections in the neonate. Neonates who feed from breast milk are less susceptible to intestine infections[7]. Nutrition intolerance is common in premature neonates which will be visible by distension of stomach and increased gastric residual volume. Evaluation of gastric residual volume at the beginning of each gavage is one of the common methods to identify nutrition tolerance or intolerance in premature neonates. Increasing of gastric residual volume after gavage indicates the nutrition intolerance of the neonate and can be one of the primary symptoms of necrotizing enterocolitis. Necrotizing enterocolitisis one of the reasons of neonates mortality, especially premature neonates with low weight when born. Reduction of intestinal movements, reduction of gastrointestinal hormones, enzymes and even the type of formula (breast milk versus dry milk) are the factors which have effect on reduction of stomach's function and increasing of gastric residual volume[8]. Also, gastro-esophageal reflux is common in premature neonates and causing chronic pulmonary disease, pneumonia, aspiration and apnea[7]. Nurses can increase premature neonates' nutritional tolerance through nursing cares. Putting neonates in proper position (positing) during feeding and afterwards is one of these cares[7]. The common positions in the ICU of neonates, includes lateral sleeping, supine and prone[10]. Usually after gavage, in order to reduce the risk of aspiration and reflux, they put the neonate in prone or right lateral sleeping position[9]. Using the two positions of prone or right lateral sleeping, can be helpful for neonates with respiratory distress syndrome[8]. Another positioning which has been considered in neonates areas in recent years is called nesting position. At the end of the pregnancy, the size of the embryo is maximized and the space for his movement in abdomen has been minimized. In this case the embryo bends his head, shoulders and hips and the organs are placed near the trunk. After birth, the neonate tends to be in the same position[12]. given that the nest position is the most similar to embryo's condition in mother's womb and the positive results of researches done on the effect of cases such as reduction of neonate's blood oxygen saturation percentage fluctuation, preventing from exacerbation of respiratory distress in the neonate and considering the effect of this positioning condition on premature neonates gastric residual volume after gavage is valuable. This study's goal is to determine the best position of nesting and its effect on neonate gastric residual volume after gavage.

Materials and Methods

The current study is a randomized clinical trial with unilateral-blind intersecting plan done on premature neonates with gestational age of 32 to 37 weeks who were hospitalized in the neonatal ICU of Zabol medical center during the study. Criteria for entering the study: age at birth between 32-37 weeks of pregnancy, the birth weight of the neonate less than 3000 grams, the absence of any gastrointestinal malformations such as esophageal atresia, Broncho pulmonary dysplasia and like that which prevents oral

feeding. Written permission of neonate's position changing by the doctor in charge and feeding by gavage was in the file. 70 neonates are randomly assigned to the experimental group (35 neonates per group). Neonates of the first group are fed (gavage) in the first two feeding sessions in nesting position and in the next two sessions in supine position. Second group's neonates the opposite. In both groups, feeding was done every one hour for 3 hours and the amount of the prescribed milk was 5 ccs. The gastric residual volume after gavage, was measured one, two and three hours after each time feeding (three times and totally six times in both sessions of gavage in each position). In both conditions and throughout the gavage and afterwards, the head of the neonate was maintained 30 degrees higher than the body and the head was able to turn left or right. The neonates didn't receive any feeding during the three hour time between feeding intervals in both positions, until the cleansing period was completed.

At the beginning of the shift in the morning and before feeding, the neonate was weighed with a digital SKA weight (accuracy of 10 ± gr) and changes were recorded in the relevant checklist. Data were analyzed through SPSS statistics software version 22 and by using descriptive statistics (average, standard deviation and descriptive frequency) and also by using chi-square and t-test the data would be analyzed.

Results

In the first group 51.5% of premature neonates were female and 48.5% were male but in the second group these numbers were 45.8% female and 54.2% male. The mean (standard deviation) age of the neonates was 28.61 (2.3.03) in the first group and 29.81 (1.98), in the second group. The age at birth in the first group was 14.8 and in the second group it was 8.64. Birth weight in the first group was 1423.32 and in the second group it was 1390.99 grams. The results of cesarean section were 80% in the first group and 89.9% in the second group.

Table 1: Distribution of absolute and relative abundance of research units based on demographic characteristics

Neonate's demographic characteristics		Nesting position		Supine		Chi-square test	P–amount
		number	percent	number	percent		
Sex	girl	16	43.2	22	57.9	1.61	0.204
	boy	21	56.8	16	42.1		
	Total	37	100	38	100		
Birth age (pregnancy week)	27-30	25	67.6	19	50	2.39	0.122
	31-33	12	32.4	19	50		
	Total	37	100	38	100		
Age after birth (day)	5-8	22	59.5	15	39.5	2.996	0.083
	9-12	15	40.5	23	60.5		
	Total	37	100	38	100		
Birth weight (grams)	1100-1350	16	50	11	33.3	1.86	0.173
	1400-1700	16	50	22	66.7		
	Total	32	100	33	100		

The mean (standard deviation) of the mothers' age in the first group was 28.68 (1.8) and the second group was 40.28 (1.4) years old and the fathers of first group was 31.32 (1. 2) and the second group was 30.09 (3/2) years. The majority of mothers were housewives in the first group (77%) and the second group (90%), diploma and higher in the first group (37.2%) but in the second group under the diploma (38%) and self-employed fathers in the first group (60%) and in the second group (62.8%) and diploma and higher (42.8%) and second group were (48.5%).

Table 2: Distribution of absolute and relative abundance of mothers of research units based on demographic characteristics

Mothers demographic characteristics		Nesting position		Supine	
		number	percent	number	percent
Education level	Under diploma	13	35.1	12	31.6
	Diploma and higher	11	29.7	11	28.9
	Bachelor	11	29.7	10	26.3
	Master and higher	2	5.4	5	13.2
	Total	37	100	38	100
Job	Employed	15	40.5	13	34.2
	Housewife	22	59.5	25	65.8
	Total	37	100	38	100
Age (year)	17-35	36	97.3	37	97.4
	36-45	1	2.7	1	2.6
	Total	37	100	38	100
Giving birth	Normal	12	32.4	18	47.4
	CesareanSection	25	67.6	20	52.6
	Total	37	100	38	100

Table 3: Distribution of absolute and relative abundance of fathers of research units based on demographic characteristics

Father's demographic characteristics		Nesting position		Supine	
		number	percent	number	percent
Education level	Under diploma	12	32.4	6	15.8
	Diploma and higher	9	24.3	10	26.3
	Bachelor	12	32.4	14	36.8
	Master and higher	4	10.8	8	21.1
	Total	37	100	38	100
Job	Employee	12	32.4	12	31.6
	Self-employed	20	54.1	21	55.3
	Unemployed	5	13.5	5	13.2
	Total	37	100	38	100
Age	22-35	31	83.8	36	94.7
	36-50	6	16.2	2	5.3
	Total	37	100	38	100

In order to achieve goal number one (Determination of residual gastric volume after gavage of premature neonates in nesting position), Tables number 5-3 and graph number 1-3 were regulated. The results confirmed the research's number one goal.

According to the ANOVA test there is a significant relation between the measurements of gavage residual volume averages in two positions of supine and nesting, meaning that the average of gavage residual volume in supine position in one, two and three hours after feeding has been much more than the nesting position. It was also observed that the average of the gavage residual volume in both groups were significantly different with each other, meaning that by the passage of the time, the residual volume in the second group had a smaller volume than the first group.

In the first group the gavage residual volume by the passage of the time included a less amount and on the other hand, this amount was more in the supine position than nesting position, somehow that in the first hour, the amount of gavage in supine position was 4.33 ± 0.45 and in the nesting position was 3.77 ± 0.31 ml which also in the second hour was equal to 3.16 ± 0.23 and 2.17 ± 0.23 ml respectively, also in three hours after feeding, in supine and nesting position is equal to 1.65 ± 0.16 and 1.04 ± 0.18 respectively ($P < 0.05$).

But in the second group the gavage residual volume in the first hour in supine position was gained 4.30 ± 0.3 and in nesting position was gained 3.2 ± 0.26 ml which also in the second hour was gained 3.32 ± 0.34 and 1.48 ± 0.27 ml respectively, also at three hours after feeding in supine and nesting position was gained 2.13 ± 0.14 and 0.54 ± 0.11 respectively ($P < 0.05$).

Table 4: Distribution of quantitative demographic statistics average of research units.

	Nesting position		Supine		Independent T-test	P-number
	Average	Standard deviation	Average	Standard deviation		
Birth age (week of pregnancy)	29.46	1.2	29.95	2.03	-1.058	0.294
Calendar age (day)	8.51	1.74	8.76	1.6	-0.646	0.520
Neonate's weight (grams)	1388.11	130.59	1426.03	157.86	-1.132	0.261
Mother's age (year)	28.68	4.24	28.37	3.5	0.344	0.732
Father's age (year)	31.32	4.2	30.92	3.56	0.450	0.654

Table 5: Distribution of average of gastric residual volume after gavage in studying units based on feeding time.

B- gastric residual volume after gavage (second session)							A- gastric residual volume after gavage (first session)						Position's condition
Test statistics	Third hour		Second hour		First hour		Test statistics	Third hour		Second hour		First hour		
	Standard deviation	Average	Standard deviation	Average	Standard deviation	Average		Standard deviation	Average	Standard deviation	Average	Standard deviation	Average	
F=162.517 df=2 p<0.001	1.42	1.02	1.63	1.81	0.88	3.80	F=123.983 Df=1.531 P<0.001	1.59	1.03	1.5	2.17	1.07	3.78	Nesting
f=74/972 df=1.477 p<0.001	1.83	1.74	1.30	2.99	0.75	4.14	f=108.754 df=1.621 P<0.001	1.67	1.64	1.24	3.16	0.77	4.35	Supine
	T=-3.572 p<0.001		T=-5.618 df=34 p<0.001		T=-4.172 df=34 p<0.001			T=-3.852 p<0.001		t=-5.977 df=34 p<0.001		T=-3.977 *p<0.001		Statistics of even t-test

Because the normalization assumption doesn't exist, non-parametric even t-test which is Wilcoxon is used.

Table 6: Distribution of average of gastric residual volume after gavage in studying units based on feeding time (second repeat).

Position's condition	A- gastric residual volume after gavage (first session)							B- gastric residual volume after gavage (second session)						
	First hour		Second hour				First hour	Second hour				First hour		Second hour
	Average	Standard deviation		Average	Standard deviation		Average	Standard deviation		Average	Standard deviation		Average	Standard deviation
Nesting	3.22	1.19	1.51	1.21	0.53	0.9	f=166.723 df=2 p<0.001	3.92	0.96	2.23	1.35	0.78	1.20	f=155.795 df=1.651 p<0.001
Supine	4.30	0.86	3.32	1.30	2.13	1.79	f=59.190 df=1.543 p<0.001	4.41	0.68	3.27	1.11	1.74	1.53	f=8 128.834 df=1.454 p<0.001
Statistics of even t-test	T=-3.979 p<0.001		T=-8.205 df=34 p<0.001		T=-4.434 p<0.001			T=-2.789 p<0.007		T=-4.304 df=34 p<0.001		T=-3.256 p<0.001		

Discussion

The results of this study were in line with studies by Laughlin et al., 2011[13]. In this study, stomach's residual volume was measured regularly before and after enteral feeding. Big amount of gastric residual volume may cause result in reflux and vomiting and aspiration and discomfort. An improper emptying of the stomach in these neonates is one of the primary manifestations of necrotizing enterocolitis. It also coincided with the study of Yu (1965)[14]. Yu concluded that they must be laid on left lateral or supine position because in these two positions, stomach's residual volume is more than the others and this sort of positioning must be used less frequently in hospitals and by nurses[14]. Also, Malhourta et al. (1992) examined the amount of stomach residual volume in 50 healthy neonates that were born between 28 and 36 weeks of gestation. On days 4 to 7 of feeding these neonates, they found that stomach's residual volume in prone position was less than supine position which it was in the same line with our study[15]. Also the obtained results were similar to

Sanger et al (2013) study, which was the most recent and most relevant to our study. Based on the researches they had done, it showed that among the 147 neonates which were born between 28 to 36 weeks of gestation, laying them to left and right lateral and supine position would maximize the stomach's residual volume[16]. The study of Poulose et al. was another example of the effectiveness of nesting position on physiological condition of premature neonates[17]. Also in our study, this way of positioning and its effect on stomach's residual volume after gavage was proved and bolded the importance of this subject. Also in this study according to the obtained results which are brought to tables 1 to 6 it was cleared that the supine position makes the neonates' stomach be able to keep more milk after gavage in comparison with nesting position. In these studies, prone position is the same as nesting position and it confirms that this method is effective on emptying a bigger amount of gastric volume in neonates fed by gavage method. In line with goals number two and three (determining gastric residual volume after gavage for premature neonates in supine position) and (comparing gastric residual volume after gavage for premature neonates in nesting and supine position) table 5-3 and graph 1-3 were regulated. Also the results confirmed the research's goals number two and three. Based on the information above, the overall purpose (feeding premature neonates by gavage method in nesting position in compared with the usual method of supine position, reduces the amount of gastric residual volume) is confirmed. The obtained results showed that this position in premature neonates can significantly decrease the amount of gastric residual volume after gavage, compared to supine position. In the placement of neonates in nesting position, a higher amount of emptying gastric volume has been seen through the passage of time. Making such a decision is very important for considering the neonate's placement and its effectiveness on case nutrition which hasn't been given much attention. The importance of this subject increases when we notice that the way of putting the neonate in nesting position has the lowest cost and the minimum training of nursing personnel but its results are much more valuable and more significant. In this position, the neonate feels more comfortable and has more control over her movements and reduces her stress from the environment and also improves neonate's nutrition and eliminates and decreases problems such as gastric reflux, vomiting and so on, that reveal in neonate because of the big amount of residual volume after gavage. All of these reasons are evidence of the importance of paying attention and executing this subject in the way of keeping premature neonates in ICUs.

The results that have been mentioned about this so far are all those that affect the quality of premature neonates but it mustn't be forgotten that there are also long-term and indirect results in between. One of these results is emotional and intellectual support of premature neonate's parents because by this method the neonate grows faster and the opportunity for the parents to feed their own baby would get bigger. The probability of reduction in hospitalizing period in ICU according to multiple positive aspects of this method must be considered, and this case not only would be pleasant for the parents but also it will reduce the costs that health system must support for caring for these neonates in ICUs.

Conclusion

Therefore this research is a clear example of using a simple and cheap and easily executable method to solve the premature neonates' problem which is much more vulnerable than normal neonates. It is suggested Studies with more and wider statistical community and with the control group in this basis would be done. Such studies must be considered that simultaneously evaluate multiple placements of the neonate including nesting position and evaluate their effect on the amount of gavage residual volume in the stomach of the neonates.

Acknowledgement

This study obtained from MSc thesis with ethics code (IR.UMSHA.1396.545) from Hamedan University of medical science, and approved in Iranian registry of clinical trial database by id (IRCT20120215009014N206).

References

1. Verklan MT, Walden M. Core Curriculum for Neonatal Intensive Care Nursing: WB Saunders Co; 2010. 194-205 p.207
2. Howson CP, Kimmey M, McDougall L, Lawn JE. Born too Soon: Preterm Birth Matters. Reprod Health. 2013;10(Suppl 1):S1.
3. Ahmadi Z, jozmohtashami M, Seyed Fatemi N, Haghani H. Study of realationship between social support and parents satisfaction of provided care for premature infants in selected hospitals of Tehran University of Medical Sciences 1394. JPEN. 2015; 2 (2) :39-48
4. Organization WH. Newborn Health Epidemiolog. 2012; Available from: www.who.int/entity/maternal.../epidemiology /newborn/en/index.html.
5. Kliegman RM, Behrman RE, Jenson HB, Stanton BF. Nelson Textbook of Pediatrics. 18thed. Philadelphia, Saunders Elsevier;s 2007; PP: 706-707.
6. Harding C. An evaluation of the benefits of nonnutritive sucking for premature infants as described in the literature. Archives of Disease in Childhood 2009; 94(8):636-641.
7. Boiron M, Nobrega LD, Roux S, Henrot A, Saliba E. Effects of oral stimulation and oral support on non-nutritive sucking and feeding performance in preterm infants. Developmental Medicine & Child Neurology 2007; 49(12):439-44.
8. Hwang YS, Vergara E, Lin CH, Coster WJ, Bigsby R, Tsai WH. Effects of Prefeeding Oral Stimulation on Feeding Performance of Preterm Infants. Indian Journal of Pediatrics 2010; 3(12):1-6.
9. Valizadeh S, Hosseini M B, Asghari Jafarabadi M, Mohebbi L. The Effect of Kangaroo Mother Care on Feeding Tolerance in Preterm Infants. JBUMS. 2014; 16 (12) :16-2238
10. Corvaglia L, Martini S, Aceti A, Arcuri S, Rossini R, Faldella G. Nonpharmaco-logical Management of Gastroesophageal Reflux in Preterm Infants. BRI. 2013;2013:141967.
11. Valeur J, Berstad A, Hausken T. The effect of body position on postprandial perceptions, gastric emptying, and intragastric meal distribution: an ultrasonographic study in reclining healthy subjects. SJG. 2015 Feb;50(2):170.
12. Dutta S, Singh B, Chessell L, et al. Guidelines for Feeding Very Low Birth Weight Infants. Nutrients. 2015;7(1):423-44.
13. Laughlin J, Luerssen TG, Dias MS, Committee on Practice and Ambulatory Medicine, Section on Neurological Surgery. Prevention and Management of Positional Skull Deformities in Infants. Pediatrics. 2011;128:1236-41.
14. Yu J, Payne WW, Ifekwunigwe A, et al. Biochemical status of healthy premature infants in the first 48 hours of life. Archives of Disease in Childhood 1965; 40:516-525.
15. Malhotra, A.K.; Deorari, A.K.; Paul, V.K.; Bagga, A.; Singh, M. Gastric residuals in preterm babies. J. Trop. Pediatr. 1992, 38, 262–264.
16. Sangers H, de Jong P, Mulder S, Stigter G, van den Berg C, te Pas A, et al. Outcomes of gastric residuals whilst feeding preterm infants in various body positions. Journal of Neonatal Nursing. 2013;19(6):337-41.
17. Poulose, R, Babu, M. Sharda Rastog Effect of Nesting on Posture Discomfort and Physiological Parameters of Low Birth Weight Infantsi. IOSR-JNHS, Vo4, 1, 2015, PP 46-50.