

## The Difference between Right Side and Semi Recumbent Positions after Feeding on Gastric Residual Volume among Infants

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**Abstract:** Gastric residual volume (GRV) is considered as an objective parameter for gastric emptying and tolerance of feeding. The effect of infant's position after feeding on gastric residual has been mostly conducted in infants. The aim of this study was to assess the difference between right side and semi recumbent positions after feeding on gastric residual volume among infants. A quasi experimental design was utilized. The current study was conducted in Pediatric Intensive Care Unit (PICU) at New Pediatric Specialized Hospital, Cairo University. A sample of 35 infants included in the study one day after being admitted to PICU and fulfilling the inclusion criteria, and two tools utilized to collect the required data: socio-demographic data sheet and GRV record sheet. The main results revealed that more than seventy percent of the infants were male, the mean age of infants was  $6.5 \pm 2.2$  months and regarding to grade of respiratory distress more than half of infants with grade II. No significant difference was detected between infants positioned at right side and semi recumbent regarding amount of GRV after feeding. The current study recommended that nurses can place infants in semi recumbent position or right side after feeding. Replication of the study in bigger sample with different diseases.

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**Keywords:** GRV; gastric empty; infants; right side; semi recumbent position; PICU.

### 1. Introduction

Food enters the stomach leave the esophagus through esophagus sphincter, in the stomach the digestive breakdown of food really begins. It operates like a food mixer, mixing the food bolus to a paste called chyme, and releasing numerous chemicals such as digestive hormones, enzymes and gastric juices which help to break down food molecules in the chyme into small particles for absorption into the bloodstream. The chyme slowly exits the stomach via the pyloric sphincter into the duodenum where digestion continues. A gastric residual volume (GRV) is food from a previous feeding left in the stomach at the start of the next feeding [1].

GRV is considered as an objective parameter for gastric emptying and tolerance of feeding and is measured before each feeding as a common practice in clinical settings. The emptying time of the stomach and its residual capacity has a direct effect on the volume and schedule of feeding. Gastric emptying is affected by infant's age, types of formula, nutrient compositions, drugs, and position of the infant [2]. The effects of various body positions (right side, left side, back and prone positions) used in clinical settings on the changes of gastric residuals over time have not been fully addressed in infants. Even in studies conducted on low birth weight infants, the findings have not led to clinical application due to lack of control or randomization in

some of these studies. Therefore, controversies remain regarding the best position after feeding [3].

Many studies recommended placing infant at right side after feeding to promote digestion as Van Wijk, et al., [4] who recommended position the infant on the right side for at least 1 hour in the same manner to minimize the possibility of regurgitation and aspiration and to promote digestion and prevent reflux if the infant's condition permits it. Actually their explanation in placing infant on right side position to promote digestion is that in this position nothing represents pressure upon the stomach of infant.

Metheny [5], found no difference in GRV values obtained when the infants were semi recumbent or in the right lateral decubitus position. A traditional reason for avoiding the semi recumbent position continues to be fear of aspiration although multiple studies have established that there is no increased risk of choking or aspiration with the semi recumbent position [6].

American Academy of Pediatrics (AAP) [7], identified any non-prone position (e.g side or semi recumbent) as being optimum for reducing sudden infant death syndrome (SIDS) risk. But in 2000, on the basis of new evidence, the AAP advised that placing infants on their semi recumbent position after feeding confers the lowest risk and is the preferred position. With the large decrease in the proportion of infants placed to sleep prone since the initiation of

semi recumbent to sleep campaigns around the world, the contribution of side sleep position to SIDS risk has increased.

Several studies, including 2 in the United States, have demonstrated that side sleep position confers an increased risk relative to semi recumbent. Also a study conducted in California after the semi recumbent to sleep era (1997–2000) found that the SIDS risks associated with side and prone position were similar in magnitude, so previous studies have found that side sleep position is unstable. The probability of an infant rolling to the prone position from the side sleep position is significantly greater than rolling prone from semi recumbent [8].

Supportive nursing care related to feeding plays a significant role in improving the nutritional state for infants. This care requires some basic considerations regarding the volume of the feeding, type of formula, duration between successive feeds, GRV, and prevention of associated complications. Infant's body position after feeding has also been considered as an important factor affecting gastric emptying [3].

### Significance of the study

Dramatic decreases in infant death rates have been observed in response to semi recumbent to sleep campaigns [9]. The American Academy of Pediatrics and the semi recumbent to sleep campaign mentioned that placing infants to sleep on the side is not as safe and is not advised and recommended that infants less than 1 year of age should be placed on the semi recumbent to sleep in order to lower the risk of infant death [10]. Despite this, many nurses in Pediatric Intensive Care Unit (PICU) do not follow the semi recumbent sleep position recommendations because they fear of aspiration and they think that digestion achieved better in right side position than in semi recumbent position, [11].

Many nurses are ignorant of the advice given about the semi recumbent to sleep campaign because nurses continue to worry about aspiration when infants are placed on semi recumbent position, although many studies proved that aspiration in semi recumbent position is not correct and it is clear that more education is needed for hospital nurses about infant sleep position and hospital policies. Therefore, this study will assess the difference between right side and semi recumbent positions regarding GRV infants after feeding to the position which promote gastric digestion and at the same time does not cause shocking.

### Aim of the study

The aim of this study was to assess the difference between right side and semi recumbent positions

after feeding on gastric residual volume among infants.

### Subjects & Method

#### Research Design

A quasi experimental research design was utilized to carry out the current study.

#### Research hypothesis:

There is no difference between right side and semi recumbent positions regarding amount of GRV in infants after feeding.

#### Setting:

This study was conducted at pediatric intensive care unit (PICU) at New Pediatric Specialized Hospital, Cairo University (NPSHCU). PICU receives all children from all Egypt and provides free treatment and care to them.

#### Subject:

A sample of 35 infants included in the study since the second day after being admitted to PICU and diagnosed and all required investigations performed. According to NPSHCU statistic records about 150 infant admitted to PICU in year 2008/2009. This study group according to ethical considerations studied twice, once as control and the second time as experimental group. The sample size determined based upon the sample calculation formula:

$$N = \frac{T^2 \times P(1-P)}{M^2}$$

N = required sample size

T = Stander significance

T = 1.96

P = prevalence

M<sup>2</sup> = standard margin 0.5

$$N = \frac{(1.96)^2 \times 150(1-150)}{(0.5)^2}$$

N = 35

The criteria for inclusion were

- 1-Age between 1-12 months.
- 2- Diagnosed as respiratory distress.
- 3-Have no medical diseases that affect digestion.
- 4- Receiving artificial feeding through nasogastric tube.
- 5- Receiving feeding every 3 hours.
- 5- GRV should be milk digested or semi digested (based on color of GRV).
- 6- Do not take medications increase or decrease gastric motility.

#### Tools for Data Collection:

Two tools utilized to collect the required data:

- 1- Socio-demographic data and medical information sheet, which developed by the research investigator after reviewing the related literature. It included 4 questions related to the infant's age, sex, degree of respiratory distress and amount of formula feeding

(milk) /meal.

2- Gastric residual volume record sheet, which used as a tool to measure amount of GRV retained in the stomach before giving formula feeding (it measured by aspirating syringe from a nasogastric tube). The record sheet included 4 items those items are time, color, amount and position of infant after feeding..

#### **Procedure:**

An official permission obtained from the director of NPSHCU and the head of the PICU after an explaining the aim, tools, duration and the benefits of the study. Also written consent obtained from the parents of studied infants whom admitted to PICU after explaining the aim, the benefits and the time/duration of the study tools. Socio-demographic data were collected from infant's sheet.

The study carried out on two successive days for each infant. During the first and second day at 9:00 am, 12:00 at noon and 3:00 pm before each feeding the research investigator aspirated GRV and recorded its characteristics in the GRV record sheet. After that the research investigator fed the infants the prescribed amount of artificial milk (if the color of GRV was white and aspirated milk refeed and the amount deduced from prescribed formula). At 9:00 am, 12:00 at noon and 3:00 pm after each feeding for one hour at least the infant placed on right side during the first day of the study and placed him/her on semi recumbent position during the second day. During the rest of day those infants left to PICU routine after feeding as being placed on their right side position and/or sometimes left in their back.

In the study day, the procedure of aspirating GRV, feeding and placing infant on right side/or semi recumbent position took about 10-15 minutes depended on amount of prescribed formula milk. During the study one, two and/or 3 infants/ week admitted to PICU and applied upon them inclusion criteria, based on this the research investigator went to PICU/week twice, 4 and/or 6 times/week depended on number of infants admitted to PICU. Time at 9:00 am, 12:00 at noon and 3:00 pm had chosen because these times were suitable for research investigator. Data were collected over a period from May 2010 till the end of August, 2010.

#### **Pilot study:**

A pilot study was done on 5 infants to evaluate the content of socio-demographic data and medical information sheet and gastric residual volume record sheet, and to test the feasibility of the tools and to determine the time required for assessing each infant. Few modifications were done. Infants included in the pilot study were included in the study.

#### **Tool validity:**

Assessment sheet reviewed by 3 experts in the

field of pediatric medicine and pediatric nursing to test content validity and according to their review few modifications were carried out in the content of the assessment sheet.

#### **Ethical considerations:**

The research investigator informed all parents about the aim, tools and duration of the study after the explaining to them the benefits of the study. Written consents of the parents were obtained. Parents were assured about confidentiality of the data which gathered from their infants during the study. The researcher informed the parents about their right to withdraw from the study at any time without any effect on the care provided for their infants. During the pilot study the researcher placed(4) infants after feeding on their left side to measure amount of GRV and compare it with right side and semi recumbent positions but 4 infants exposed to choking for this cause the researcher canceled left side position from the study for ethical considerations.

#### **Statistical analysis**

Data was analyzed using SPSS win statistical package version 17 (SPSS Inc., Chicago, IL). Numerical data were expressed as mean and standard deviation (SD). Qualitative data were expressed as frequency and percentage. For non-normally distributed quantitative data. Comparison of two repeated measures was done using Wilcoxon signed-ranks test while Comparison of more than two repeated measures was done using Friedman test. Spearman-rho method was used to test correlation between numerical variables ( $r$ ). A  $p$ -value  $\leq 0.05$  was considered significant.

### **3. Results**

Table 1 reveals that 71.4% of the infants were male and there was a statistically significant difference between infants regarding sex ( $\chi^2 = 6.37$  at  $p = 0.02$ ). Also table 1 shows that mean age of infants was  $6.5 \pm 2.2$  months. Regarding to grade of respiratory distress of infants who were admitted to PICU, more than half of the infants (54.3%) was grade II and there was no a statistically significant difference between infants regarding grade of respiratory distress as ( $\chi^2 = 7.10$  at  $p = 0.08$ ).

It is obvious from table 2 that the highest percentage (37.1%) of the studied infants had given amount of artificial milk ranges between  $> 50 \leq 100$  ml and the mean of the amount of artificial milk was  $30 \pm 82$  ml.

It is clear from table 3 that there is no statistically significant differences between right side position and semi recumbent position after feeding regarding amount of GRV in the 3 sequential times as the mean at 1<sup>st</sup> time in right side position was  $3.0 \pm 2.5$ , the mean at 2<sup>nd</sup> time was  $3.1 \pm 2.56$  and the

mean at 3<sup>rd</sup> time was  $3.1 \pm 2.57$ , regarding to mean of GRV in semi recumbent position in the 3 sequential times was as the following at 1<sup>st</sup> time  $3.3 \pm 2.5$ , the mean at 2<sup>nd</sup> time was  $3.3 \pm 2.74$  and the mean at

3<sup>rd</sup> time was  $3.3 \pm 2.37$ . significant difference were found between right side and semi recumbent positions in the mean amount of G.RV in 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> time as  $p > 0.05$ .

Table (1): Demographic characteristics of the studied infants (No. = 35).

Item	No.	%	$\chi^2$	P- value
<b>Sex :</b>	25		6.37	0.02* (sig.)
<b>Male</b>		71.4		
Female	10	28.6		
<b>Age:</b>				
1 ≤ 4 months	7	6		
5 ≤ 7 months	16	45.7		
8 ≤ 12 months	12	34.3		
Mean ± SD of Age	6.5 ± 2.2			
<b>Grade of respiratory distress:</b>			7.10	0.08
Grade II	19	54.3		
Grade III	10	28.8		
Grade IV	6	17.14		

Significant \*

Table (2): Percentage Distribution of Amount of artificial milk which given to Studied infants (No. = 35).

Item	No.	%
Amount of artificial milk		
≤ 50 ml	11	31.4
> 50- ≤ 100 ml	13	37.1
> 100 - ≤ 150 ml	6	17.1
> 150 ml	5	14.3
Mean ± SD of amount of artificial milk	30 ± 82	

Table (3): Comparison between mean Amount of Residual Volumes in Infants at Right Side and Semi recumbent Positions in 3 sequential times (No. = 35)

Mean ± SD of GRV before feeding	Right side position (1 <sup>st</sup> day)	Semi recumbent position (2 <sup>nd</sup> day)	Wilcoxon Signed Ranks Test (z test)	p. value
1 <sup>st</sup> time (9 a.m)	$3.0 \pm 2.5$	$3.2 \pm 2.5$	1.109	.268
2 <sup>nd</sup> time (12 at noon)	$3.1 \pm 2.56$	$3.3 \pm 2.74$	1.1163	.256
3 <sup>rd</sup> time (3 p.m)	$3.1 \pm 2.57$	$3.3 \pm 2.37$	1.119	.261

Table (4): Comparison between mean Amount of Residual Volumes in Infants at Right Side Position/semi recumbent position in 3 sequential times (No. = 35).

Position after feeding		Mean ± SD of GRV	Friedman Test ( $\chi^2$ )	p. value
Right side position	1 <sup>st</sup> time (9 am)	$3.0 \pm 2.5$	2.337	.311
	2 <sup>nd</sup> time (12 at noon)	$3.1 \pm 2.56$		
	3 <sup>rd</sup> time (3 pm)	$3.1 \pm 2.57$		
Semi recumbent position	1 <sup>st</sup> time (9 am)	$3.2 \pm 2.5$	2.426	.307
	2 <sup>nd</sup> time (12 at noon)	$3.3 \pm 2.74$		
	3 <sup>rd</sup> time (3 pm)	$3.3 \pm 2.37$		

Table (5): Correlation between Right Side, Semi recumbent Positions regarding GRV in 3 sequential times (No. = 35).

Position	Right side 1	Semi recumbent 1	Right side 2	semi recumbent 2	Right side 3
Semi recumbent 1	$r = .827^*$ $p = .000$				
Right side 2	$r = .144$ $p = .410$	.200 .249			
Semi recumbent 2	$r = .138$ $p = .428$	.182 .294	$.971^*$ .000		
Right side 3	$r = .065$ $p = .710$	121 .489	$.980$ .000	$.948^*$ .000	
Semi recumbent 3	$r = .072$ $p = .682$	.116 .508	$.942^*$ .001*	$.956^*$ .001*	$.960^*$ .001*

\* Significance at  $p \leq 0.05$

\* Significance at  $r \geq 0.05$

Table 4 explains that there is no statistically significant differences between the three times regarding mean amount of GRV when infant placed on either right side as ( $\chi^2=2.337$ , at  $p=.311$ ) or semi recumbent position as ( $\chi^2=2.426$ , at  $p=.307$ ).

Table 5 reveals that there was a positive correlation between right side and semi recumbent positions regarding amount of GRV which indicates that an increase in the amount of GRV in right side position also the amount of GRV in semi recumbent position increases as ( $r \geq 0.5$ ,  $p \leq 0.5$ ).

#### 4. Discussion

The results of current study revealed that the majority of the infants who admitted to PICU were male this finding supported by studies done by Ismail [12], Saied [13] and Haque and Bano, [14] who founded in their studies that the majority of infants admitted to PICU were male. This male preponderance in the current study has not known its cause because it is not logic that the parents differentiate between their infants in seeking medical help from governmental hospital. So the higher number for male admission to PICU is not explicable.

In the current study near than half of infants their age range between 4 -7 months. This result in agreement with what founded by Ismail [12] and Saied [13] as they reported in their study that the majority of infants in their sample their age were less than one year. This may be due to increase incidence of pneumonia or respiratory distress in this age which being complicated and requiring admission of infant to PICU.

The current study revealed that there is no statistical significant difference between placing infants on right side and semi recumbent positions after feeding regarding amount of GRV in 3 sequential times. This may be due to nothing produces pressure upon stomach and impedes digestion when infant placed in semi recumbent position as the same thing when the infant placed in right side position, therefore, no difference in the amount of GRV.

The results of the current study goes in line with studies done by Alievi, et al., [15] and Thomas, et al., [16] as they reported the same result and stated that semi-recumbent and full side-lie positions were recommended in the management of a range of infant conditions after feeding in intensive care unit. However, full side-lie was less commonly used than supine positioning.

Furthermore, Van der Voort and Zandstra [17] and Bourgault, et al., [18] incongruence with the result of the current study as they found in their studies that there is no difference between right side

and semi recumbent positions after feeding when the head of the bed is elevated to 30° in semi recumbent position, and they recommended semi recumbent position after feeding with elevating the head of bed to a minimum of 30° to 45° to reduce the risk of microaspiration. Also Szarka and. Camilleri [19], Reignier, et al., [20], they found in their study that feeding in semi recumbent position should be considered to enhance gastric emptying and to prevent vomiting in infants receiving mechanical ventilation

The results of the current study are supported by Blumenthal, et al., [21] as they studied stomach emptying of infants in different positions and found no significant differences in the pattern of stomach emptying in the right side, semi recumbent and prone positions. They speculated that placing infants in the semi recumbent position to sleep does not cause clinical aspiration as many people afraid. They recommended that the semi recumbent sleeping position should be encouraged in hospital nurseries to increase the rate of semi recumbent sleeping subsequently in the home. Also Steingoetter, et al., [22] reported in their study that the stomach maintains the rate of gastric emptying despite changes in body position.

The results of the current study are contradicted with what stated by Cohen, et al., [23] as they founded that the amount of GRVs is lesser in right side position than in semi recumbent positions. In addition, Victor [24] reported in his study that the stomach empties more rapidly in the prone and right lateral positions than in the supine and left lateral positions.

The result of the current study reveals that there was a positive correlation between right side and semi recumbent positions regarding amount of GRV which indicates to any increase in the amount of GRV in right side position also there is an increase in the amount of GRV in semi recumbent position. This result is supported by results of study done by Van der Voort and Zandstra [17] who found in their study that infants with a clinically increase in the amount of GRV in one position there is an increase in the amount of GRV in the other position.

It is obvious that the results of the current study prove research hypothesis as there is no a significant difference between semi recumbent position and right side position regarding to amount of GRV after feeding.

#### Conclusion

It can be concluded from the study that placing infants after feeding on either right side or semi recumbent positions have the same effect on the GRV amount.

## Recommendations

The current study recommends that:

- 1-Nurses should place infants in semi recumbent position or right side position after feeding.
- 2- Replication of the study in a bigger sample.
- 3-Replication of the study in another sample with different diagnosis.
- 4-Health education for parent about the effect and benefits of semi recumbent position on GRV amount.

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