

A Study of Variation in the Tube Feeding Rate by Nurses in a Tertiary NICU

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Abstract

Introduction: 50-60% of the low birth weight babies in a neonatal unit are on gravity feed via gavage tube as they often are not strong enough to sustain on oral feeds. Successful feeding depends on nursing skill and individual variation can be expected. As with many other nursing practices in NICU, considerable variation can be expected in gravity feeding rate as well. The objective was to determine the intra individual and inter individual variation in the rate of gravity feeding among the nurses. **Material and Methods:** This was a Prospective study done in a Tertiary Neonatal care unit. Babies weighing < 2 kg on enteral feeds were included in study. The nurses carried out feeding in the standard prescribed manner. Time taken for feeds was noted. **Results:** 21 nurses participated in the study. 15 babies were included and there were 342 feed events. During 75(22%) feeding events, the nurses had an assignment of less than four babies. During rest of the 267 (78%) feeding events, they had more than four babies assigned for care. The median volume of feed was 14 ml and median duration was 8 minutes. Feeding rate variation within same nurse varied from one to 37.5 times their base line rate and in between the nurses varied by minimum of 17 times. **Conclusion:** A wide intra and interpersonal variation among the nurses, with respect to the rate of feeding of newborns was observed in our study.

Key words: preterm, gravity feeds, feeding rate

Introduction

Survival of the preterm babies is increasing due to the advancements in the neonatal care¹ Premature or low birth weight babies have a huge challenge before them for survival. Often they have initial stormy course which at times can be fatal. Their immediate survival and subsequent growth and development are strongly influenced by the nutritional advancement² even simple interventions such as early initiation of breastfeeding have been shown to improve their survival in resource restricted settings³

Approximately 50-65% of preterm infants experience feeding intolerance⁴ due to incoordination of suck-swallow reflex. This can

result in aspiration when fed by oral route. Hence these babies are usually fed by gavage feeds. Even in sick babies, early initiation of trophic feeds through gavage is beneficial⁶. Full feed is typically administered over a period of approximately twenty minutes⁶ bolus as this also mimics a normal feeding time. Gavage feeding involves intense nursing skills and labor in terms of holding the baby semi reclined and lifting the syringe barrel slowly, and hence variation in the feeding rate can be expected. Observation in our unit bolstered our expectation.

According to a recent international survey, feeding practices showed marked variations in neonatal intensive care units in different countries⁷. However most of these studies have considered various methods of gravity feeding. Unfortunately, we could not find any literature looking at the feeding rates with respect to various personal attributes of the health care provider.

We hypothesized that there will be variation in the rate of gravity feeding both within and in between individuals. If so, we wanted to note the magnitude of such variation. The answer to this question would lead to further studies on the effects of rate of gravity feeding on feed tolerance and if needed the strategies to decrease the variation. Hence, we conducted this study to know the extent of variation in gravity feeding rate within individual nurses and in between different nurses at different feeding events. This could help us to devise the strategies to bring about uniformity in the feeding rate.

Material and Methods

This was a hospital based prospective observational study conducted between July 2015 and September 2015 in neonatal unit of JSS Medical college Hospital, JSS University, Mysuru, Karnataka, India. Babies weighing less than 2 kg who could not be fed orally but tolerating enteral feeds of at least 50% of their fluid requirement through gavage were included in the study. Sick babies on ventilator and on inotropes were excluded.

All the babies included in the study, had either orogastric or naso gastric tube size 6 Fr inserted and fixed at appropriate length. The position of the tube was initially confirmed by determining of acidic pH of the aspirated juice using pH paper.^{7,8,9} Once the position was confirmed, the graduation at which the tube was secured to face was noted and confirmed before each feed to make sure the tube had not migrated. The nurse in charge then administered the feed by filling

the prescribed volume of milk into a syringe barrel and connecting it to the gavage tube. She would gradually raise the tube to empty the milk. Following feeding, babies were burped and laid on their beds.

All the nursing staff in charge of babies on gravity feeding filled in the nursing observation sheet with the details of babies assigned to them, onset and conclusion of feeding (burping time not included) one of the investigators collected this data along with other demographic data such as weight, gender and gestation from the case notes.

All these data was entered into Microsoft excel 2013. Continuous variables are summarised as mean and standard deviation or median and interquartile range depending on their distribution. Categorical variables are expressed as proportions

Institutional Ethical committee clearance was obtained. As this was a quality improvement exercise, no special consent was needed

Results

There were total of 21 nurses who participated and 15 babies were included and there were 342 feed events. 170 feeding events between 6 am to 6 pm were considered as day feeds and 172 feeding events between 6 pm to 6 am were considered as night feeds. During 75(22%) feeding events, the nurses had an assignment of less than four babies. During rest of the 267 (78%) feeding events, they had more than four babies assigned for care. The nursing work load in terms of babies assigned was equally distributed between day and night. During 133(39%) of the day and 134 (39%) of the night feeding events, the nurses had more than four babies assigned. Only during 37 (11%) of the feeding at day and 38(11%) at night, the nurses had less than four babies assignment [Table 1].

The median volume of feed was 14 ml and median duration was 8 mins. The mean rate was 1.1ml/kg/min. The table 2 depicts the feed duration, volume and rate in detail.

Feeding rate variation within same nurse varied from one to 37.5 times their base line rate. Whisker box plot [Figure 1] depicts the spread of variation, median and interquartile range.

Variation of feeding rate in between nurses was also wide. The minimum slowest rate of feeding was 0.1ml/min and maximum slowest rate was 2.0 ml/min, amounting to a variation of 30 times. The minimum and

maximum fastest feeding rate was 0.5ml/min and 9.0 ml/min respectively and this amounted to a variation of 17 times. Overall minimum feeding rate was 0.1ml/min and maximum feeding rate was 9 ml/min.

There was no correlation between the mean feed volume and the variation in the feeding rate of the nurses [Figure 2]

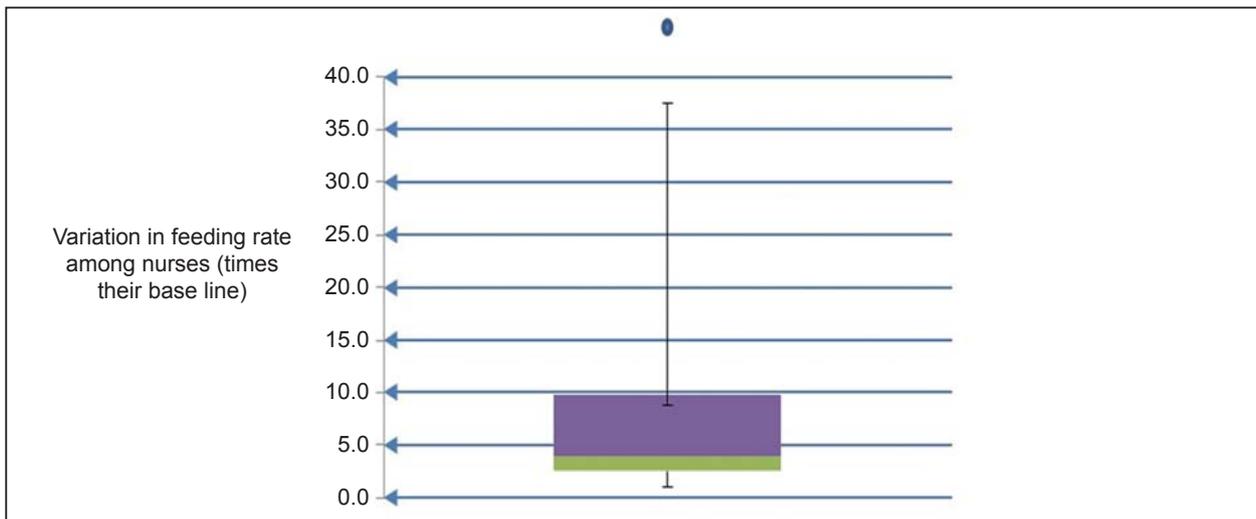


Fig 1: Feeding rate variation among the nurses

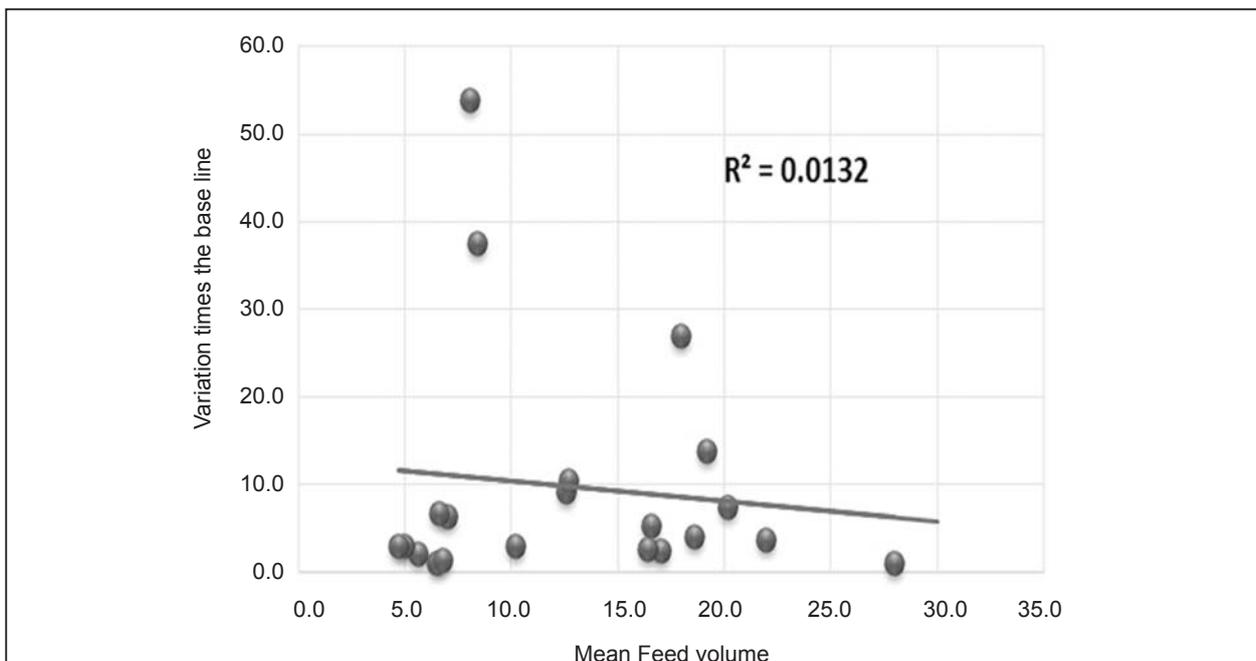


Fig 2: Correlation between mean feed volume and variation in the feeding rate

Table 1: Baby and Feeding event characteristics

Parameter	Summery statistics
Birth weight in grams	
Mean (SD)[Range]	1511 (382) [1120 – 2480]
Total No of babies = 15	
Feeding event per Nurse	
Median (IQR) [Range]	19 (8 - 28) [2 – 78]
Total events = 342	
Day feeds events - n (%)	170 (50%)
Night feeds events – n (%)	172 (50%)

Table 2: Nurse's work attributes and rate of feeding

Overall assignment	
Parameter	Median (IQR)
Duration (min) of feeding	8 (5 - 12)
Volume (ml) of milk	14 (6 - 21)
Feeding rate - Vol / min	1.7 (1.0 - 2.4)
Feeding rate corrected for weight Vol /Kg/min	1.1 (0.7 - 1.7)
Baby assignment > 4 per shift	
Duration (min) of feeding	8 (5 - 12)
Volume (ml) of milk	15 (5 - 21)
Feeding rate - Vol / min	1.8 (1 - 205)
Feeding rate corrected for weight Vol /Kg/min	1.2 (0.8 - 1.5)
Baby assignment < 4 per shift	
Duration (min) of feeding	5 (3 - 10)
Volume (ml) of milk	10 (6 - 17)
Feeding rate - Vol / min	1.5 (1.1 - 2.3)
Feeding rate corrected for weight Vol /Kg/min	1.2 (0.7 - 1.7)
Day shift	
Feeding rate - Vol / min	1.7 (1.2 - 2.5)
Feeding rate corrected for weight Vol /Kg/min	1.1 (0.7 - 1.7)
Night shift	
Feeding rate - Vol / min	1.7 (1.0 - 2.4)
Feeding rate corrected for weight Vol /Kg/min	1.2 (0.7 - 1.7)

Discussion

Variation in the feeding rate can be expected as the human factor is involved, but the magnitude and the scale of such variation has not been studied in neonatal units. There are various nursing practices where variation between the individuals is substantial and at times matter of concern. well studied practice variation include managing the PICC line¹⁰, blood sampling volume¹¹ rate of blood drawing from umbilical artery¹² and positioning the babies¹³ Feeding rate variation which could potentially cause feed intolerance is not yet studied.

Our study demonstrated a wide feeding rate variation during gravity feeding. Variation in the slowest feeding rate between the nurses was 30 times and their fastest feeding rate was 17 times the base line.

We did not come across any recommended feeding rate in such stable babies. Literature suggest that the feeds are typically completed in about 20 mins¹⁴ considering this as a common practice in NICUs and working backwards, a hypothetical baby weighing 1 kilogram on full feeds of 150 to 160 ml/kg/day, she/he would be getting about 18 to 20 ml feeds every 3 hourly. This volume of milk is recommended to be fed over 15 to

20 mins as it mimics normal feedings and create normal cyclical surges of hormones in the gut. This translates to approximately 1 ml/kg/min of feeding rate.

It is interesting to note that when all the data was summarised, the feeding rate noted in our study was appropriate. The matter of concern was the variation among individual nurses and also in-between nurses. This varied from one to 37.5 times the base rate for individual nurse and from 17 to 30 times in-between nurses. This underlines the fact that overall summarized value alone might not actually reflect the gravity of the problem. Our study has demonstrated a wide variation in the feeding rate from a minimum of 0.1ml/min to maximum of 9ml/min and there was no correlation between the mean feed volume and variation in the feeding rate. This points out towards human factors which can potentially be controlled.

Infants are usually fed every 3 hours over 10-20 mins, it is our common observation that a bolus feeding, when given fast can cause abdomen distension, discomfort in the infant and possibly leading to reflux, an issue of great concern in neonates. On the other hand, the feeds when given slowly, every feed will take

longer duration and there might not be enough time for digestion before next feeds. There are very few scientific trials to confirm this and a Cochrane review noted that there was a tendency for tachypnea with push feeds compared to gravity feeds¹⁵

Given the fact that there is gross paucity of evidence regarding the feeding rate, it is safer to assume that current recommendation of slow gravity feeds over 15 to 20 mins as standard of care. We strongly believe that the scale of variation in feeding rate as noted in our study should be addressed on a priority basis. Repeated reinforcing education of the nurses, skill practice sessions may all be helpful to bring about the uniformity in feeding rate. We also believe, the feeding process

could be automated, which could achieve this uniformity along with freeing the hands of the nurses who can concentrate on clinical observation. This has a potential to reduce the need for nursing resource as well.

Conclusion

A wide intra and interpersonal variation among the nurses, with respect to the rate of feeding of newborns is observed in our study. The magnitude of variation with in the nurse baby pair can be as high as 32 times the base line and between the nurses 17 times the base line. This needs further elaborative research to study the impact of such variation on feed intolerance and nourishment of the baby.

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