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Bowel Habits of Preterm Infants in Ilorin

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Summary

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Objective: To determine the pattern of bowel habits of preterm infants in the first 10 days of postnatal life.

Methods: One hundred and forty preterm infants delivered at the University of Ilorin Teaching Hospital (UITH) or referred to it within twelve hours of delivery, were studied. The babies were divided into two equal groups namely, those less than 33 weeks (group 1) and those between 33 and less than 37 weeks of gestation (group 2); 40 term babies were included in the study for comparison. The volume of feeds (where applicable), the age at first feeding, frequency of stools passed and the colour of the stools were recorded.

Results: The first stool was passed at 32.2± 27.5 hours in babies <33 weeks (group 1), at 21.8±15.8 hours in those between 33 and <37 weeks of gestation (group 2) and at 14.3±12.4 hours in the term babies. Although there was a significant indirect relationship between gestational age at birth and the time of passage of the first stool ($p = 0.000078$), the onset of enteral feeding was not a factor for initiating passage of the first stool; it however, had a direct relationship with the onset of transitional stool. The gestational age had an inverse correlation with the duration of passage of transitional stool ($r=0.31$ and $p<0.001$). The average frequency of stools/day increased with gestational age from 0.67 (group 1) and 0.57 (group 2) on the first postnatal day to a peak frequency of 1.80 and 2.00 respectively, during the first week of life. After this, there was a decrease, in spite of increasing milk intake.

Conclusion: The average frequency of stools/day in exclusively breastfed infants increases with gestational age. Most preterm and term neonates fed on breast milk produce predominantly soft stool during the first 10 days of life. It is hoped that the data produced from this study will serve as a reference for comparison with studies from other countries where exclusive breastfeeding is practised

Introduction

THERE is a paucity of reports on the development of bowel habits in Nigerian neonates. Bowel habits depend on factors such as diet,[1,2] infection, and race[3] which vary considerably from place to place and region to region. Postnatal age (PNA) from as early as 24 hours to as late as 14 days have been considered to be normal for the passage of the first stool in Caucasian preterms in the absence of other abnormal clinical findings.[4-7] There are, however, indications that black infants attain some neurological maturity of their gut earlier than their Caucasian counterparts of the same gestational age.[8,9] Therefore, a knowledge of the normal pattern of bowel habits of preterm infants will not only add to our understanding of the physiology of the large bowel, but will also help in identifying differences, if any, between the Negroid infants and their Caucasian counterparts. This will guide clinicians in making a timely choice of intervention without unnecessary investigations which are sometimes invasive and expensive. Additionally, the care of the infant will be more cost-effective, and parental fears and anxiety which often lead to the use of purgatives for their babies, allayed. This study was designed to describe the pattern of the bowel habits of Nigerian preterm infants in the fist 10 days of postnatal life.

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Materials and Methods

This was a prospective study carried out at the Neonatal Intensive Care Unit (NICU) of the University of Ilorin Teaching Hospital (UITH), Ilorin, between May 1998 and September 1999. Institutional ethical approval was obtained from the Ethical Committee of the UITH; in addition, verbal consent was obtained from the parents of each baby after the nature of the study had been fully explained to them. The study sample consisted of 140 preterm infants of various gestational ages delivered at the UITH, Ilorin, or referred to it within twelve hours of delivery. There were two gestational age (GA) strata, each with 70 babies selected consecutively based upon an initial estimation of sample size. The preterm were categorized into those less than 33 weeks and those between 33 and 37 weeks. Furthermore, it was desired to include seventy (70) term infants whose mothers were on admission at the Maternity Wing of the Hospital for reasons other than prematurity of their babies, for comparison; however, only 40 of the term babies included in the study were not lost to follow-up before the postnatal age (PNA) of 10 days.

The gestational age was obtained using the mother's last menstrual period (LMP) or clinical GA assessment using the Ballard score[10] if LMP was not known. Infants who had moderate to severe asphyxia (Apgar score[11] <5 at five minutes), necrotising enterocolitis or obvious congenital maliformations were excluded from the study. Records were made of the age (in hours) at which the first stool was passed, the type and volume of the first feed, and the baby's age when the first feed was given. Additionally, a daily record of the number of stools passed, the colour of the stool (using a simple scoring system of meconium, transitional or yellow as used by Ajayi *et al*[12]), the consistency of the stool passed (using a scoring system of loose, formed or hard[13] for easy recall), and where applicable, the volume of milk ingested daily, were made. All infants included in the study were commenced on enteral feeding after being adjudged to be clinically stable; meconium passage was not a prerequisite for initiation of enteral feeding. Infants weighing less than 1500 gm were fed with quantified expressed breast milk (EBM) at 40-60ml/kg/day, given in equal volume per feed at two-hourly intervals, using a polyvinyl feeding tube (No. 5 French) or cup and spoon and the feeding increased daily as tolerated, to a maximum of 150-180ml/kg/day by PNA of seven days. Babies whose oral intake was less than 150ml/kg/day had supplementary intravenous fluid to meet the daily basic fluid requirement. Babies weighing 1500 gm or more were fed with breast milk on demand by direct breast feeding, this being the normal practice in the NICU. Babies discharged before PNA of 10 days, were given a follow-up appointment for alternate days during which 48 hours recall of stool frequency, colour and consistency were obtained from the mothers. Babies were weighed during such follow-ups.

The data collected were analysed using the EPI INFO version 6 software package on an IBM-compatible microcomputer. Chi-square analysis was used to test the significance of the relationship between categorical variables. Regression analysis was used to determine the relationship between dependent and independent variables. The strength of significant associations was determined by calculating the 95 percent confidence interval and the odds ratio. For all statistical calculations, a p-value <0.05 was considered significant.

Results

A total of 180 infants in three gestational age groups were studied. Group I consisted of 70 preterm neonates (30 males, 40 females) with gestational ages (GA) less than 33 weeks, group 2 consisted of 70 preterms (33 males, 37 females) whose gestational ages were between 33 and above, but less than 37 weeks and group 3 consisted of 40 term neonates (23 males, 17 females) delivered at gestational ages of 37 to 42 weeks.

The birthweights of the babies ranged from 750 to 2200 gm in those of less than 33 weeks' gestation, between 1000 and 2300 gm in those of between 33 and less than 37 weeks of gestation and were 2300-4800 gm in the term babies. There was a positive correlation between gestational age and weight ($r=17.160$; $p=0.000188$). There was a corresponding daily increase in the number of stools passed by infants in each of the three study groups as the post-natal age (PNA) increased. The peak mean numbers of stools were 1.80 and 2.00/infant/day on the 6th day in infants with GA of less than 33 weeks and GA 33-<37 weeks respectively, whereas the peak mean stools was 2.35/infant/day on the 5th day in the term infants (Fig 1). Fifty (71.4 percent) babies with GA less than 33 weeks and 22 (31.4 percent) babies with GA 33-<37 weeks had the volumes of milk ingested quantified for at least, eight days before commencement of liberal breast feeding. There was a direct and significant relationship between the volume of milk ingested and the number of stools passed each day by the babies ($r=0.78$, $P<0.05$ and $r=0.73$, $p<0.05$ respectively; Tables I and II). The relationship between the number of stools passed each day and the volume of milk ingested by the term neonates could not be determined because these babies were on direct breast feeding on demand, but there was a progressive daily increase in the number of stools passed by these babies also (Fig. 1). At PNA of five days, 70 percent and 21 percent of stools passed by

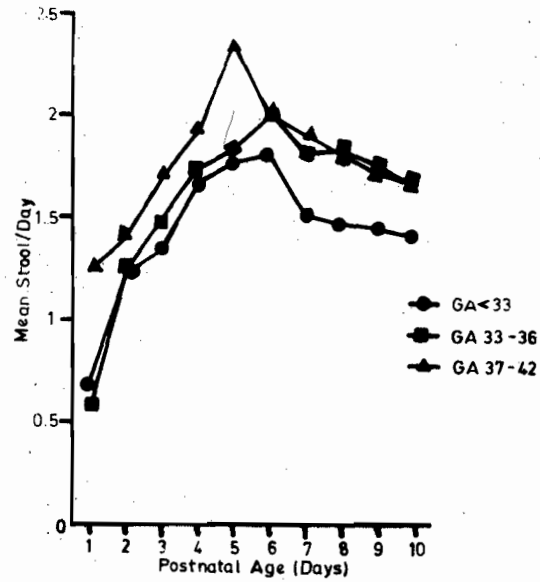

Fig 1 ***Mean Number of Stools passed per day according to GA in the first 10 days***

Table I

Correlation between Volume of Milk ingested and Mean Stool Frequency in 50 Preterm Babies (Group 1)

Age of Babies (Days)	*Milk Intake (ml/kg/day)*	*Mean Daily Stool Frequency*
1	14.9	0.63
2	37.6	1.10
3	48.6	1.40
4	68.4	1.54
5	89.0	1.70
6	105.2	1.45
7	119.5	1.61
8	128.3	1.59
9	135.3	1.51
10	141.0	1.49
r=0.78,	df=8;	t=3.525

Table II

Correlation between Volume of Milk ingested and Mean Stool Frequency in 22 Preterm Babies (Group 2)

Age of Babies (Days)	*Milk Intake (ml/kg/day)*	*Mean Daily Stool Frequency*
1	25.98	0.28
2	46.62	1.33
3	52.30	1.78
4	70.38	1.67
5	92.12	1.89
6	106.00	1.44
7	125.00	1.06
8	136.00	1.89
9	141.03	1.72
10	147.00	1.50
r=0.73;	df=8;	t=3.02

infants in group 1 were meconium and transitional stools respectively, whilst the stools of babies in group 2 consisted of 37 percent meconium and 39 percent transitional stools at the same PNA. Only eight percent of stools passed by babies in group 3 at PNA of five days were meconium while transitional stools accounted for 64 percent. At PNA of 10 days, meconium and transitional stools still accounted for 11 percent and 4.3 percent (Group 1) six percent and two percent (Group 2) of the stools passed by the preterm infants whilst the term infants had established 100 percent normal stool by PNA of 9 days (Table III). The change in stool colour from meconium through transitional to yellow was significantly related to the onset of feeding ($r=0.33$ and $p< 0.0001$) and GA ($r=0.31$ and $p< 0.001$).

In all the gestational age groups, most infants produced formed, soft stools. One thousand one hundred and four (87.5 percent) of the stools passed by babies of less than 33 weeks gestation were formed, 156 (12.4 percent) were loose stools and two (0.1

percent) were hard. Nine hundred and eighty four (87.6 percent) of the stools passed by infants with gestational age 33-<37 weeks were formed, 137 (12.2 percent) were loose and two (0.1percent) were hard. Term neonates passed 795 stools; of these 713 (89.7 percent) and 82 (10.3 percent) were formed and loose, respectively. The four hard stools recorded were produced by premature infants whose time of first stool was more than 48 hours. The differences in stool consistency were not statistically significant ($x^2=4$, $p>0.05$).

Discussion

Once the passage of stools is initiated, there is a direct and significant relationship between stool frequency and the volume of milk ingested. The volume of milk ingested appears to be a principal determinant of the post-prandial motor response and gastrointestinal propulsive activity.[14,15] The direct relationship between the volume of milk ingested and the number of stool passed each day was probably due to the initiation of gastro-colic reflex by the presence of milk in the stomach leading to defaecation. It appears likely that the number of stools passed by newborn babies is related quite closely with total intake and the peak stool frequency occurs when lactation has been fully established. In the present study, the average number of stools per day increased gradually to reach the peaks on the 6-7th day for the preterm infants and the 5th day for term infants, and then declined. This pattern of bowel habits was similar to that obtained by Lemoh and Broole[16] in a study of 55 healthy infants aged between three days and two years, in whom they showed a decline in frequency from four bowel actions a day during the first week of life to 1.7 during the second year. This wide range in the peak frequencies in their study could be due to the small fraction of neonates (16 out of 55 subjects) included in that study. Term infants attained normal stools earlier than the preterms in this study. Gestational age has an inverse correlation with duration of passage of transitional stool and subsequent change in stool colour to yellow. Physiological maturity of the motor mechanisms of the gastrointestinal tract coupled with early feeding enhances gastric motility, which in turn, shortens transit time; hence, the shorter time for transitional stool in term infants.

It is concluded from this study that the average frequency of stools/day in exclusively breastfed infants increases with gestational age; the peak frequency of 1.8-2.0 stools/day for the preterm and 2.35/day for the term babies occurred during the first week of life, after which there was a decrease, inspite of increasing milk intake, indicating a maturation of the water conserving ability of the gut. Most preterm and term neonates fed on breast milk produced predominantly soft stools during the first 10 days of life.

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