Nigerian Journal of Clinical Practice
March 2009 Vol.12(1):54-57

TIME OF PASSAGE OF FIRST STOOLS (MECONIUM) AND SERUM LEVELS OF CALCIUM AND MAGNESIUM IN NIGERIAN NEONATES (African neonates)

AI Omoigberale, AA Okolo
Department of ChildHealth, University of Benin Teaching Hospital, Benin City, Nigeria.

ABSTRACT

Background: Over 90% full term normal newborns are known to pass meconium (first stools) within the first 24hrs of life especially among Caucasians. This has not been fully documented among African neonates. This study was therefore done to determine time of passage of first stools (meconium) in African neonates and also the serum levels of calcium and magnesium in these children in order to establish a data base for normal standards.

Methodology: Two thousand and four hundred neonates were recruited from Hospitals in Benin City urban areas for the study. 76.7% of these were full term and AGA babies (37-40 weeks;2.8kg-4.3kg) while 23.3% of them were preterm and low birth weight neonates (34-36 weeks and weight between 2.4 to 1.5kg) respectively.

Results: 88% of the full term neonates passed meconium at 15.4 ± 3.6hrs of life while only 12.0% of them passed meconium after 24hrs of life and all by 48hrs of life. The mean time of passage of stools by preterm, low birth weight babies was 45.2 ± 2.4hrs. The values of serum calcium in the full term neonates ranged from 6.5 9.2 mEq/l with mean of 7.8 ± 1.2mEq/l while the level in the preterm low birthweight neonates was much lower (5.4 8.3mEq/l) with a mean of 6.7 ± 1.3 mEq/l. The values of serum magnesium ranged from 0.9 1.6mEq/l with a mean of 1.2 ± 0.3mEq/l in full term neonates while preterm low birthweight neonates had levels as low as 0.5 1.1mEq/l with a mean of 0.7 ± 0.2mEq/l

Conclusion: This study has shown a relatively shorter time of passage of first stools (meconium) in Nigerian neonates (blacks) than in the Caucasians. The implication of the findings in this study is that a delay in the passage of first stools (meconium) and early appearance of jaundice in normal black neonates could be due to gastrointestinal abnormalities. This observation could lead to early identification of these neonates with resultant early intervention.

Key Words: Meconium (First Stools), Africans Neonates AGA (Appropriate for Gestational Age), Preterm, Low Birth Weight. *(Accepted 15 October 2007)*

INTRODUCTION

Meconium (otherwise referred to as first stools) begins to form in the small intestine during the 16th week of gestation and slowly moves to the colon. It consists of gastrointestinal secretions, mucus, pancreatic juice, bile, bilirubin, cellular debris, lanugo hair and vernix caseosa swallowed with amniotic fluid. It has a dark green to black appearance.

Meconium is passed in the first day of life in over 90% of healthy newborns and in another 8% during the next 12hrs in the Caucasians[1]. It was also reported by Swenson et al[2] that over 94% of normal infants pass meconium in the first 24hrs of life. However in a series of 501 children with hirschsprungs disease, 94% of them failed to pass meconium in the first 24hrs and 57% in the first 48hrs after birth[2]. The gut has an important role in increasing bilirubin levels in neonates through the entero-hepatic circulation of bilirubin[3],[4]. In normal adults, bilirubin is broken down by the gut flora and the breakdown products excreted in feces and urine as urobilinogen and urobilin respectively, thereby reducing the quantity of unconjugated bilirubin in the body. However the newborns lack the normal bacteria flora and have greater activity of the deconjugating enzyme β-glucuronidase[5]. As a result conjugated bilirubin which is not absorbed, is not converted to urobilinogen but is hydrolyzed to unconjugated bilirubin which is reabsorbed by way of the enterohepatic circulation, thus increasing the bilirubin load on the already stressed liver. Where there is intestinal obstruction or metabolic disease this may be indicated by delayed passage of meconium and and increased enterohepatic circulation of unconjugated bilirubin and subsequent early appearance of jaundice in the newborn.

While it is known that serum calcium levels correlate with gestational age; it is also a well established fact that calcium and magnesium are inter-linked[6]. In intra-uterine life and particularly during the last half of pregnancy, calcium is actively transported from the mother across the placenta to the foetus. Studies by Bronner and Coburn[6]. have confirmed active

Correspondence: Dr A I Omoigberale
E-mail: isigboge@yahoo.com

transport of calcium across the placenta. The net effect of this is relatively higher foetal calcium level which depresses parathyroid function in the foetus and early neonate.

Intakes of dairy products and vegetables influence the ultimate intake and absorption of calcium and magnesium[7]. Most Africans do not have access to these food items especially dairy products even though they rear the animals that produce these products. They rather sell them in order to earn money. Hence most African mothers may not be having optimal levels of these minerals since their dietary intake is limited. It is proposed that such limitation may also affect their babies in terms of intestinal motility that may lead to delayed evacuation of meconium. Consequently this study was therefore conceived to study the time of passage of stools in Nigerian neonates and the levels of serum calcium and magnesium in these neonates in order to establish a data base for normal standards as far as calcium and magnesium are concerned. There has been hitherto paucity of information on these parameters in our environment (Benin City). This study was also to look at differences in these parameters between the African neonates and the Caucasians whose values are already well known.

MATERIALS AND METHODS

This study was carried out in the following hospitals and health centers in Benin City urban areas. The University of Benin Teaching Hospital, Benin; Central Hospital Benin City; St. Philomena Catholic Maternity Hospital Benin City; Evboriaria health centre; Ikpoba Okhae health centre and Uhumwonde health centre where deliveries take place. The study was prospective and done between January and December 2001.

The subjects were apparently healthy babies including low birth weightbabies (2.4kg-1.5kg) with gestational age of (34-36 weeks). Exclusion criteria included the following.

(i) Babies born to mothers who were malnourished.
(ii) Babies whose mothers had prolonged labour.
(iii) Babies whose mothers had risk factors for sepsis
(iv) Sick babies especially those who presented with severe birth asphyxia, pathological jaundice, intra-uterine growth retardation and congenital abnormalities because these on their own can cause delay passage of meconium.

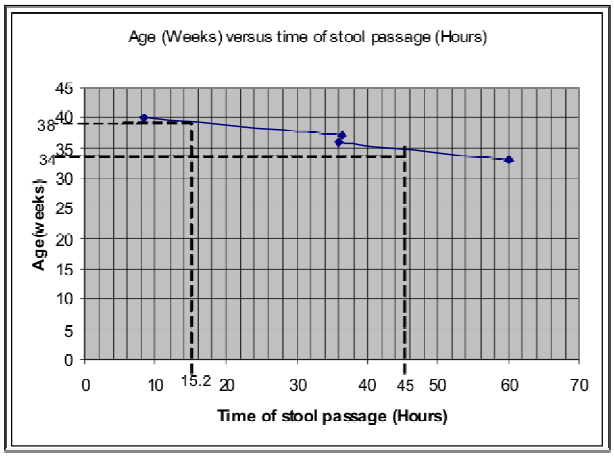
Upon informed parental consent, a structured questionnaire was utilized to store information on maternal parity and mode of delivery as well as other relevant parental information. All the babies were breastfed with breast feeding starting between 30 minutes to 1 hour after delivery. None of the mothers were on any medications. Time of passage of first stool (meconium) was recorded and blood taken from the neonates for serum levels of calcium and magnesium between 48hrs 72hrs of life. This was done for equilibrium to have taken place since active transport of calcium across the placenta may result in higher foetal or early neonatal calcium levels immediately after birth.

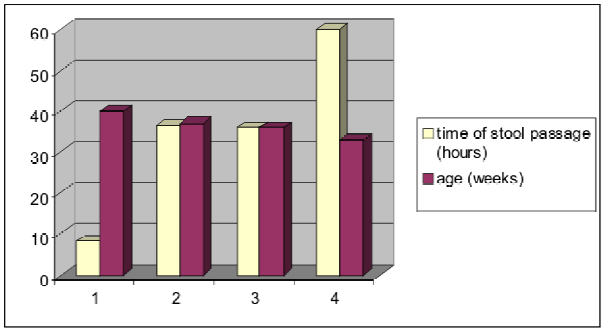
RESULTS

Two thousand four hundred babies were recruited for this study from the various hospitals and health centers.

One thousand eight hundred and forty (1840) (76.7%) of these babies (2400) were full term and appropriate for gestational age (AGA) while 560 (23.3%) were pre-term and low birth weight neonates (34-36 weeks) and weight (between 2.4kg-1.5kg). One thousand six hundred and twenty (1620) (88.0%) of the full term neonates passed meconium between 8.3 to 36.4 hrs with a mean time of passing first stool of 15.4 ± 3.6Hrs with confidence interval of 95%.

Only 220 (12.0%) of the 1840 full term neonates passed stools after 24hrs of life. However all passed by 48hrs of life. The mean time of passage of first stool (meconium) in the preterm low birth weight neonates (560) in this study was 45.2 ± 2.4hrs (range of 36 60hrs). None of these babies passed stools in the first 30hrs (fig 1). The values of serum calcium in the full term neonates ranged from 6.5 9.2mEq/l with a mean of 7.8 ± 1.2 mEq/l, while the level in the preterm low birth weight babies was much lower (range 5.4 8.3mEq/l) with a mean of 6.7 ± 1.3 mEq/l. The values of serum Magnesium ranged from 0.9 1.6mEq/l with a mean of 1.2 ± 0.3mEq/l in full term neonates while preterm low birth weight babies had levels as low as 0.5 1.1 mEq/l with a mean of 0.7 ± 0.2 mEq/l.





DISCUSSION

As has been reported in the literature meconium is passed in the first day of life in over 90% of healthy Caucasian newborns[1]. This study has shown that 88% of the neonates passed first stool in 15.4 ± 3.6 hrs, much earlier than that reported for the Caucasians in the literature. Various studies have shown that developmental milestones such as acquisition of grasp" reflex, sitting, crawling and walking occur much earlier in the blacks than Caucasians[6]. The time of passage of first stool appear to follow the same
general trend as reflected in the literature[6]. This early passage of meconium in these children could probably be due to early maturation of the gastrointestinal tract and consequently motility of the gut.

A possible hypothesis is the type of foods blacks eat especially high fibre food. High fibre food increases gut motility while leaving very little for absorption. It is conjectured that if mothers of these babies eat such food during pregnancy and even before pregnancy, such may on towardly have effect on the babies especially their gut motility. The delayed passage of stool in the low birth weight and preterm neonates could be due to immaturity of the gut systems in these neonates. Even then the time recorded in this study was much earlier than those previously recorded.

The implication of the above findings is that this could help in early detection of some gastro-intestinal abnormalities (Hirschsprungs, hypertrophic pyloric stenosis, duodenal atresia etc) that would cause delay in passage of meconium and early appearance of jaundice in these children apart from also establishing a data base for normal standards.

This study also showed low levels of serum calcium and magnesium in these neonates when compared to Caucasians (6.5 9.2 cf 9.0 10.6mEq/l; 0.9 1.6mEq/l) in full term neonates respectively. The values for the pre-term, low birth-weight neonates were even lower (0.5 1.1 mEq/l).

It is thought that maternal nutrition especially during pregnancy could influence the serum levels serum calcium and magnesium in the index foetus and subsequent neonates.

In most developing countries, Nigeria inclusive, intake of dairy products is particularly deficient. Since dietary intakes of dairy products subsequently influence the absorption of calcium and magnesium, this could possibly explain the low level of serum calcium and magnesium in these neonates. It is not surprising therefore that at these levels, these neonates do not convulse since these levels may cause convulsion in Caucasian neonates who have higher levels. Could genetic have a role to place in the levels of these minerals.

This needs to be looked into. This result would also enable us to establish a data base for normal standard for the Nigerian neonates (African neonates).

CONCLUSION

This study has shown a relatively shorter time of passage of first stools in the blacks (Nigerian Neonates) than Caucasians as reported in the literature. Apart from its usefulness as data base for normal African standards, it also affords early detection of either gastrointestinal obstruction or metabolic disease and subsequently early intervention. This will definitely reduce morbidity and mortality that may be associated with late detection and intervention. Lastly the relatively lower level of serum calcium and magnesium in these neonates may be the result of low levels of dietary dairy intake of the pregnant mothers. The possible genetic aspect of it needs to be investigated.

ACKNOWLEDGMENT

The authors are grateful to the mothers of these babies who consented to taking part in this study after due explanation. We are also grateful to the Resident doctors and nurses who took part in the work including collection of blood and timing of passage of meconium. We are also grateful to Miss Doris Osarobo for the typing of the work..

Lastly we remain internally grateful to Almighty God for giving us the good health and mind of body and resources for the work.

REFERENCES

1. **Sherry SN, Kramer I J.** The time of passage of the first stool and first urine by the newborn infant.(J Pediatr 1955, (46):2;158-9).

2. **Swenson O, Sherman J O, Fisher J H.** Diagnosis of congenital mega colon: An analysis of 501 patients. J. Pediatr Surg (1973) 587 594.

3. **Roland RL, Odeli GB.** Physiologic Jaundice; the enterohepatic circulation of Bilirubin. New Engl J Med (1964) 284: 1 6.

4. **Ulstrons R A, Esenklan E.** The entero-hepatic shunting of bibirubin in new born infants. J. Pediatr (1964); 65: 27 37.

5. **Gourley GR.** Pathophysiology of breast milk jaundice. In; polin RA, Fox WW, eds. Fetal and neonatal physiology, 2nd ed. Philadelphia: WB Saunders, 1998; 1499.

6. **Bronner F, Coburn J W (eds).** Disorders of mineral metabolism**.** Vol. II: Calcium physiology volume III: Pathophysiology of calcium, phosphorus and magnesium. New York, Academic Press, 1981.

7. **Reddy V, Lamb W H.** Diseases of children in the subtropics and tropics. Edited by Stanfield P, Brueton M, Chan M, Parkin M & Waterston T. ELST edition 2001.