

Inadequate Breastfeeding Associated Hypernatraemia; an Outcome

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Abstract

Objective: To determine the frequency of hypernatraemic dehydration in inadequate breastfed infants.

Methods: This was a cross-sectional study conducted in Neonatal Intensive Care Unit (NICU) of Liaquat National Hospital, Karachi over a period of one year from January to December 2015. Ethical committee approval was obtained. The inclusion criteria include all neonates (age \leq 28 days of life) who consume human milk with no supplementation of any type (no water, no non human milk) since birth were included. Moreover, neonates with serum sodium level $>$ 150 mEq/L was also a part of inclusion criteria. The exclusion criteria include all neonates who are preterm or infants (age $>$ 28 days of life) or neonates with any other birth related issues such as congenital malformation, inborn errors of metabolism, renal disease were excluded.

Results: 58 neonates with hypernatraemic dehydration were enrolled in study, the major symptom 32 (55%) babies were presented with decreased urine output followed by fever, jaundice, weight loss, lethargy, seizures and decrease urinary output. With respect to serum sodium levels, most babies fall in the category of (150-160 mEq/L) which constitutes about 24 babies. Hypernatraemic dehydration affects more male babies than female babies with 38 (65.51%) and 20 (34.48%) respectively. Moreover, according to our study, babies born to primiparous women are more likely to be affected with hypernatraemic dehydration than multiparous women. Furthermore, maximum number of babies who suffered from hypernatraemic dehydration had age presentation of 11-20 days of life, followed by 1-10 days and 21-30 days respectively.

Conclusion: Breastfeeding associated hypernatraemic dehydration is a serious condition with many serious complications and even results in death if detected late. It is recommended to have routine weight checks at 2, 3, 5 and 10 days of life to identify babies at risk. Lactation counselling should be an essential part of antenatal care being provided to pregnant women, to prepare them to undertake this highly beneficial activity with proper technique and with pride and confidence.

Keywords: Hypernatraemia, breastfeeding, neonates, dehydration, primiparous, lactation.

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Introduction

Breastfeeding is considered as perfect form of nourishment that prevents from wide variety of infections and maintains electrolyte homeostasis of children¹. Breastfeeding is associated with de-

creased risk of allergies, lactose intolerance and also contributes to improved neurodevelopment outcome. Breast milk is sterile therefore reducing chances of infections as commonly seen with bottle feed. Colostrum secreted in first few days provides factors that promote maturation of the gut and good digestion².

Improper feeding practices results in complications of which hypernatraemic dehydration is a potentially lethal and completely preventable complication. The failure to diagnose inadequate

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breastfeeding can have serious consequences, including seizures, intracranial haemorrhages, vascular thrombosis which ultimately leads to death. The main cause of hypernatraemic dehydration in breast fed infants is water deprivation due to inadequate breastfeeding practices. The incidence of hypernatraemic dehydration secondary to inadequate breastfeeding is 9.3%. There is a high propensity of missing these neonates due to hypernatraemic dehydration presents clinically with subtle dehydration therefore, more chances to be missed. They are initially less symptomatic and therefore medical diagnosis might be delayed^{3,4}. Sodium is the principal determinant of extracellular osmolality as it is a dominant cation of extracellular fluid. Its distinctive among electrolytes as its concentration depends on water balance rather than sodium balance³. Hypernatraemia is a serum sodium concentration of >145 mEq/L, although it is sometimes defined as >150 mEq/L¹ and represents a deficit of water in relation to total body sodium⁴. Normal physiology of sodium balance in breast milk involves declining of sodium concentration in breast milk over first 15 days of lactation. It has been observed that sodium concentration of colostrum in first 5 days is 22 ± 12 mmol/l, and of transitional milk from day 5 to 10 is 13 ± 3 mmol/l, and of mature milk after 15 days is 7 ± 2 mmol/l⁵. Inadequate practices of breastfeeding fail to achieve this physiological fall in sodium concentration in breast milk. Therefore, sodium concentration in breast milk can be used as a useful predictor for lactation.

It has been observed that natural drop in sodium is highly predictive of successful lactation and prolonged elevation of sodium signifies impaired lactogenesis or breastfeeding. These mothers are at higher risk of lactation failure⁶.

Breastfed infants with hypernatraemia usually have profound dehydration, with failure to thrive; this could be attributed to intracellular water loss. Abdominal skin pinch of these neonates has a "doughy" feel⁶ as they have a better preservation of intravascular volume; anterior fontanelle can retain

its normal fullness and therefore complications of hypovolemic dehydration like hypotension eventually leading to oliguria is not seen among hypernatremic dehydrated neonates⁷. The clinical features vary with a spectrum from an alert, well-appearing and hungry to an irritable, dull, lethargic child⁸.

Due to this there is a high propensity of missing neonates with hypernatraemic dehydration. They are initially less symptomatic and therefore medical diagnosis might be delayed. Hypernatraemic dehydration is not alone and is usually associated with co-morbidities such as hyperglycemia and hypocalcaemia which further increases the risk of central nervous system complications and complicating its management⁹.

Inadequate breastfeeding associated hypernatraemia is a potentially dangerous condition, which requires early diagnosis and prompt management. Hypernatraemia in neonates can cause serious neurologic damage, including brain oedema, haemorrhagic infarcts and seizures, intracranial haemorrhages, vascular thrombosis and permanent brain damage which can ultimately leads to death^{10,11}. The main cause of hypernatraemic dehydration in breast fed infants is water deprivation along with high sodium due to inadequate breastfeeding practices¹². The failure to diagnose inadequate breastfeeding can have serious consequences that include hypocalcaemia, hypoglycaemia, seizures, intracranial hemorrhage, vascular thrombosis, acute renal failure, elevated liver enzymes, disseminated intravascular coagulation and ultimately leads to death¹⁰.

The incidence of hypernatraemic dehydration secondary to inadequate breastfeeding is 9.3%¹³. Hypernatraemic dehydration due to inadequate breastfeeding can be difficult to recognize clinically because infants with hypernatremic dehydration have better preserved extracellular volume and therefore have less-pronounced clinical signs of dehydration¹⁴. This condition is primarily due to low

volume intake of breast milk, as a result of insufficient lactation secondary to ineffective milk removal from breast, which in turn, is primarily associated with poor breastfeeding techniques (i.e. incorrect positioning and latching)⁹. Consequently the breast becomes engorged, which leads to inadequate prolactin surges and galactopoiesis failure, the baby may become lethargic and fail to stimulate further lactogenesis. The net result is neonate becomes dehydrated while the kidneys are mature enough to retain sodium ions leading to hypernatremic dehydration¹⁵.

Adequate breast milk intake depends on several interrelated stages such as normal mammary development (mammogenesis), unimpeded initiation of lactation (lactogenesis), sustained ongoing milk synthesis (galactopoiesis) and effective milk removal¹⁶. Adequacy of which has been based on urine output of at least 6 times per day. However, weight loss and inadequate passage of stools are also sensitive indicators of dehydration among inadequately breastfed infants¹⁷.

Hypernatraemic dehydration is a relatively common but preventable complication of inadequate breastfeeding and is associated with significant mortality and morbidity¹⁸. While the incidence is increasing day by day and local data is not sufficient on this topic. Therefore, the aim of conducting this study was to determine the frequency of hypernatraemic dehydration in inadequate breastfed infants. By highlighting the causes and identifying the flaws we may improve the neonatal outcome, especially by a simple method of educating mothers about breastfeeding techniques beginning in the prenatal period¹⁹.

Methods

This is a cross-sectional study conducted in Neonatal Intensive Care Unit (NICU) of Liaquat National Hospital, Karachi over a period of one year from January to December 2015. Ethical committee approval was obtained. A total of 58 neonates ba-

bies were enrolled in the study. The inclusion criteria included all neonates (age ≤ 28 days of life) who consume human milk with no supplementation of any type (no water, no non-human milk) since birth. Moreover, neonates with serum sodium level >150 mEq/L i.e fulfilling the criteria of hypernatraemia were included.

The exclusion criteria includes all neonates who are preterm or infants (age >28 days of life) or neonates with any other birth related issues such as congenital malformation, inborn error of metabolism, renal disease were excluded from the study.

Inadequate breast feeding was labeled if any two of the following were present; average <8 feedings per 24-hour period duration of feeding less than 10 minutes per breast, swallowing sounds were inaudible, gained less than 4 ounces per week after the fourth day and less than 6 wet cloth diapers per day⁷.

The data was collected on predesigned performa. It included patient admission number, sex, age, history, physical examination and laboratory tests. Written informed consent was obtained from parents of study participants. Data analysis was done using SPSS version 22.

Results

58 neonates with hypernatraemic dehydration were enrolled in study. Hypernatraemic dehydration affects male babies more than female babies with 35 (60.34%) decrease urinary output respectively, 38 (65.1%) and 20 (34.8%) respectively. Of which 32 (55%) babies were presented with fever, 27 (50%) with jaundice, 23 (39.6%) weight loss, 26 (44.8%) lethargy, 17 (29.3%) with seizures. Most neonates presented to us with more than one presentation at time, as seen in Table 1.

Table 1. Presenting complaints, sodium concentrations and age at presentation of neonates with hypernatraemic dehydration

Symptoms (mix presentation)	Frequency % (out of 58)
Fever	32
Jaundice	27
Weight loss	23
Lethargy	26
Seizure	17
Decrease Urinary output	35
Serum Sodium Levels (mEq/L)	
(150-160)	24
(161-170)	14
(171-180)	09
(181-190)	07
(191-200)	04
Gender	
Male	38
Female	20
Gravida	
Primiparous	39
Multiparous	19
Age of presentation (in days of life)	
1-10	11
11-20	31
21-30	16

With respect to serum sodium levels, most babies fall in the category of (150-160 mEq/L) which constitute about 24 babies (41.3%), followed by 14 babies (24.13%) in the range between (161-170 mEq/L), 9 (15.5%) in the range (171-180 mEq/L), 7 (12.0%) in the category (181-190 mEq/L) and only 4 babies (6.8%) fall in the range between (191-200 mEq/L). Hypernatraemic dehydration affects more male babies than female babies with 38 (65.51%) and 20 (34.48%) respectively.

According to our study, babies born to primiparous women are more likely to be affected with hypernatraemic dehydration than to multiparous women. Most of the babies 31 (53.44%) presented with hypernatraemic dehydration have had age of presentation between 11-20 days of life followed by 16 (27.58%) in the age between 21-30 days and 11 (18.96%) in the age between 1-10 days of life respectively.

Discussion

In our study, the most common symptom neonates presented with hypernatremic dehydration associated inadequate breastfeeding is decrease urinary (60.34%) output. This in contrast to a study conducted by Asif Ahmed et al at in Srinagar, Jammu and Kashmir which showed lethargy (68.96%) as a leading symptom¹⁸. This difference could be due to contrasting weather conditions of both areas, as in our region due to excessive loses kidneys are unable to retain fluids which ultimately end up in decrease urinary output. Another justification can be explained by a study done by R Shroff et al, who reported 5 cases of hypernatraemic dehydration with decreased urine output, in their case series and acute renal failure was observed in all babies¹⁸. Two babies in their cohort of patients were anuric with fractional excretion of sodium calculated as 3.2% and 2.9%, respectively. To exclude a urinary concentrating defect in their study, after rehydration and stabilization period, all the babies underwent a water deprivation or 1-deamino-8-D-arginine vasopressin test with normal results in all²⁰.

Moreover, in our study most babies (41.37%) fall in the category of serum sodium level in between (150-160 mEq/L) where as in study conducted by Hassan Boskabadi et al in year 2010 shows that maximum number of babies (43.85%) fall in the category of serum sodium level in between (180-190 mEq/L)⁴. The variation in the result of both studies could be that in our study, the dehydration status of newborn was picked up a little early as compared to other studies where it might have been caught in the later phase.

Males are more affected than females with hypernatraemic dehydration in our study. Compared to other studies, gender has got a very little impact on hypernatraemic dehydration in neonates.

According to our study, babies born to primiparous women are more likely to develop hypernatremic dehydration than to multiparous women; which is same as in another study con-

ducted on exclusive breast fed infants²¹ in which 78.6% were first child of the family. This is further supported by many case reports of hypernatraemic dehydration in babies of primigravida mother²²⁻²⁴. The most common reason could be due to ineffective breastfeeding. Primiparous mothers are usually unable to manage effective breastfeeding to their newborn which results in decrease oral intake ultimately leading to dehydration. A southern Indian study²⁵ tested effectiveness of educational package on knowledge regarding breastfeeding among primigravida mothers. Their results showed that the pre-test level of knowledge of most of the subjects 53 (53%) had poor knowledge, whereas in the post-test 58 (58%) had good knowledge. This data indicate that almost half of the first time mothers were unaware of the correct feeding technique which emphasizes the need of regular educational programs and workshop in prenatal period. Their findings were that most of the mothers practice incorrect technique of breast feeding which leads to many unnoticed problems in babies and lactating mothers. These include improper nutrition to baby, altered growth, oral thrush, low secretion of milk, inadequate feeds, nipple problems etc. They have suggested few simple ways to obviate these problems like starting breast feeding immediately after birth, proper positions, latching up and burping up the baby²⁶.

Another contributing factor has been observed by Lock et al which stated that early postpartum hospital discharge may leave mothers poorly prepared for breastfeeding and may contribute to increased neonatal morbidity²⁷.

A recent study revealed that 16% of exclusively breastfed infants born to primigravida mother had 10% weight loss by day 3 of life²⁸. Effective education and support was provided by a lactation consultant in this study²⁹. Another study by Marchini G estimated that 10% of breastfed infants develop hypernatraemia and that 33% of breastfed infants with weight loss exceeding 10% have hypernatraemia²⁷. This suggests that breastfeeding-associated hypernatraemia is much more common

than thought previously, with a higher rate than reported.

Furthermore, the most common age of presentation with hypernatraemic dehydration in our study is in between 11-20 days of life where as in study conducted by Yaseen H, et al. in the year 2004 shows that majority of the patients belonged to age between 2-13 days of life³⁰. Exact aetiology is unknown; however it is assumed that primiparous mother due to ineffective breastfeeding techniques and poor assessment of baby intake usually manifest hypernatraemic dehydration in neonates after 10 days of life. A study by Das JC, conducted in Bangladesh observed that age of clinical presentation of hypernatraemic dehydration was around ten days with a range from 3 to 21 days. Reasons identified were that parents failed to identify that the infant is ill, and professionals may also falsely reassure about infant's apparent well-being³¹.

It is recommended to have routine weight checks at 2, 3, 5 and 10 days of life to identify babies at risk and reduce the severity of dehydration. Moreover, an emphasis on exclusive lactation with recommended post-discharge follow-up is mandatory in order to assess both mother and baby health status thus by preventing neonates from inadequate breast feeding hypernatremia. An increased awareness among health professionals is required so that this potentially devastating condition can be prevented.

The limitation of our study is most patients were lost to follow-up and short duration of study.

Conclusion

Breastfeeding is an important intervention for both the mother and the baby. Hypernatraemic dehydration in neonates is due to ineffective breastfeeding, which is a common problem. Therefore regular follow up of all breastfed infants should be done in order to avoid serious morbidity and mortality. Taking weight as an assessment tool to identify all "at-risk" cases, it is recommended that all babies losing >10% of birth weight should be re-

ferred to a paediatrician for further assessment. Moreover, all mothers should be taught the skills of breastfeeding, especially for first-time mothers in order to reduce the likelihood of hypernatraemic dehydration in neonates.

Conflict of Interest

Authors have no conflict of interests and no grant/ funding from any organization for this study

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