

# Outbreak of hypernatremia, hyperthermia & azotemia during summer months among neonates admitted to tertiary care NICU and their immediate outcome

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## Abstract

**Background:** Dehydration and hypernatremia amongst exclusively breast fed neonates due to inadequate breast feeding or due to less feeding is a potentially devastating condition, and its incidence rate increases during hot environment especially during summer months. We conducted this study to identify possible etiology behind dehydration and hypernatremia among healthy newborn. **Methods:** Hospital case records of 40 neonates admitted to the NICU in Bapuji Child Health Institute and Research Centre, Davangere during summer months (March –May) 2017 were retrospectively analysed. Case records were reviewed and data collected on parity of the mother, feeding practices, symptoms and signs at presentation, external environment temperature during the week prior to admission, biochemical changes and outcome. **Results:** During March-May 2017, there were 620 admissions in NICU. Amongst 620 cases, clinical profile, signs and symptoms, biochemical profile and outcome of 40 cases of hyperthermia were studied. 95% cases had significant weight loss (13-15%), 100% cases had hyperthermia (mean temp 99.3-101 F), 88% cases had hypernatremia (mean Na<sup>+</sup> 155-185), 75% cases had azotemia (mean urea 96.73), creatinine(mean1.5). 95% cases were successfully treated according to NICU protocol and discharged within a short period but succumbed. **Conclusion:** Dehydration and hypernatremia is preventable and treatable condition. All the mothers need to taught correct feeding method like proper position and attachment of feeding. Signs of dehydration must be explained to mother as well as close relatives. Follow up visits should be ensured and check for weight is must. Not to encourage mother to give any other feed apart from exclusive breast feeding for first 6 months and even during summer months.

**Keywords:** Dehydration, Exclusive breast feeding, Hypernatremia

## Introduction

Exclusive breastfeeding for the first 6 months of life is recommended by the World Health Organization to optimize the growth and development of the infants [1]. Breast milk in addition to nutrients provides various immunological factors that help to reduce the diarrheal and respiratory illness in children [2].

Breast feeding is an instinct behaviour and many mother-baby dyads accomplish it successfully [3]. However, some babies may not receive enough milk from their mothers due to various reasons. If breastfeeding is inadequate, then malnutrition and

hypernatremia dehydration can occur in the baby [4]. Moritz *et al.* have termed this condition as “breastfeeding associated hypernatremia” (BFAH) [5]. An increase in the incidence of BFAH in otherwise healthy neonates has been observed in the past few years [5-8]. The clinical features and complications seen in these babies have been reported in various studies [9]. It has been found that daily weighing of the babies helps in the early recognition of this illness [10,11].

Dehydration in exclusively breast-fed baby needs to be identified and treated as early as possible, so that mothers are not discouraged from breastfeeding. Dehydration can be life threatening, it may cause severe renal impairment and sometimes causes acute kidney

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injury, which can lead to morbidity and mortality. Hypernatremic dehydration is a lethal condition and is associated with cerebral edema, intracranial hemorrhage hydrocephalus. As extracellular water level decreases there is increase in serum sodium. Hypernatremia was thought to be unusual in breast fed babies [12]. Since 1990s, there has been an increase in the number of breastfed infants reported to have hypernatremia and hypernatremia dehydration. The condition carries an acute morbidity and mortality [13].

Na content of colostrum in first 5 days is 22 mmol/l and transitional milk from day 5 to day 10 is 13 mmol/l and of mature milk after 15 days is 7 mmol/l[14,15]. Inadequate milk production due to insufficient lactation may lead to dehydration. This condition gets aggravated during hot and humid atmosphere. During summer months baby losses more water due to large surface area, and these babies only receives breast milk, which may not be sufficient for baby's requirement may lead to dehydration and presents with fever, convulsions,

## Result

During March-May 2017, there were 620 admissions in NICU. Amongst 620 cases, clinical profile, signs and symptoms, biochemical profile and outcome of 40 cases of hyperthermia were studied.

**Table-1: Anthropometry and biochemical values at admission.**

	N	Minimum	Maximum	Mean	Std. Deviation
Age (Days)	40	3	28	7.22	6.322
Gravida	40	1	2	1.40	.496
Birth weight (kg)	40	1.8000	4.0000	2.728750	.5138951
Admission weight	40	1.4000	3.6000	2.231250	.4871013
External temp	40	99.6	103.0	100.380	.9693
Na	40	145	210	159.20	15.841
urea	40	43	188	96.73	39.092
Creatinine	40	1.0000	2.8000	1.567500	.3931383

Abnormalities noted were as follows: 95% cases had significant weight loss (13-15%), 100% cases had hyperthermia (mean temp 99.3-101 F), 88% cases had hypernatremia (mean Na<sup>+</sup> 155-185), 75% cases had azotemia (mean urea 96.73), creatinine(mean1.5). 95% cases were successfully treated according to NICU protocol and discharged within a short period but succumbed Table 1

**Table- 2: Chief complaints at admission.**

Complaints	Frequency	Percentage
Poor feeding, excessive cry	20	50.0
Poor feeding, excessive cry, yellowish discolouration of eyes	20	50.0
<b>Total</b>	<b>40</b>	<b>100.0</b>

The chief presenting complaints were poor feeding,excessive irritability and yellowish discoloration of eyes. Table 2

**Table-3: Signs at Presentation.**

Signs	Frequency	Percentage
Tachypnea	33	82.5
lethargy	4	7.5
convulsions	3	10.0
<b>Total</b>	<b>40</b>	<b>100</b>

The signs noted at the time of admission to the hospital were: fever, tachypnea, convulsions and lethargy Table Of the 40 cases admitted to the NICU, assisted ventilation was required in 17 cases. Table 4

**Table-4: Ventilatory Assistance.**

Ventilator Support	Frequency	Percentage
Not required	33	82.5
Required	7	17.5
<b>Total</b>	<b>40</b>	<b>100.0</b>

**Table-5: Prognosis.**

Outcome	Frequency	Percentage
Unfavourable	2	5.0
Favourable	38	95.0
<b>Total</b>	<b>40</b>	<b>100.0</b>

Of the total cases admitted, outcome was favorable in 95% of the cases and the rest succumbed to illness the major cause being sepsis. Table 5

## Discussion

The dry & warm condition in Central Karnataka is conducive for heat waves. Summer of 2017 was one of the hottest summer on record in India. Summer months of March, April and May experienced a record setting heat wave with temperature reaching as high as 46.8C. This heat wave during the summer months explains the most cases reporting during these months followed by June.

A study from north India also showed that 36.8% of newborns were hyper thermic during summer months. A significant proportion of babies are likely to suffer from hyperthermia especially in warm climates because a strong correlation between room air, environmental temperature and neonatal temperature was observed [16].

In present study, slightly higher number of males correlates with the slightly adverse sex ratio in favour of males. The gender difference between the neonates is not statistically significant. Most neonates were affected during the first 3 days of life and mean age of the neonates affected was 7days. This can be attributed not only to high environmental temperature but canalso be attributed to poorly established feeding pattern and

physiological phenomenon of fluid loss during the first 3 days of life after delivery. Most neonates (33, 82.5%) were of normal birth weight and few (7, 17.5%) having low birth weight (1.8-2.5kgs). No neonates from the very low birth weight category (<1.5 Kg) developed hyperthermia. This can be explained by the fact that all preterm / very low birth weight neonates were admitted in NICU which is a thermo-control unit. Most neonates (30, 75%) were delivered normally and remaining (10,25%) through Caes are an section delivery.

Inadequate feeding was found in all the neonates; supporting the fact that adequacy of feeding is directly linked with dehydration and poses an additional risk of hyperthermia to neonates. In the present study, the duration of stay in the hospital ranged from 3-7days.

Babies were brought with complaints of not feeding well, excessive crying, lethargy, high body temperature ranging between 99-103°F, reduced urine output and severe dehydration. Investigations done revealed Hypernatraemia and deranged renal functions. All the neonates were managed symptomatically but 7 babies required Mechanical ventilation of which 5 had successful outcome and 2 succumbed.

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The relationship of dehydration with hyperthermia is bidirectional. Dehydration is not only the cause of hyperthermia but also the effect of hyperthermia. This vicious relationship is aggravated by inadequacy of feeding. The presence of various signs supports the sequential events during worsening of hyperthermia, with refusal to feed and dehydration appearing first, followed by irritability and lethargy.

Breast feeding is considered to be the best and safest way to feed neonates. Human milk is low in sodium, which mitigates against the possible development of hypernatremia in breast fed neonates [17].

Compared with cow's milk mature human milk contains considerably less sodium, potassium and chloride. Higher level of sodium in breast milk is associated with lactation failure, and a reduction in feeding frequency is associated with marked rise in milk sodium concentration. This might be related to reduce breast milk production, which could in turn be secondary to maternal factors or neonatal factors. Insufficient milk production is the most important factor in the induction of hypernatremia. Low level of maternal knowledge in lactation, cesarean section and failure of early postnatal follow up was associated with the neonatal dehydration. Decreased urine and stool frequency might be considered as a warning for failure of lactation [18].

Hypernatremia is lethal condition leads to cerebral edema, intracranial hemorrhage, seizures, disseminated intravascular coagulation and finally death. Hypernatremic dehydration in exclusively breast-fed neonates is preventable. Primipara should be given appropriate counseling and support for successful initiation of breastfeeding and maintenance of lactation [19]. The health care provider should be aware of this potentially serious complication of exclusive breastfeeding and recognize neonates at risk for this potentially lethal condition. In conclusion it is important to be aware that hypernatremic dehydration can occur in the neonatal period due to inadequate breastfeeding. It is therefore important to ensure adequate hydration in breastfed neonates [20]. The other causes of hypernatremia should be ruled out before attributing hypernatremia to inadequate breastfeeding.

## Conclusion

Postnatal weight loss in the first week of life is physiological and benign. However following points should be kept in mind during summer months

1) Neonate continues to lose weight for a longer time

2) Environmental factors play an important role in neonatal dehydration

3) Hypernatremia is an important associated electrolyte disturbance

4) Azotemia with varying grade are seen, which is reversible with good supportive care.

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