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Usefulness of Elevated Breast Milk Sodium as an Early Predictor of Lactational Failure in Primiparous Mothers

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ABSTRACT

Introduction:
Breast milk is the best and complete source of nutrition a baby can get. Perceived lactational insufficiency is one of the major causes of dropout from excusive breastfeeding in first 2 weeks of life.
Objectives: Primary:

- Assessment of elevated BM[Na+] on 3rd post-partum day as a screening test in predicting lactational failure in primi mothers.

Secondary:

- to enable mother in achieving successful lactation.
- to prevent complications emerging out of lactational failure.
- to promote exclusive breast feeding.

Methodology: This prospective study was done at a medical college of Assam,India from March,2019 to Sep,2019. Samples of breast milk from 83 nursing primi mother were obtained on 3rd post-partum day for analysis of Breastmilk sodium (BM[Na+]).Value above 28 mmol/l was considered elevated. Follow-up was scheduled from day 5 to day 14 postnatally for assessing lactational failure .**Results**: During the study period 83 mother baby dyad were enrolled for the study. Of these 66 completed the study while 17 mothers were lost to follow up, BM[Na+] was elevated in 32 (48.5%) and was normal in 34 (51.5%) mothers. Lactational failure was significantly more common in the mothers with BM[Na+] above 28nmol/l compared to those below it [31.2% vs 2 5.9%, p<0.01; Relative Risk: 5.31
Conclusion: Day 3 Breast milk sodium can be used as a screening tool for predicting lactational failure in first 2 weeks of life in primiparous mother.

Keywords: *Breast-milk sodium; lactational failure.,*

INTRODUCTION

Breast Milk is the best and complete source of nutrition for a baby in first few months of life. To accrue the maximum benefits, breast feeding should be exclusive for a period of 6 month. However as per NFHS data (2015-16) children under 6 month of age receiving exclusive breastfeeding is 54.9% only. The most rapid decline in the incidence of breast-feeding occurs in the first 2 weeks[1] & the most common reason given by mother for premature discontinuation is perceived inadequate milk production (PIM)[2,3,4] . Delayed lactogenesis stageII is a major contributing factor of inadequacy of breastmilk. There was always the need of a marker to predict lactational adequacy or identify mothers at risk of poor lactational outcome . Many researcher have studied Breast-milk sodium concentration as a marker of lactogenesis stageII, where in they found highest BM[Na] on day 1 which then drops drastically on day 3 or 4 following which the drop is slow and reaches its nadir value in 2nd to 4th week[5,6,7,8]. Previously the drop in BM[Na] was considered as dilutional , where as, now it is also hypothesized to be due to non closure of paracellular pathway resulting in movement of sodium from extracellular fluid to alveolar cells, as the drop precedes the increase in milk volume by 1 day [6,9].

METHODOLOGY:
This is a cohort study done at a Medical College & Hospital of Assam, India for a period of 6 month from May 19 to October 19.

The procedures followed were in accordance with the ethical standards of Helsinki Declaration of 1975, as revised in 2000. Institute ethics committee approval was taken (mention number if available)

Inclusion criteria for the study were gestational age > 34 weeks, singleton pregnancy, birth weight > 2 kg and exclusive breast feeding since birth. Any neonate requiring significant resuscitation, congenital anomalies, maternal complication requiring mother and neonatal separation were excluded from the study.

Eighty-three primi mothers and their neonates were eligible and were enrolled for the study. All the mothers were asked to self-express 2ml milk from right breast into a sterile container on day 3 of delivery. The milk was then immediately sent to laboratory where in it was centrifuged at 3000 rpm to separate the fat and liquid part. The liquid part was then analyzed for sodium using standard digital photometer which could measure Na+ in a range of 10 mmol/l to 150 mmol/l.

Normal BM [Na+] on day 3 for term mother is 21.4 ± 2.3 SEM & for pre-term mother is 21.8 ± 3.1 SEM 10. A cut off of mean ± 2 SEM of pre-term (28mmol/l) was taken to include both term and pre-term for selecting cutoff. BM[Na+] above 28 mmol/l was taken as elevated and below 28 mmol/l was considered normal.

Two groups were formed one with normal breast milk sodium and one with elevated breast milk sodium. Both the groups were then followed up from day 5 to day 14 for assessment of lactational failure.

Criteria for lactational failure was set as
1. Weight loss criteria(Essential criteria) 11,12,13 >10% weight loss on any day of follow up
OR
Any % Weight loss from day 5 to day 13 that on day 14th of follow up not regained Birth Weight. &/ OR
2. Mother's complaining of insufficient milk
3. Urinary frequency less than 6 times/day.

RESULTS
Day 3 BM[Na+] ranged from 12.5 mmol/l to 78 mmol/l with a mean of 31 ± 4.2. Of the 83 samples 17 were lost to follow up, study was completed with 66 samples. Amongst the 66 mothers 52 (81.8%) of mothers established successful lactation & 12 (18.1%) mothers met the criteria of lactational failure. Out of 12, 10 (31.2%) and 2 (5.9%) amongst the elevated and normal BM [Na] group developed lactational failure respectively.

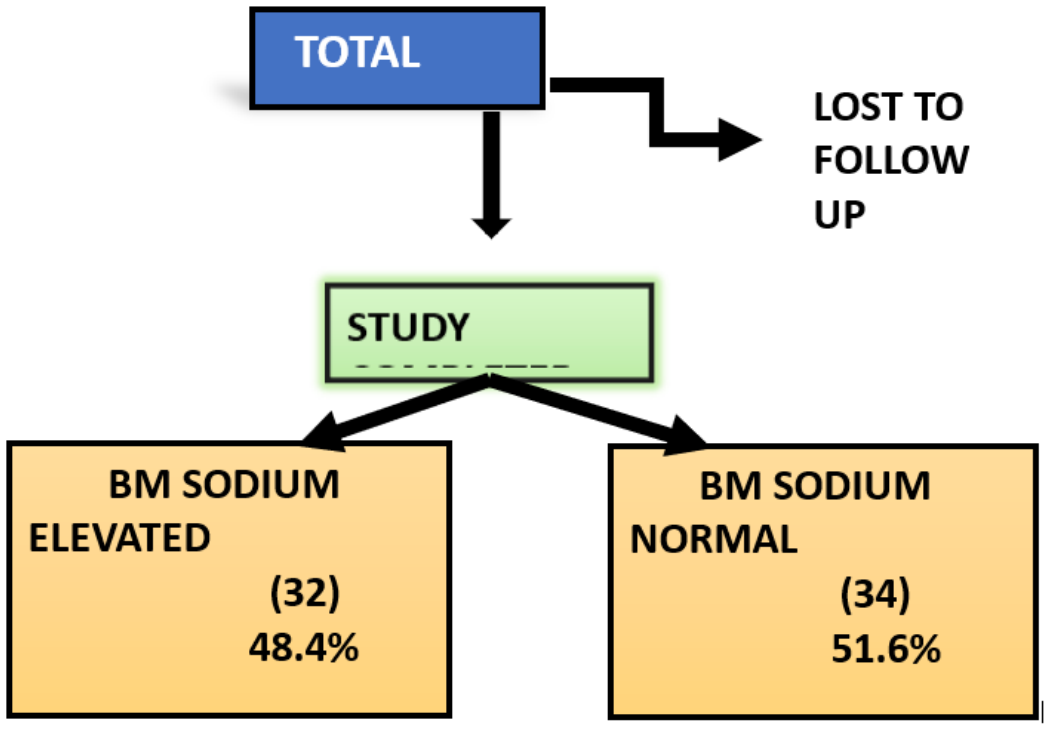

TABLE: comparison of baseline characteristic between BM[Na+] elevated and normal group.

BASELINE CHARACTERISTICS	BM[Na] ELEVATED	BM[Na] NORMAL	P- value
Mean Age of Mother(in years)	23.78± 2.40	23.47 ± 0.26	**0.629**
Mean Gestational age(in weeks)	37.6 ± 1.65	38.1 ± 162	**0.202**
Mean Birth weight	2.70 ± 0.27	2.77 ± 0.26	**0.295**
Mode of delivery	**21 were born through NVD and 11 by LSCS**	**28 babies were born by NVD and 6 by LSCS**	**0.157**

Elevated and normal BM[Na] groups were compared with respect to mean age of mother, mean gestational age, mean birth weight and mode of delivery and both the groups were found to be similar.

Amongst the 66 samples 12(18.1%) met the criteria of lactational failure. Out of 12, 10 (31.2%) and 2 (5.9%) amongst the elevated and normal BM [Na] group developed lactational failure respectively.

TABLE: LACTATIONAL FAILURE ASSESSMENT

DAY OF FOLLOW UP	No. OF FAILURE	WT LOSS >10%	BW not regained on 14th day	PIM	UO < 6 TIMES/DAY
DAY 5	1	✓		✓	
	2	✓			✓
	3	✓		✓	✓
DAY 6	1	✓		✓	✓
	2	✓			
DAY 7	1	✓			✓
	2	✓		✓	
	3	✓			✓
DAY 9	1	✓		✓	
DAY 14	1		✓		✓
	2		✓	✓	
	3		✓		✓

When analyzed using chi-squared test breast-milk sodium and lactational failure showed significant association with p-value of 0.008. The relative risk of elevated breast milk sodium group was 5.31, which showed that elevated breast-milk sodium on day 3 postnatally has 5.3 times more risk of developing lactational failure than those with normal breast milk sodium.

BM[Na]	TOTAL	LACTATIONAL FAILURE		P-VALUE	RELATIVE RISK
		YES	NO		
ELEVATED	**32**	**10**	**22**		**5.31**
NORMAL	**34**	**2**	**32**	**0.008**	**0.73**

DISCUSSION:

To our knowledge this is the first study in North East India to document the values of day 3 breast-milk sodium among primiparous mother and its association with lactational failure. The mean breast-milk sodium was similar to some published results and higher than others .

In this study we found that, a spot Breast milk sodium assessment on 3rd post-natal day (which is also the most likely day of discharge of most mothers delivered by normal vaginal delivery) is very useful in predicting lactational outcome and scheduling follow up.Primi mothers with normal breast milk sodium value can be followed up as per normal schedule where as those with elevated sodium should be monitored for frequency of feeds, proper positioning and latching. Necessary assistance to be provided if any difficulty found and discharge to be considered once sodium value normalizes thus ensuring possibly good lactational outcome.

This study partially correlates with Jane A Morton's study on usefulness of breast-milk sodium in the assessment of lactogenesis [14]. Morton measured breast milk sodium from day 3 to day 8 and chose a cut-off of 16mmo/l. Values below 16 mmol/l were followed up at 1 month and values above 16 were followed more frequently till sodium dropped to

16mmol/l or breast feeding was abandoned. He concluded that a normal drop in[Na+] is highly predictive of successful lactation although prolonged elevation of [Na+] signifies impaired lactogenesis with a high risk of failure.

BM [Nat] may be a useful determinant in the workup for inadequate milk production. One can conceptualize the causes for impaired lactation as (1) preglandular (ie, prolactin-inhibiting factors); (2) glandular (ie, surgical breast reconstruction, and "insufficientglandular development"); and (3) postglandular (ie, factors that lead to infrequent and ineffective emptying such as breast edema, impaired latchon, or inappropriate schedules).

Amongst the causes post-glandular causes are most commonly encountered. Primiparity is the most important of post-glandular causes of lactational failure wherein due to lack of knowledge of proper positioning, poor latching and general understanding of breast feeding practices results into improper / ineffective milk removal. This if continued ultimately lands up in lactational failure.

Another study demonstrated that higher no. of feeds is associated with low breast-milk sodium on day 3 among primi-parous mother15.

In several reports, unusually high concentrations of sodium have been reported in the milk of mothers whose infants developed malnutrition, dehydration, and hypernatremia between days 10 and 15.[16-18]

Even though measurement of BM[Na+]as a marker of lactational adequacy is precluded from clinical practice, its significance is of importance particularly in preventing complications emerging out of lactational failure and improving exclusive breast feeding rates.

CONCLUSION:

Day 3 measurement of Breast milk sodium can be used as a screening tool for prediction of lactational outcome in primi Mother's :

- Elevated sodium increases the risk of lactational failure and warrants close monitoring of babies to prevent complication.
- Normal sodium is highly predictive of successful lactation.

LIMITATION:

No data on BM[Na+] values on Indian population available.

Study was done with BM[Na+] values of previuos studies, where parity and frequency of breast feeding were not considered.

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CONFLICT OF INTEREST: NONE

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