

## A Study to Assess the Prevalence of Dehydration Fever in Newborns to Ascertain Associated Comorbid Conditions and Outcome Following Treatment

Swesh Chandra<sup>1</sup>, Debasis kr Samanta<sup>2</sup>

<sup>1</sup>Senior Resident, Department of Pediatrics, Dr. Baba Saheb Ambedkar Medical College and Hospital, Rohini, Delhi, India

<sup>2</sup>Senior Resident, Department of Pediatrics, RKM Seva Pratishthan, Kolkata, West Bengal, India

Received: 08-4-2023 Revised: 22-05-2023 / Accepted: 28-06-2023

Corresponding author: Dr. Swesh Chandra

Conflict of interest: Nil

### Abstract

**Aim:** The objectives of the study were to determine the number of newborns admitted into the SNCU with dehydration fever, to ascertain about other associated comorbid conditions, and to know the outcome of these newborns following treatment.

**Material & methods:** It was an observational descriptive study where neonates were admitted in NICU with dehydration fever over period of 1 year and hospital-based convenience sample were taken. This observational descriptive study was undertaken at Dr. Baba Saheb Ambedkar Medical College and Hospital, Rohini, Delhi, India. The study was conducted among 100 neonates admitted with dehydration fever. All babies born during the study period who were admitted in NICU with hypernatremic dehydration were included in the study.

**Results:** In the study among subjects presenting with hypernatremic dehydration, 26% of mothers were in the age group <20 years, 50% in the age group 21 to 25 years, 24% were in the age group 26 to 30 years. Mean mother age was 23.7±3.07 years and median age was 25 years. 85% were Primigravida and 15% were Multigravida. 10% had gestational HTN, 6% had preeclampsia, 12% had PROM, 8% had vaginitis. 26% had lactation failure, 74% had no lactation failure. 25% were on supplementary formula feeds. 34% presented with fever, 20% had decreased urine output, 20% had fever + decreased urine output and 26% had jaundice. Association between symptoms at presentation and neonatal factors neonates presenting on day 2, majority had jaundice, on day 3, majority presented with fever, on day 4, majority presented with decreased urine output and jaundice and on day 5, majority presented with decreased urine output. In the study, majority presented with Jaundice, decreased urine output and fever +decreased urine output respectively and fever.

**Conclusion:** Dehydration fever occurs most commonly on day 3 or after, effective measures should be initiated for early diagnosis and prevention of complications like effective breast-feeding counselling, proper techniques, good latching and supplementation of artificial feeds if required and monitoring of daily weight and daily urine output.

**Keywords:** Dehydration fever, Hypernatremia, Lactation failure, Neonates.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

### Introduction

Exclusive breastfeeding is the accepted mode of infant feeding in the first 6 months of life. It can alone meet the energy requirements, both the micro and macronutrient and the water requirements of the baby in these 6 months. [1] Breast milk is the main nutrient for the growth and development of the infant. [2] Normal neonatal feeding is advocated on demand every 2 hours. Intake of adequate breast feeding depends on normal mammary development (mammogenesis), unimpeded initiation of lactation (lactogenesis), sustained on-going milk synthesis (galactopoiesis), infant breastfeeding techniques. Total daily milk

intake depends on the frequency and duration of feeds. The World Health Organization recommends, all infants should be exclusively breastfed for the first 6 months of life, and complimentary feeding should be started thereafter. [3]

In cases of inadequate feeding, either due to maternal problems or breast related problems, baby can become dehydrated and develop hyperthermia, hypernatremia and acute renal failure with disastrous consequences, if not attended on time. Inadequacy of feeding can become exaggerated in

summers due to increased insensible losses. [1] Early recognition of dehydration fever by serial monitoring of weight to detect inappropriate weight loss and early correction of dehydration fever can prevent disastrous complications in the baby. It has almost always been discussed that neonatal hyperthermia is usually iatrogenic, consequent to inadvertent dislodgement of skin thermistor in a baby nursed in a servo-controlled incubator or open care system. [4] However, we have seen newborns being admitted into our "sick newborn care unit" (SNCU) with fever of varying degrees, associated with significant dehydration, lethargy, and refusal to feeds. A good number of these newborns improved rapidly following maintenance of hydration and supportive care only. Oddie et al. found that 1 out of 8 (12.5%) neonates with dehydration fever had convulsions. [5]

In another study, hyperkalemia was noted in 83.67% of neonates with dehydration fever and acute kidney injury (AKI) in 18.36%, whereas 1 (2.04%) baby was treated with peritoneal dialysis. Therefore, it is apparent that failure to detect the condition can have serious consequences including death. [6,7]

Hence, the aim of the study was to determine the number of newborns admitted into the SNCU with dehydration fever, to ascertain other associated comorbid conditions, and to know the outcome of those newborns following treatment.

### Material & Methods

It was an observational descriptive study where neonates were admitted in NICU with dehydration fever over period of 1 year (Dec 2015 to Nov 2016) and hospital based convenience sample were taken. This observational descriptive study was undertaken at Dr.Baba Saheb Ambedkar Medical College and Hospital, Rohini, Delhi, India. The study was conducted among 100 neonates admitted

with dehydration fever. All babies born during the study period who were admitted in NICU with hypernatremic dehydration were included in the study. Detailed history of maternal and neonatal factors of neonates admitted in NICU with dehydration fever, and lab investigations were noted

### Inclusion criteria

- Babies with serum Na >145meq/l,
- Euglycemia
- Term babies
- No clinical and lab evidence of sepsis.

### Exclusion criteria

- Clinically detected major congenital malformation.
- Antenatally detected central nervous system malformations.
- Parents who were unwilling to give consent.

### Statistical analysis

**Data was entered into** Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of frequencies and proportions. Chi-square test was used as test of significance for qualitative data. Continuous data was represented as mean and standard deviation. ANOVA (Analysis of Variance) was the test of significance to identify the mean difference between more than two groups for quantitative data. Graphical representation of data: MS Excel and MS word was used to obtain various types of graphs such as bar diagram. P value (Probability that the result is true) of <0.05 was considered as statistically significant after assuming all the rules of statistical tests. Statistical software: MS Excel, SPSS version 22 (IBM SPSS Statistics, Somers NY, USA) was used to analyze data.

### Results

**Table 1: Sociodemographic profile distribution in mother and presenting complaints in neonates**

		Count	%
Age	<20 years	26	26
	21 to 25 years	50	50
	26 to 30 years	24	24
Gender	Male	45	45
	Female	55	55
Parity	Multigravida	15	15
	Primigravida	85	85
Maternal complications	Nil	64	64
	Gestational hypertension	10	10
	Pre-eclampsia	6	6
	Prom	12	12
Lactation failure	Vaginitis	8	8
	Decreased	26	26
	Normal	74	74

Supplementary formula feeds	No	75	75
	Yes	25	25
Weight loss >10% at admission compared to birth weight	No	15	15
	Yes	85	85
Day of life	2	20	20
	3	60	60
	4	10	10
	5	5	5
	Fever	34	34
Presenting symptoms	Decreased urine output	20	20
	Fever + decreased urine output	20	20
	Jaundice	26	26

In the study among subjects presenting with hypernatremic dehydration, 26% of mothers were in the age group <20 years, 50% in the age group 21 to 25 years, 24% were in the age group 26 to 30 years. Mean mother age was 23.7±3.07 years and median age was 25 years. 85% were Primigravida and 15% were Multigravida. 10% had gestational

HTN, 6% had preeclampsia, 12% had PROM, 8% had vaginitis. 26% had lactation failure, 74% had no lactation failure. 25% were on supplementary formula feeds. 34% presented with fever, 20% had decreased urine output, 20% had fever + decreased urine output and 26% had jaundice.

**Table 2: Association between symptoms at presentation and neonatal factors**

		Group								P value
		Fever		Decreased urine output		Fever + decreased urine output		Jaundice		
		Count	%	Count	%	Count	%	Count	%	
Supplementary feeds	No	25	33.34	20	26.66	20	26.6	10	13.34	0.512
	Yes	10	40	5	20	2	8	8	32	
Day of life	2	8	40	0	0.0	0	0.0	12	60	0.01
	3	30	50	15	25	10	16.66	5	8.34	
	4	0	0.0	5	50.0	0	0.0	5	50.0	
	5	0	0.0	3	60.0	1	20.0	1	20.0	
Sex	Female	15	27.27	12	21.81	10	18.18	18	32.72	0.245
	Male	18	40	10	22.22	10	22.22	7	15.55	
Weight loss >10% at admission compared to birth weight	No	13	86.66	0	0.0	0	0.0	2	13.34	0.003
	Yes	20	23.52	22	25.88	22	25.88	24.70	26.2	

Association between symptoms at presentation and neonatal factors neonates presenting on day 2, majority had jaundice, on day 3, majority presented with fever, on day 4, majority presented with decreased urine output and jaundice and on day 5, majority presented with decreased urine output. In the study, majority presented with Jaundice, decreased urine output and fever +decreased urine output respectively and fever.

**Table 3: Comparison between symptoms at presentation and birth weight and weight at admission**

Group	Birth weight					Weight at admission				
	Mean	SD	Minimum	Median	Maximum	Mean	SD	Minimum	Median	Maximum
Fever	3.27	0.22	2.75	3.45	3.90	2.84	0.32	2.16	2.84	3.42
Decreased urine output	3.16	0.24	2.70	3.14	3.46	2.40	0.22	2.40	2.50	3.12
Fever + decreased urine output	2.60	0.48	2.02	3.00	3.42	2.20	0.42	1.90	2.16	3.07
Jaundice	2.75	0.34	2.12	2.72	3.14	2.36	0.34	1.74	2.34	2.36
P value	<0.001					<0.001				

In the study there was significant difference in mean birth weight, weight and admission and percentage weight loss between birth weight and admission with respect to symptom on presentation.

**Table 4: Comparison between symptoms at presentation and weight, electrolyte profile and renal function test**

	Group								P value#
	Fever		Decreased urine output		Fever + decreased urine output		Jaundice		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Weight loss	12.08	6.04	11.22	1.00	18.32	9.51	12.48	2.68	0.014
Sodium	152.36	3.70	150.03	2.08	152.08	4.36	154.36	3.54	0.109
Potassium	4.42	0.38	4.48	0.49	4.74	0.85	4.32	0.34	0.145
Urea	48.52	20.80	62.38	30.17	52.72	12.78	51.49	16.34	0.434
Creatinine	0.86	0.52	1.08	0.64	1.17	0.64	1.10	0.72	0.614

Those presented with jaundice had lowest birth weight and weight at admission and those presented with fever + decreased urine output had highest percentage of weight loss in the study.

### Discussion

Breast milk is the main nutrient for the growth and development of the infant. [8] Normal neonatal feeding is advocated on demand every 2 hours. Intake of adequate breast feeding depends on normal mammary development (mammogenesis), unimpeded initiation of lactation (lactogenesis), sustained on-going milk synthesis (galactopoiesis), infant breastfeeding techniques. Total daily milk intake depends on the frequency and duration of feeds. The World Health Organization recommends, all infants should be exclusively breastfed for the first 6 months of life, and complimentary feeding should be started thereafter. [9] Dramatic weight loss and dehydration with an increase in serum sodium (Na) concentration related to the insufficient breast milk intake may be observed mostly on the initial days of the infant. [10] Weight loss of new-born babies in the first few days of life is a clinically known entity. Mean weight loss is approximately 6% of birth weight in well babies during the first 3 days. [11-13]

In the study among subjects presenting with hypernatremic dehydration, 26% of mothers were in the age group <20 years, 50% in the age group 21 to 25 years, 24% were in the age group 26 to 30 years. Mean mother age was 23.7±3.07 years and

median age was 25 years. 85% were Primigravida and 15% were Multigravida. 10% had gestational HTN, 6% had preeclampsia, 12% had PROM, 8% had vaginitis. 26% had lactation failure, 74% had no lactation failure. 25% were on supplementary formula feeds. 34% presented with fever, 20% had decreased urine output, 20% had fever + decreased urine output and 26% had jaundice. Our findings were in consistent with other studies. [14,15] Although all the babies showed other features of dehydration as elaborated earlier, associated with fever of varying degree, serum electrolytes were within normal range. This finding is similar to that observed by Boutin et al. [16] Maayan-Metzger et al. concluded that in low-risk full-term infants, fever with no other symptoms during the 1st day of life is related primarily to dehydration. [17]

Association between symptoms at presentation and neonatal factors neonates presenting on day 2, majority had jaundice, on day 3, majority presented with fever, on day 4, majority presented with decreased urine output and jaundice and on day 5, majority presented with decreased urine output. In the study, majority presented with Jaundice, decreased urine output and fever +decreased urine output respectively and fever. In the study there was significant difference in mean birth weight, weight and admission and percentage weight loss between birth weight and admission with respect to symptom on presentation. Those presented with jaundice had lowest birth weight and weight at admission and those presented with fever +

decreased urine output had highest percentage of weight loss in the study. The study suggests that as the weight at admission decreases higher the chance of presenting with complaints like both fever and decreased urine output. Mean % of weight loss was 12.06 when dehydration fever was presented with fever, 11.29 when dehydration fever presented with decreased urine output, 18.44 when presented with both fever and decreased urine output and 12.73 when presented with jaundice these values were statistically significant. The study suggests that as the weight at admission decreases higher the chance of presenting with complaints like both fever and decreased urine output. [18]

### Conclusion

Dehydration fever is one of the serious complications during the post-natal period. As most of the dehydration fever occurs on day 3 or after, effective measures should be initiated for early diagnosis and prevention of complications. Preventive measures include prevention of dehydration fever like, effective breast feeding counselling, proper techniques, good latching and supplementation of artificial feeds if required and monitoring of daily weight and daily urine output.

### References

1. Kumar MS, Pattar R, Yelamali BC, Pol R, Vanaki R, Talawar K. Clinical spectrum and outcome of dehydration fever in term healthy neonates-a teaching hospital based prospective study. *Med Innov.* 2014 Jul; 6:20-3.
2. Tyler M, Hellings P. Feeding method and rehospitalization in newborns less than 1 month of age. *Journal of Obstetric, Gynecologic, & Neonatal Nursing.* 2005 Jan; 34(1):70-9.
3. World Health Organization, UNICEF. Global strategy for infant and young child feeding. World Health Organization; 2003.
4. Singh M. *Temperature Regulation in Care of The Newborn Revised.* 8th ed. Chennai, Tamil Nadu: CBS Publishers and Distributors Pvt., Ltd.; 2014. p. 267-8.
5. Oddie S, Richmond S, Coulthard M. Hypernatraemic dehydration and breast feeding: a population study. *Archives of Disease in Childhood.* 2001 Oct 1;85(4):318-20.
6. Kumar MS, Pattar R, Yelamali BC, Pol R, Vanaki R, Talawar K. Clinical spectrum and outcome of dehydration fever in term healthy neonates-a teaching hospital based prospective study. *Med Innov.* 2014 Jul; 6:20-3.
7. Simmons MA, Adcock III EW, Bard H, Battaglia FC. Hyponatremia and intracranial hemorrhage in neonates. *New England Journal of Medicine.* 1974 Jul 4;291(1):6-10.
8. Tyler M, Hellings P. Feeding method and rehospitalization in newborns less than 1 month of age. *J Obstet Gynecol Neonatal Nurs.* 2005; 34:70-9.
9. WHO/UNICEF. *Global Strategy for Infant and Young Child Feeding.* Geneva: World Health Organization; 2003.
10. Livingstone VH, Willis CE, Abdel-Wareth LO, Thiessen P, Lockitch G. Neonatal hypernatremic dehydration associated with breast-feeding malnutrition: a retrospective survey. *Canadian Med Assoc J.* 2000;162(5): 647-52.
11. Maisels MJ, Gifford K. Breast-feeding, weight loss, and jaundice. *J Pediatr.* 1983.
12. Maisels MJ, Gifford K, Antle CE, Leib GR. Jaundice in the healthy newborn infant: a new approach to an old problem. *Pediatr.* 1988; 81(4):505-11.
13. Marchini G, Stock S. Thirst and vasopressin secretion counteract dehydration in newborn infants. *J Pediatr.* 1997;130(5):736-9.
14. Gartner LM, Morton J, Lawrence RA, Naylor AJ, O'Hare D, Schanler RJ, et al. Breastfeeding and the use of human milk. *Pediatr.* 2005; 115(2):496-506.
15. Anon. Sharing good practice: prevention and management of excessive weight loss in the breast fed neonate. *Baby Friendly News.* 2006; 20:4.
16. Boutin A, Carceller A, Desjardins MP, Sanchez M, Gravel J. Association between dehydration and fever during the first week of life. *Clinical Pediatrics.* 2011 Dec;56(14): 132 8-35.
17. Maayan-Metzger A, Mazkereth R, Kuint J. Fever in healthy asymptomatic newborns during the first days of life. *Archives of Disease in Childhood-Fetal and Neonatal Edition.* 2003 Jul 1;88(4): F312-4.
18. Kaplan JA, Siegler RW, Schmunk GA. Fatal hypernatremic dehydration in exclusively breast-fed newborn infants due to maternal lactation failure. *Am J Forensic Med Pathol.* 1998; 19:19-22.