

A Study of Clinical Profile of Neonates Admitted in Sick New Born Care Unit with Dehydration and the Effect of Intervention on Duration of Admission Due to Dehydration in Neonates and Rate of IV Fluid Use for Treatment

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Abstract

Background: Dehydration in new-born infants may be due to various reasons like inadequate breast feeding, primigravida mothers, poor support to mother and early discharge from hospital. Dehydration in neonates cause fever, increased jaundice, electrolyte disturbances like hypernatremia, acute renal failure. Dehydration may also lead to serious illnesses like convulsions, coma, cerebral venous thrombosis, aortic thrombosis and peripheral gangrene. Many studies in the literature have focused on hypernatremic dehydration in neonates. Limited studies have been done regarding overall profile of dehydration.

Objective: To study the clinical profile of neonates admitted to SNCU (Sick New born care unit) with dehydration. To determine the effects of interventions on the admission due to dehydration in neonates and use of IV fluids.

Materials and Methods: Hospital based observational study was conducted among 102 Neonates admitted to SNCU, Department of Paediatrics, CIMS Hospital, Chamarajanagara for a period of 24 months from March 2020 to February 2022. Neonates aged <28 days, Birth weight more than 2 kg, Gestational age >34 weeks and Weight loss >10% were included in the study. Neonates with Congenital anomalies, Birth asphyxia were excluded from the study. Institutional ethical clearance was obtained prior to start of study and informed consent from Parents or Guardian was taken prior to recruitment, data was collected from neonates admitted in SNCU with dehydration. Data was entered in MS excel and analyzed using SPSS 22 version software. ANOVA Test was the test of significance for quantitative data and chi-square test was the test of significance for qualitative data. p value <0.05 was considered as statistically significant.

Results: In the present study majority were in the age group <7 days (94.1%), females were in majority (52.9%). Most common primary diagnosis was Jaundice in 37.2%, AKI in 29.4% and neonatal sepsis in 24.5%. 87.3% were discharged, 2.9% had mortality and 9.8% were referred to higher centre. Majority of neonates were managed with IV Fluids + Breast feeding (78.4%), 15.7% were only breast fed or used expressed breast milk and 5.9% received artificial feeds. Among neonates managed with IV fluids, mean days of admission was 3.86 ± 1.466 days, among breast fed neonates 5.44 ± 0.814 days, among neonates who received feeds 6.50 ± 1.049 days.

Conclusion: Neonates admitted with dehydration in SNCU had varied clinical features and diagnosis. IV fluids with Breast feeding reduced the duration of admission in SNCU and mortality rate was reduced. Neonates receiving other interventions such as Exclusive breast milk or artificial feeds needs to be carefully monitored for early discharge.

Keywords: Neonates, Dehydration, Intervention, Sick Newborn Care unit (SNCU)

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Introduction

Dehydration in newborn infants may be due to various reasons like inadequate breast feeding,

primigravida mothers, poor support to mother and early discharge from hospital. [1-4]

Dehydration may also be due to high environmental temperature in tropical countries like India especially in summer. Dehydration in neonates may cause fever, increased jaundice, electrolyte disturbances like hyponatremia, acute renal failure. [4,5] Dehydration may also lead to serious illnesses like convulsions, coma, cerebral venous thrombosis, aortic thrombosis and peripheral gangrene. [6,7] Studies have reported even long-term neurodevelopmental problems. Many studies have been done regarding the clinical profile and incidence of hyponatremic dehydration in neonates. [8,9,10] However few studies have been done regarding overall profile of dehydration. [11,12]

Hence the present study was conducted to know the magnitude of the problem in a district hospital in a backward district mainly catering to the rural and tribal population in Karnataka. Objectives of the study was to study the clinical profile of neonates admitted to SNCU with dehydration and the use of IV fluid therapy in treatment. To determine the effects of interventions on the admission due to dehydration in neonates and use of IV fluids.

Material and Methods:

Hospital based observational study was conducted among Neonates admitted to SNCU, Department of Paediatrics, CIMS Hospital, Chamarajanagara for a period of 24 months from March 2020 to February 2022. Neonates aged <28 days, Birth weight more than 2 kg, Gestational age >34 weeks and Weight loss >10% were included in the study. Neonates with Congenital anomalies, Birth asphyxia were excluded from the study. Sample size was estimated by using the prevalence of dehydration among neonates admitted to new-born care unit at 18.9% from the study by Akech.S et al using the formula $n = 4pq/d^2$, 1% alpha error and 10% absolute precision was considered in the study.

Case definition: Dehydration in a neonate aged <1month was defined as any of the following: a clinical diagnosis of dehydration at admission or discharge, use of a fluid bolus at admission (written in the treatment sheet or fluid chart as bolus, stat, immediately, rapidly or to run in <15 min), weight loss (current weight minus birth weight) >10% or 20% in term and preterm infants, respectively, in those aged ≥ 1 week, prescription of daily fluid or feed volumes >20% of requirements for a given age and body weight for children not receiving phototherapy or abnormal electrolytes (any of serum sodium >150 mmol/l, serum urea >10 mmol/l or serum creatinine >80 mmol/l if aged ≥ 2 days).

Institutional ethical clearance was obtained prior to start of study and informed consent from Parents or Guardian was taken prior to recruitment, data was collected from neonates admitted in SNCU with dehydration. Data such as age, sex, maturity, birth weight, weight on admission, urine output, feeding

history and a complete clinical examination including signs of dehydration, jaundice and temperature. Maternal sociodemographic data, antenatal history, parity, mode of delivery, maternal breast examination was done, position attachment and duration of feeding was recorded. Babies admitted were treated with iv fluids and breast feeding as per unit protocol. The number of babies requiring IV fluids were noted. Laboratory investigations such as Serum bilirubin, Blood urea, Serum Creatinine, Serum electrolytes, Complete blood count and CRP was done.

After obtaining the baseline data regarding dehydration in newborn and assessing the various factors associated with it, appropriate intervention was planned. Interventions like providing individual lactation counselling to mothers, syringing for retracted nipple in mothers, daily weighing and temperature monitoring of babies in the post natal ward, monitoring the urine output daily, education of the postnatal ward nurses for early recognition. post intervention the data were recorded regarding admissions due to dehydration.

Data was entered in MS excel and analyzed using SPSS 22 version software. Qualitative data was presented in the form of Proportions. Quantitative data was presented as mean, standard deviation. ANOVA Test was the test of significance for quantitative data and chi-square test was the test of significance for qualitative data. p value <0.05 was considered as statistically significant.

Results:

In the present study 102 neonates with dehydration were included. Of them majority were in the age group <7 days (94.1%), females were in majority (52.9%), birthweight was ≥ 2.5 Kg in 92.2%, Gestational age was >37 weeks in 96.1%, 3.9% were preterm, 54.9% were delivered by caesarean section, 23.5% of neonates admitted in SNCU were referred from other centres. Most common clinical feature on examination was delayed skin pinch (49.1%), followed by Diarrhea in 19.6%. Most common primary diagnosis was Jaundice in 37.2%, AKI in 29.4% and neonatal sepsis in 24.5%. 87.3% were discharged, 2.9% had mortality and 9.8% were referred to higher centre [Table 1].

Majority of neonates were managed with IV Fluids + Breast feeding (78.4%), 15.7% were only breast fed or used expressed breast milk and 5.9% received artificial feeds due to mother's illness. Among 80 subjects who received IV Fluids, 95% of them received 10% Dextrose/Half DNS, 5% received Other fluids such as normal saline or ringer lactate [Table 2].

In the study among neonates managed with IV fluids, mean days of admission was 3.86 ± 1.466 days, among breast fed neonates 5.44 ± 0.814 days,

among neonates who received feeds 6.50 ± 1.049 days. There was significant difference in days of admission with respect to type of intervention. IV fluids provide faster correction compared to breast feeding and artificial feeds. However, IV fluids administration was done based on the severity of dehydration and condition of the baby [Table 3].

Rate of IV Fluid administration

IV fluids were administered according to AIIMS protocol which varies as per age, severity of dehydration, birthweight. The median volume per kilogram body weight administered was 80 ml/kg (interquartile range 60–160 ml), and the median

duration of fluid administration was 8 h (interquartile range 6–24 h).

30 (29.4%) children received a bolus of fluid (Normal saline) at admission, most commonly used IV Fluid was 10% Dextrose or half DNS in 95% for dehydration correction.

Majority, 25 of 30 (83.3%), of bolus recipients only got one bolus of median volume 10 ml/kg (interquartile range 8–20 ml/kg. Bolus was mostly given rapidly, 20 of 30 (66.7%), over 1–2 h in 10 of 30 (33.3%) cases.

Table 1: Profile of neonates with dehydration

		Neonates with Dehydration (n = 102)	%
Gender	Male	48	47.1
	Female	54	52.9
Age	Age <7 days	96	94.1
	Age 8 to 28 days	6	5.9
Birth weight	2 to 2.5 kg	8	7.8
	≥2.5 Kg	94	92.2
Gestation Age	34 to 36 weeks	4	3.9
	>37 weeks	98	96.1
Birth history	Caesarean delivery	56	54.9
	Vaginal delivery	46	45.1
Referred to hospital		24	23.5
Hospital readmission		2	2.0
Clinical features	Diarrhea	20	19.6
	Delayed skin pinch	50	49.1
	Delayed capillary refill time	15	14.7
	Sunken anterior fontanelle	3	2.9
	Temperature gradient	6	5.9
	Weak pulse	8	7.8
Primary diagnosis	Neonatal sepsis	25	24.5
	Jaundice	38	37.2
	Pneumonia	4	3.9
	AKI	30	29.4
	Prematurity	4	3.9
	Respiratory distress syndrome	1	1.0
Outcome	Died	3	2.9
	Discharged	89	87.3
	Referred	10	9.8

Table 2: Management of Dehydration among Neonates

Management		Frequency	%
Intravenous fluid with Breast feeding		80	78.4%
Type of IV Fluid	10% Dextrose/Half DNS	76	95%
	Others (Normal saline/Ringer Lactate)	4	5%
Breast feeding/Expressed Breast milk		16	15.7%
Feeds		6	5.9%

Table 3: Effect of Intervention of duration of admission

No of days of admission	N	Mean	SD	95% Confidence Interval for Mean		Minimum	Maximum	P value
				Lower Bound	Upper Bound			
				IV Fluids with Breast feeding	77			
Breast Feeding/ Expressed Breast milk	16	5.44	0.814	5.00	5.87	4	7	
Feeds	6	6.50	1.049	5.40	7.60	5	8	
Total	99	4.27	1.577	3.96	4.59	2	8	

ANOVA Test

Discussion:

This study was intended to determine the clinical profile and management of neonatal dehydration in neonates admitted to SNCU of district hospital which caters mostly to poor and tribal community. The criteria for diagnosis of dehydration were broad. It was noted through literature that prevalence of dehydration varied across hospitals (4.8%–25.4%), which can be attributed to poor documentation. In the present study among 102 neonates with dehydration majority were in the age group <7 days (94.1%), females were in majority (52.9%), birthweight was ≥ 2.5 Kg in 92.2%, Gestational age was >37 weeks in 96.1%, 3.9% were preterm, 54.9% were delivered by caesarean section, 23.5% of neonates admitted in SNCU were referred from other centres. Most common clinical feature on examination was delayed skin pinch (49.1%), followed by Diarrhea in 19.6%. Most common primary diagnosis was Jaundice in 37.2%, AKI in 29.4% and neonatal sepsis in 24.5%. 87.3% were discharged, 2.9% had mortality and 9.8% were referred to higher centre.

Pellboer RAA et al [11] among 158 neonates with dehydration, 65% of cases were <2 weeks old, median weight loss was 9.3% and median age at admission 5 days; Serum sodium value was measured in only 12% of all cases. Insufficient breast-feeding volume (61%) and inadequate growth were reported (41%). Lethargy, jaundice or clinical dehydration was scored in 11–25%, seizures or shock in 3%. A breast pump was used at mother's home in 31%. 82% of hospitals had breast pumps also had services of lactation consultants (73%). Majority (65%) babies were treated by formula feeding, 30% with breast feeding.

Akech.S et al [12] in Kenya observed that Prevalence of dehydration was 19.7% (153 out of 810 patients) varied from 9.4% to 27.0%. Most cases with dehydration 53.6% were diagnosed by clinical examination, followed by excessive weight loss in 35.3% and abnormal urea/electrolytes/creatinine 15.0%.

Nair S et al among 49 neonates (3.4% of the total admitted new-borns) with hypernatremic dehydration. Fever (34.6%), poor feeding (42.8%), loose stools (40.8%) and lethargy (26.5%) were the common presentation of neonates with hypernatremic dehydration. The mean (SD) time needed for correction of hypernatremia was 38.6 (15.1) hours. Also, the study showed lesser incidence of hypernatremic dehydration in neonates who were exclusively breast fed. [13] The Clinical profile varied from study to study because of inclusion criteria, advance health care setup in developed nations and poor documentation in poor and developing countries.

In the present study Majority of neonates were managed with IV Fluids + Breast feeding (78.4%), 15.7% were only breast fed or used expressed breast milk and 5.9% received artificial feeds due to mother's illness. Among 80 subjects who received IV Fluids, 95% of them received 10% Dextrose/Half DNS, 5% received Other fluids such as normal saline or ringer lactate. In the study among neonates managed with IV fluids, mean days of admission was 3.86 ± 1.466 days, among breast fed neonates 5.44 ± 0.814 days, among neonates who received feeds 6.50 ± 1.049 days. There was significant difference in days of admission with respect to type of intervention. IV fluids provide faster correction compared to breast feeding and artificial feeds. However, IV fluids administration was done based on the severity of dehydration and condition of the baby.

Akech.S et al [12] observed that documentation of iv fluids used was poor but as per the available data, Ringers lactate 19.6% and 10% dextrose in 11.8% patients were mostly used. Only 17 of 153 i.e. 11.1% neonates were given bolus fluid prescription. They found Neonatal dehydration to be common lack of documentation may underestimate the burden. Goyal S et al [14] among 248 neonates with dehydration. The mean age on admission 4.19 days, mean weight loss was 13.39%. The incidence of dehydration fever was 13.80 per 1000 live births. Shah RH et al [15] among 28 neoantes with dehydration, 21 had hypernatremia. The incidence of dehydration was found to be 6.45%.

In the present study median volume per kilogram body weight administered was 80 ml/kg (interquartile range 60–160 ml), and the median duration of fluid administration was 8 h (interquartile range 6–24 h). 30 (29.4%) children received a bolus of fluid (Normal saline) at admission, most commonly used IV Fluid was 10% Dextrose or half DNS in 95% for dehydration correction. Majority, 25 of 30 (83.3%), of bolus recipients only got one bolus of median volume 10 ml/kg (interquartile range 8–20 ml/kg. Bolus was mostly given rapidly, 20 of 30 (66.7%), over 1–2 h in 10 of 30 (33.3%) cases.

Dextrose 10%/ DNS with electrolytes and Ringer's lactate, which were the commonly prescribed fluids, are commonly used as maintenance fluids in neonates or for treating dehydration in older infants, respectively (WHO 2005, 2013). Weight loss is often accompanied by hypernatremia, [16,17,18] which should be corrected gradually during dehydration, as rapid reduction of serum sodium may result in rapid shifts of water between fluid compartments, leading to cerebral oedema, pontine myelinosis, coma and even death. [19,20,21] Hence careful monitoring during intervention is needed. There is very limited literature with respect to effect of interventions on rate of admission among neonates with dehydration in SNCU. Various reasons such as age of admission, exclusive breast feeding, awareness of breastfeeding among mothers especially primiparous can play a major role in dehydration and considering the preventable nature of the condition importance to be given at centres in education mothers regarding dehydration in mothers.

Conclusion:

With the observations from the study it was concluded that Dehydration in neonates is common and present with varied clinical features and diagnosis. Cautious approach to be followed in management of Neonates with dehydration. IV fluids with Breast feeding reduced the duration of admission in SNCU and mortality rate was reduced. Neonates receiving other interventions such as Exclusive breast milk or artificial feeds needs to be carefully monitored for early discharge. Depending upon the clinical condition of neonate, management to be planned and follow standard protocol for better prognosis. Documentation of fluid management is must be improved as data suggest wide variation in choice of fluid, rate and volumes administered.

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