

ETHICAL REVIEW COMMITTEE, ICDDR,B.

228

Principal Investigator DR. A.R. SAMADI

Trainee Investigator (if any) _____

Application No. 80-050(P)

Supporting Agency (if Non-ICDDR,B) NIL

Title of Study Types of Dehydration

Project status:

With particular reference to
hypernatremia (Retrospective Study)

- New Study (Ltd Study)
- Continuation with change
- No change (do not fill out rest of form)

Circle the appropriate answer to each of the following (If Not Applicable write NA).

- Source of Population:
- (a) Ill subjects Yes No
 - (b) Non-ill subjects Yes No
 - (c) Minors or persons under guardianship Yes No
- Does the study involve:
- (a) Physical risks to the subjects Yes No
 - (b) Social Risks Yes No
 - (c) Psychological risks to subjects Yes No
 - (d) Discomfort to subjects Yes No
 - (e) Invasion of privacy Yes No
 - (f) Disclosure of information damaging to subject or others Yes No
- Does the study involve:
- (a) Use of records, (hospital, medical, death, birth or other) Yes No
 - (b) Use of fetal tissue or abortus Yes No
 - (c) Use of organs or body fluids Yes No
- Are subjects clearly informed about:
- (a) Nature and purposes of study Yes No
 - (b) Procedures to be followed including alternatives used Yes No
 - (c) Physical risks Yes No
 - (d) Sensitive questions Yes No
 - (e) Benefits to be derived Yes No
 - (f) Right to refuse to participate or to withdraw from study Yes No
 - (g) Confidential handling of data Yes No
 - (h) Compensation &/or treatment where there are risks or privacy is involved in any particular procedure Yes No

- 5. Will signed consent form be required:
 - (a) From subjects Yes No
 - (b) From parent or guardian (if subjects are minors) Yes No
- 6. Will precautions be taken to protect anonymity of subjects Yes No
- 7. Check documents being submitted herewith to Committee:
 - Umbrella proposal - Initially submit an overview (all other requirements will be submitted with individual studies).
 - Protocol (Required)
 - Abstract Summary (Required)
 - Statement given or read to subjects on nature of study, risks, types of questions to be asked, and right to refuse to participate or withdraw (Required)
 - Informed consent form for subjects
 - Informed consent form for parent or guardian
 - Procedure for maintaining confidentiality
 - Questionnaire or interview schedule *
- * If the final instrument is not completed prior to review, the following information should be included in the abstract summary:
 1. A description of the areas to be covered in the questionnaire or interview which could be considered either sensitive or which would constitute an invasion of privacy.
 2. Examples of the type of specific questions to be asked in the sensitive areas.
 3. An indication as to when the questionnaire will be presented to the Cttee. for review.

NOT Relevant

not relevant

not relevant

not relevant

not relevant

not relevant

I agree to obtain approval of the Ethical Review Committee for any changes involving the rights and welfare of subjects before making such change.

Principal Investigator Hassan

Trainee _____

80-050(P)
Rec'd 30/12/80.

SECTION I - LIMITED STUDY

1. Title: Types of Dehydration with Particular Reference to Hybernemia
2. Principle Investigator: Dr. Aziz R. Samadi
3. Co-Investigator: Mr. M.A. Wahed
Dr. R. Islam
Dr. Momenul Alam
Dr. Shahabuddin
4. Starting Date: 1 December 1980
5. Completion Date: 1 February 1981
6. Total Direct Cost:
7. Scientific Program Head:

This protocol has been approved by the Working Group. Pathogenesis & Therapy Working Group.

Signature of Scientific Head:

Date:

W.B.S.
10/12/80

8. Abstract:

Diarrhoeal diseases are complicated by dehydration, which is caused by loss of water and electrolytes. Severe dehydration is an emergency state which needs immediate replacement of water and electrolytes. Replacement therapy is based on the types of dehydration. Hypernatremic dehydration has been reported to be the most fatal type of dehydration, usually occurring in children of under two years of age. The role of diet in onset of disease and some other environmental factors have been reported as important. This study, which is a retrospective analysis of ICDDR,B hospital records, will provide information on the prevalence of different types of dehydration with particular reference to hypernatremia. The course of the disease in the hospital will be examined and the case fatality and sequelae due to hypernatremia will be recorded. The relation of diet, fever, anorexia, and other environmental contributing factors will also be evaluated.

SECTION II - PLAN OF LIMITED STUDY

A. INTRODUCTION

Hypernatremia may result either from excessive loss of water in comparison to loss of salt or greater intake of sodium in relation to intake of water. Knowledge of various factors such as fever, anorexia, diet, fluid replacement and various environmental factors which may contribute to hypernatremia is of paramount significance in early diagnosis.

Early recognition of hypernatremic state is of great importance in its treatment, since delay in treatment may lead to an irreversible state resulting in either death or severe brain damage with permanent sequelae (1).

The magnitude of hypernatremia in relation to diarrhoea has not been well documented in developing countries. This may be a worthwhile attempt to analyse and study the types of dehydration, with special reference to hypernatremia in ICDDR,B for the years 1979 and 1980.

1. Objectives:

To study and analyse the types of dehydration with particular reference to hypernatremia in patients suffering from diarrhoea with complications who are admitted in Dacca Health Station Hospital with a view to getting information on (a) prevalence of hypernatremia in the hospital admissions, (b) course and outcome of hypernatremic dehydration in these patients and (c) establishing the possible predisposing factors.

2. Background Information:

Dehydration is a common complication of diarrhoea which endangers the life of the children in developing countries. The children suffering from gastroenteritis lose water and electrolytes in stool and vomiting which cause different degrees of dehydration. A critical stage in dehydration occurs when a volume of fluid equal in mass to about 10% of the body weight has been lost over a period of a day or two (2). This stage requires immediate fluid replacement by the intravenous route. The replacement therapy not only depends on water deficit but is also related to the types of dehydration. However, it is important to remember that body composition of dehydrated patients is influenced not only by losses but also by concomitant intake (3). The types of dehydration is classified on the basis of the serum sodium level in dehydrated patients: isonatremic when serum sodium levels are between 130-150 mEq/L, hyponatremic when serum sodium levels are less than 130 mEq/L, and hypernatremic when serum sodium levels are above 150 mEq/L (2,3,4). However, serum sodium levels for hypernatremia in children from developing countries may be lower than developed countries, since most of these children have low reserve of electrolytes resulting from antecedent malnutrition.

Hypernatremic dehydration is considered to be a highly dangerous type of dehydration (5). The management of hypernatremic

dehydration is best done differently from management of isonatremic or hyponatremic dehydration; failure to do so results in an increased number of serious sequelae or death (6). Hypernatremic dehydration in infancy results from a disproportionate loss of water over electrolytes from the body fluids (6). Predisposing factors include the diet being used at the time of onset of illness or during the course of disease, type of replacement that is used for water loss, and those factors which aggravate water loss without salt, such as high environmental temperature, fever, tachypnea (6). Anorexia, immaturity of kidneys in young infants (1) a dry hot climate (2), high solute load due to concentrated dried milk and very early introduction of mixed feeding may contribute to hypernatremic dehydration (6,7,8,9,10,11,12). Although the possible role of different etiologies of diarrhoea has been suggested as a contributory factor, there is no well documented argument to prove this (13).

In North America hypernatremic dehydration accounts for 20-25% of patients admitted to hospital with dehydration; however, the incidence varies from one region to another and also varies with season and prevailing feeding practices (2). Although the incidence of hypernatremic dehydration in developing countries has not been thoroughly studied, the clinicians are encountering hypernatremia as a problem.

Mortality from hypernatremic dehydration is high. Rosenbloom (14)

reported 28% mortality in hypernatremic dehydration; all deaths were in infants under six years of age. A review of the literature by Goldszer (15) revealed that only four of the patients appearing in the literature with serum sodium levels greater than 200 mEq/L are reported to have survived. Wahed et al (16) in an attempt to look for prevalence of hypernatremia in children under five years of age admitted to ICDDR,B hospital, reported that children below 1 year of age represents 75%, children between 1-2 years of age 19% and children between 3-5 years of age constitute only 6% out of 350 cases (hypernatremia was considered when serum sodium level was >145 mEq/L). Early recognition of hypernatremic dehydration has been given importance for early treatment, since delay in treatment may lead to either death or permanent brain damage (1). The recognition of hypernatremia depends on serum sodium level: certain features from history and physical findings enable one to recognize hypernatremia prior to laboratory confirmation (2).

The clinical manifestation of hypernatremic dehydration consists of disturbance of consciousness which usually appears as a peculiar combination of marked lethargy or somnolence coupled with hyperirritability (2) and an occasional shrieking cry (11). Hypertonicity of muscles, often producing mild nuchal rigidity, may occur. More extreme manifestations of central nervous system involvement include muscle twitching, tremors, and frank convulsions. The abdominal skin has a velvety feel and sometimes a "doughy" consistency (2,11).

Circulation is usually maintained; but, if the dehydration exceeds 10% weight loss or if the hypernatremia is very severe ($\text{Na} > 180 \text{ mEq/L}$), shock may complicate the picture (2). The mucous membranes of the patients are dry and parched (9) - excessive thirst is always present (11). These patients are usually running a high fever (2,4,7,11).

Hypernatremic dehydration can lead to complications such as permanent brain damage, convulsion (2,9) intracranial hemorrhage (4,7,17). Cerebral thrombosis, renal tubular necrosis, hypocalcemic tetany are less common complications but, hyperglycemia may often accompany hypernatremia (4,7).

3. Rationale:

This limited protocol will enable us to analyse and study the hospital records retrospectively to get information on types of dehydration, with particular reference to hypernatremia which is a fatal type of dehydration. Hypernatremic dehydration not only gives rise to high mortality but also causes permanent brain damage in survivors.

Therefore it is worthwhile to study its prevalence and contributing factors, and to evaluate the course of the disease in comparison to other types of dehydration.

B. SPECIFIC AIMS:

- a. To study the pattern of dehydration in children under 3 years of age who are admitted in ICDDR,B hospital for diarrheal complications.

- b. To get information on the percentage of hypernatremic dehydration, which is a fatal type of dehydration.
- c. To get information on possible predisposing factors in Dacca.
- d. To provide information on the course of disease.
- e. To provide information, if any, on clinical signs and symptoms of hypernatremia.

C. METHODS AND MATERIALS

The subject of the study will be children under two years of age who were admitted to ICDDR,B hospital with diarrhoeal disease.

The hospital records for the years 1979 and 1980 will be studied.

Information on date of admission, age, sex, weight, dietary history, nutritional status signs of dehydration, degree of dehydration, serum specific gravity, serum electrolytes, and etiologic factors will be collected. Annex 1 shows the detailed information on medical history, physical findings and laboratory data. This information will be analysed and correlated. The processing of information will be done by computer.

D. SIGNIFICANCE

This retrospective analysis of the hospital records will enable us to identify the prevalence of the most fatal type of dehydration, hypernatremia. This will enable us to know the predisposing factors and the outcome of the course of the disease in comparison to other types of dehydration. This study will enable us to learn what steps can be taken to treat and prevent hypernatremic dehydration.

E. FACILITIES

1. Office Space : No additional space
2. Laboratory space : Nil
3. Hospital Resources : Hospital records for the years 1979 and 1980 will be used.
4. Animal Resources : Nil
5. Logistic Support : Personnel assigned to study are included to the budget.
6. Major Items of Equipment : Nil
7. Computer Costs : \$435

F. COLLABORATIVE ARRANGEMENTS - Nil

REFERENCES

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2. Finberg L., 1970. The management of the critically ill child with dehydration secondary to diarrhoea. *Pediatrics* 45:1029-1031.
3. Vaughan V.C., McKay R.J. and Behrman R.E., 1970. *Text Book of Pediatrics*. 11th ed. Tokyo, Igaku Shoin Ltd. :288-289.
4. Walker-Smith J., 1979. *Diseases of the Small Intestine in Childhood*. 2nd Edition London, Pitman Medical : 217-219.
5. Huckson H.J., 1980. *Practical Paediatric Problems*. 5th Ed. England, Lloyd Luke Publications : 326-377.
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8. Davis D.P. et al., Jan 2, 1977. Hypernatremia and gastroenteritis. *Lancet* : 252.
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10. Taiz L.S. and Byer H.D. 1972. High calorie/osmolar feeding and hypertonic dehydration. *Arch. Dis. Child*. 47 : 257.
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14. Rosenblooms L. and Silis J.A., 1975. Hypernatremic dehydration in infant mortality. *Arch. Dis. Child*. 50:750.

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SECTION - IV

ABSTRACT SUMMARY

Diarrhoeal diseases are complicated by dehydration, which is caused by loss of water and electrolytes. Severe dehydration is an emergency state which needs immediate replacement of water and electrolytes. Replacement therapy is based on the types of dehydration. Hypernatremic dehydration has been reported to be the most fatal type of dehydration, usually occurring in children of under two years of age. The role of diet in onset of disease and some other environmental factors have been reported as important. This study, which is a retrospective analysis of ICDDR,B hospital records, will provide information on the prevalence of different types of dehydration with particular reference to hypernatremia. The course of the disease in the hospital will be examined and the case fatality and sequelae due to hypernatremia will be recorded. The relation of diet, fever, anorexia and other environmental contributing factors will also be evaluated.

1. Population : Nil
2. Potential Risks : Nil
3. Procedure for Minimizing Risks : No applicable
4. Safeguarding Confidentiality : Patients names will not be used in analysis of data
5. Informed Consent : Not applicable
6. Interview Information : Nil

SECTION III - BUDGET

A. DETAILED BUDGET

1. <u>Personnel</u>	<u>Effort</u>	<u>Annual</u>	<u>Project Requirement</u> (2 months)	
			<u>Taka</u>	<u>Dollars</u>
Dr. A. R. Samadi	5%	\$37,385.00		312.00
Mr. M.A. Wahed	5%	Tk. 56,280.00	469.00	
Dr. R. Islam	5%	Tk.130,620.00	1,089.00	
Dr. Momenul Alam	10%	Tk. 49,845.00	831.00	
Data Entry Technician Senior I	10%	Tk. 30,060.00		
Dr. Shahabuddin	10%	Tk. 49,845.00	831.00	
			Tk.3,721.00	248.00
				US\$ 560.00
2. Supplies and Materials : Nil				
3. Equipment : Computer Service for 10 hours (Tk.650.00/hr)				435.00
4. Patient Hospitalization : Nil				
5. Outpatient Cost : Nil				
6. ICDDR,B Transport : Nil				
7. Travel and Transportation :				
8. Transportation of Things :				
9. Rent Communication and Utilities : Nil				
10. Printing and Reproduction : Tk.1,500.00				100.00
11. Other Contractual Service : Nil				
12. Construction, Renovation, Alteration : Nil				
				Total : US\$1,095.00
				=====

B. BUDGET SUMMARY

	<u>Category</u>	<u>Taka</u>	<u>Dollars</u>
1.	Personnel	3,721.00	560.00
2.	Supplies	-	-
3.	Equipment (Computer)	-	435.00
4.	Hospitalization	-	-
5.	Outpatients	-	-
6.	ICDDR,B Transport	-	-
7.	Travel Persons	-	-
8.	Transportation of Things	-	-
9.	Rent/Communication	-	-
10.	Printing/Reproduction	1,500.00	100.00
11.	Contractual Services	-	-
12.	Construction	-	-
		<hr/>	<hr/>
		5,221.00	\$1,095.00
		<hr/>	<hr/>

Total: (\$1,095.00)

PATIENT NO.					DATE OF ADMISSION			AGE (MONTHS)	SEX	WT (KG)	HT (CM)	PRV. ADM. FOR DIARR	DURATION OF DIARR. (DAYS)	FREQUENCY OF DIARR.	FREQUENCY OF VOMITING	FEVER	Remarks										
					DAY	MONTH	YR																				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	

28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	Remarks	
STOOL CHARACTER	ABDOM. PAIN	ANTIB. P. ADMISS.	DIETARY HISTORY	EYES	SKIN TURGOR	MUCOUS MEMBRANE	FONTANELLAE	C.N.S.	DEGREE DEHYDR.	ABDOM. TENDERNESS	ABDOM. DISTENTION	BOWEL SOUNDS	NUTRITIONAL STATUS	COMPLICATIONS	STOOL CULTURE	SERUM SP. GRAVITY	SERUM Na (m MOL/L)	SERUM Cl (m MOL/L)									

ANNEX 1. DATA SHEET

SERUM K (mMol/L)			SERUM CO ₂ (mMol/L)			BLOOD GLUCOSE (mMol/L)			SERUM PROTEIN		HCT (%)		TWBC THOUSANDS HUNDREDS		POLY BANDS		HOSPITAL DURATION (DAYS) OUTCOME		FAMILY SIZE		TYPE OF FLUID PRIOR TO COLLECTION OF BLOOD		Remarks						
54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76		77	78	79	80	81	

ANNEX 1. DATA SHEET SUB-CODE NUMBERS

1-5	Patient No.	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
6-11	Date of Admission	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
		Day	Mon	Yr			
12-13	Age (Months)	<input type="text"/>	<input type="text"/>				Not Recorded = 99
14	Sex:	Male = 1,	Female = 2,				
15-17	Weight (Kg)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	Not Recorded = 999
18-19	Height (cm)	<input type="text"/>	<input type="text"/>				Not Recorded = 99
20	Previous Admission to any Hospital for Diarrhoea :	Yes = 1,	No = 2				
21 - 22	Duration of Diarrhoea (Days):	<input type="text"/>	<input type="text"/>				
23 - 24	Frequency of Diarrhoea:	<input type="text"/>	<input type="text"/>				Not Recorded = 99
25 - 26	Frequency of Vomiting:	<input type="text"/>	<input type="text"/>				Not Recorded = 99
27	Fever :	Yes = 1,	No = 2,	Not Recorded = 9			
28	Stool character:	Watery = 1,	Mucoide = 2,	Mucoide & Blood = 3,	Not Recorded = 9		
29	Abdominal Pain :	Yes = 1,	No = 2,	Not Recorded = 9			
30	Antibiotic prior to admission:	Yes = 1,	No = 2,	Not Recorded = 9			
31 - 32	Dietary History:	Breast Milk=01, Artificial Milk=02, Cows Milk=03, Breast Milk Plus Artificial or Cows=04 Rice & Curry=05, Family Food=06, Barley Gruel with Sugar=07, Barley Gruel with Salt=08 Common Salt Solution=09, Oral Electrolyte Solution=10, Others=....., Not Recorded=99.					
33	Eyes:	Normal = 1,	Sunken = 2,	Not Recorded = 9			
34	Skin Turgor:	Normal = 1,	Poor = 2,	Doughy = 3,	Not Recorded = 9.		
35	Mucous Membranes:	Moist = 1,	Dry = 2,	Not Recorded = 9			

ANNEX 1. DATA SHEET SUB-CODE NUMBERS

36	Fontanelles: Normal = 1, Depressed = 2, Raised = 3, Not Recorded = 9
37	C.N.S.: Alert = 1, Sleepy = 2, Drowsy = 3, Semicoma = 4, Coma = 5, Irritable = 6, Convulsion = 7, Not Recorded = 9
38	Degree Dehydration : Not Dehydrated = 1, Mild = 2, Moderate = 3, Severe = 4, Not Recorded = 9
39	Abdominal Tenderness : Yes = 1, No = 2, Not Recorded = 9
40	Abdominal Distention : Yes = 1, No = 2, Not Recorded = 9
41	Bowel Sounds: Yes = 1, Sluggish = 2, Absent = 3, Not Recorded = 9
42	Nutritional Status: Normal = 1, Obese = 2, Malnourished = 3, Kwashiokor = 4, Marasmus = 5, Not Recorded = 9
43	Complications: None = 1, Pneumonia = 2, Vit. A Deficiency = 3, Otitis Media = 4, SkinInfection = 5 Rectal Prolapsis = 6, Others....., Not Recorded = 9
44 - 45	Stool Culture: Cholera = 01, Shigella Shiga = 02, S. Flex = 03, S. Sonni = 04, S. Boydii = 05, S. Schmitz = 06, S. Dysentrae (3-7) = 07, Salmonella = 08, ETEC/LT = 09, ETEC/ST = 10, ETEC/ST+LT = 11, NAG = 12, Rotavirus = 13, Others, Not Recorded = 99
46 - 47	Serum Sp. Gravity = 1.0 <input type="text"/> <input type="text"/> Not Recorded = 99
48 - 50	Serum Na: <input type="text"/> <input type="text"/> <input type="text"/> Not Recorded = 999

ANNEX 1 DATA SHEET SUB-CODE NUMBERS

51 - 53	Serum Cl:	<input type="text"/>	<input type="text"/>	<input type="text"/>	Not Recorded = 999
54 - 56	Serum K:	<input type="text"/>	<input type="text"/>	<input type="text"/>	Not Recorded = 999
57 - 59	Serum CO ₂ :	<input type="text"/>	<input type="text"/>	<input type="text"/>	Not Recorded = 999
60 - 62	Blood Glucose:	<input type="text"/>	<input type="text"/>	<input type="text"/>	Not Recorded = 999
63 - 65	Serum Protein	<input type="text"/>	<input type="text"/>	<input type="text"/>	Not Recorded = 999
66 - 67	Hct:	<input type="text"/>	<input type="text"/>	<input type="text"/>	Not Recorded = 99
68 - 70	TWBC :	<input type="text"/>	<input type="text"/>	<input type="text"/>	Not Recorded = 999
71 - 72	Poly:	<input type="text"/>	<input type="text"/>	<input type="text"/>	Not Recorded = 99
73 - 74	Bands :	<input type="text"/>	<input type="text"/>	<input type="text"/>	Not Recorded = 99
75 - 76	Hospital Duration (Days)	<input type="text"/>	<input type="text"/>	<input type="text"/>	
77	Outcome:	Cured = 1, Transferred = 2, Discharged on Request = 3, Died = 4			
78 - 79	Family Size:	<input type="text"/>	<input type="text"/>	<input type="text"/>	
80-81	Types of Fluids P.T.C.B. :	1=Acetate, 2= $\frac{1}{2}$ Acedate+D5%, 3=N. Saline 4= $\frac{1}{2}$ Strength N.S +5%D, 5=10:2 =6, 4:4:2 = 7, 6:4 = 8, 12:0 = 9, 7.5%NaHCO ₃ = 10, KCl = 11, D.25% = 12, None = 99			