http://www.inosr.net/inosr-applied-sciences/
Laker *et al*
INOSR APPLIED SCIENCES 10(1):78-85, 2023.

International Network Organization for Scientific Research ISSN: 2705-165X

Dehydration Status of Children 3-24 Months with Rota-Virus Diarrhoea at Fort Portal Regional Referral Hospital

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ABSTRACT

The study was done to determine the prevalence of rotavirus diarrhea among children 3 to 24 months old at Fort Portal Regional Referral hospital. This was a hospital based cross sectional, descriptive and analytical study design to determine the prevalence, dehydration status and factors associated with Rota-virus diarrhea in children 3- 24 months in Fort Portal Regional Referral hospital. The study was carried out at Fort Portal Regional Referral Hospital pediatric (ward, OPD, Nutrition unit). Among the study participants with Rotavirus diarrhoea, majority had some dehydration 28(66.7%) while only 4.8% had severe dehydration. Majority of the participants with rotavirus diarrhea had some dehydration.
Keywords: dehydration status, rotavirus, diarrhea, children, 3-24 months, Uganda

INTRODUCTION

Rotavirus is the leading cause of severe acute diarrhea world over with a high morbidity and mortality in children below 5 years [1-9]. It is ranked the 3rd leading pathogen associated with mortality among children below 5 years contributing to 128,500 deaths world over [10]. Globally it is estimated that there are 114 million diarrhea episodes requiring home care and 2.4 million hospitalizations annually with a peak age of 3-24 months [11-12]. In sub-Saharan Africa, Rotavirus diarrhea contributed to 104,733 deaths in 2016 [10] with majority of children getting infected before 18 months of age, contributing approximately 56% of the worldwide childhood deaths from rotavirus disease [13]. In this study, 3 months was the lower limit because at this age rotavirus immunization is complete and we expect the child to be at less risk of rotavirus. The upper limit of 24 was chosen because 3-24 months marks the peak of rotavirus infection [12, 14]. Pre-Rotavirus vaccination era in Uganda saw Rotavirus diarrhea prevalence of 32.8% - 45.4% in children below 5 years with majority of children (95%) being less than 24 months [14-15]. However post Rota-virus vaccination population-based estimates and the impact of RV introduction on diarrheal deaths in Africa are not available [16]. Upper limit of 24months old was chosen to reduce on recall bias which is most likely to occur with children older than 24months.

Rotavirus is highly contagious and highly associated with severe dehydration leading to mortality via shock and multiorgan failure secondary to hypovolemia [15, 17]. Thus the key to the assessment of acute diarrhea is the detection and classification of dehydration status as this serves the basis of management [18]. There is a dire need for the continued surveillance of rotavirus so as to measure the impact of the rotavirus vaccination, evaluation of vaccine effectiveness and also to evaluate trends of the rotavirus burden before and after the introduction of the vaccine [19]. There were still children having diarrhea (despite Rota virus vaccination introduction) that were suspected to have been viral, (rota virus being the commonest cause) during my year of study and practice. It is on these background that the researchers considered to determine the prevalence,

severity and factors associated with Rota-virus diarrhea among children 3 to 24months old in Fort Portal Regional Referral hospital.

METHODOLOGY

Study Design

This was a hospital based cross sectional, descriptive and analytical study design to determine the prevalence, dehydration status and factors associated with Rota-virus diarrhea in children 3- 24 months in Fort Portal Regional Referral hospital.

Study Site

The study was carried out at Fort Portal Regional Referral Hospital pediatric (ward, OPD, Nutrition unit).

Study Population

Target Population

The targeted population for the study was Children aged 3-24 months attending care from Fort Portal Regional Referral hospital. The age category was selected because Rota-virus infection among children peaks between age 3-24months. In this study, 3 months was the lower limit because at this age rotavirus immunization is complete. The upper limit of 24 was chosen because 3-24 months marks the peak of rotavirus infection.

Eligible Population

All children 3-24months old who presented with diarrhea at Fort Portal Regional Referral hospital for medical care during the study period.

Study Participants

The study participants were children 3-24 months with diarrhea and their caretakers attending Fort Portal regional referral hospital.

Inclusion Criteria

1. Child with acute diarrhea aged 3-24months old and their caregiver.
2. Children 3-24months with acute diarrhea whose caregivers had consented to the study.

Exclusion Criteria

1. Children aged 3-24month with diarrhea whose caregivers had not consented for the study.
2. All children with persistent or chronic diarrhea

Sample Size Determination

Using a sample size formula by **Kish Leslie** for cross-sectional studies:

$N = Z\alpha 2P(1-P)/\delta 2$

Where N= sample size

$Z\alpha$ = Standard normal deviation at 95% confidence interval corresponding to 1.96.

P= assumed true population prevalence of Rota-virus diarrhea, using Prevalence of rotavirus infection among children with acute diarrhea after rotavirus vaccine introduction in Kenya, of 14.5% [5].

1-P = the probability of not having Rota-virus diarrhea,

δ = Acceptable error of 5%.

The calculated sample size N = 190 children

Diagnosis of Rota-Virus Diarrhoea

The study used immunochromatographic assay (Fastep kit sensitivity- 90%, specificity- 93%) for the diagnosis of Rota-virus diarrhea, this was because they are easy to perform, they provide rapid results and with a high sensitivity [20]. A study in tertiary Care Hospital in Bangladesh showed ICT sensitivity of 90.70% and specificity of 93.88% in comparison to ELISA the gold standard [21] while in India it had a sensitivity of 95.24% and specificity of 97.47% [22].

Data collection tools

Stool specimen collection

Sample collection was done by the help of a rectal tube. A 5 ml syringe was attached to a rectal tube size 10 which was inserted into a rectum following aseptic technique [15]. The tube was inserted approximately 2 cm in the rectum while the child was held on the mother's thighs in prone position and aspirate about 5mls of stool was taken. The sample was placed into a sterile, clean dry screw-top stool container. The container was labelled with a unique identifier of the study participant.

Rotavirus Immunochromatography Test (SD bioline)

This study adopted the methodology used by Sharma [23]) in his study "Comparison of A Rapid Immunochromatography Test with Elisa to Detect Rotavirus"

Preparation of Extracted Sample

Assay diluent was taken in a disposable dropper up to the line marked on it and then transferred into the sample collection tube. This was done twice. Sample collection swab was put in to the stool sample and then inserted into the tube containing assay diluent (sample collection tube). Sample collection Swab was then swirled ten times in the sample collection tube until the sample dissolved into the assay diluents. The swab was discarded while squeezing it against the wall of tube.

Test Procedure

Test device was removed from the foil pouch and placed on a flat, dry surface. Dropping cap was assembled on the sample collection tube. 4-5 drops of the sample were added to the sample well of the test device. As the test began to work, purple color moved across the result window in the center of the test device. Test results was interpreted at 10-20 minutes.

Study Procedure

Children within the required age group who presented with acute diarrhea at OPD, emergency, and ward within the first 24hours of admission were identified by the principal investigator or research assistant. Informed consent was sought from the care giver then a questionnaire was filled, physical assessment for dehydration signs was done and sample was taken for Immunochromatographic test for rotavirus detection. Each study participant was given a unique identifier, which was also written on their files to avoid double entry in case a patient comes for review or develops another episode of diarrhea during the study period.

Laboratory tests

For every 20 samples, one sample was taken to a reference laboratory to check for consistence of the result finding. The researcher had a hands-on training for 1 week on how to carry out the rotavirus rapid diagnostic test and interpretation in KIUTH. The study was overseen by a laboratory technologist.

Data Analysis

Data was entered in Microsoft excel software, cleaned and sorted and thereafter exported to SPSS version 22 for further analysis. To classify the dehydration status of Rota-virus diarrhea, univariant analysis was done and presented in a tabular form as frequencies and percentages.

Ethical Considerations

For the study to be ethical, the following were considered;

Institutional consent

Ethics clearance from Kampala international university research ethics committee was sought. This was followed by seeking approval to conduct research from the medical director of FPRRH. To pre-test the questionnaire, permission was sought from chief executive officer KIUTH

Privacy and confidentiality

Questionnaires did not bear individual participant names in order to ensure anonymity and the completed questionnaires together with soft copy files were only accessible to the principal investigator and kept under lock and password protected respectively.

Informed consent

Written informed consent was voluntarily sought from the individual participants after thorough explanation of the study protocol and the procedures to be done. The participant was then asked to put a thumb print or a signature on 2 consent forms, one for the participant and another was to remain with the principal investigator. Consent forms were both in English and Lutoro and patient were free to withdraw from the study anytime.

Respect of individual persons

Participants were allowed to with draw from the study at any point without any repercussion impeding their health care.

RESULTS

In this study, majority of the children enrolled with diarrhea were females 135(50.4%) aged ≤12 months 177 (66.0%) with a duration of diarrhea less than 5 days 220 (82.1%). Majority were still breastfeeding 187(69.8%) and had no other person with diarrhea at home 239 (89.2%). Only 1 child was going to a day care. The rest of the baseline characteristics are shown in table 1 below.

Table 1: Baseline characteristics of study participants

Characteristic	Frequency	Percentage
Child's age (months)		
≤12	177	66.0
>12	91	34.0
Sex		
Male	133	49.6
Female	135	50.4
Mother's age (years)		
≤ 20	57	21.3
21 – 30	164	61.2
>30	47	17.5
Mother's education		
None	32	11.9
Primary	112	41.8
Secondary	83	31.0
Tertiary	41	15.3
Duration of diarrhea (days)		
< 5	220	82.1
5 – 7	43	16.0
>7	5	1.9
Still breast feeding		
Yes	187	69.8
No	81	30.2
Exclusive BF duration		
<6	120	44.8
6	148	55.2
Rota Immunization		
None	12	4.5

Partial	55	20.5
Complete	106	39.6
Not sure	95	35.4
HIV status		
Negative	141	52.6
Exposed	27	10.1
Positive	3	1.1
un known	97	36.2
Other person with diarrhea at home		
Yes	29	10.8
No	239	89.2
Child in day care		
Yes	1	.4
No	267	99.6
Under-fives at home		
None	95	35.4
1-2	145	54.1
>2	28	10.4
Number of people at home		
<3	114	42.5
3-5	96	35.8
>5	58	21.6
Bread winner's occupation		
Peasant	119	44.4
Business	101	37.7
Formal employment	48	17.9
Water Source		
Tap	126	47.0
Borehole	56	20.9
Protected spring	46	17.2
Well	40	14.9
Drink Boiled water		
Yes	187	69.8
No	81	30.2

Toilet Type used		
Pit latrine	167	62.3
VIP Toilet	28	10.4
Mud and wattle	73	27.2

*BF=breast feeding, HIV=Human immunodeficiency syndrome VIP=ventilated improved pit latrine*Among the study participants with Rotavirus diarrhoea, majority had some dehydration 28(66.7%) while only 4.8% had severe dehydration.

Table 2: Dehydration status in children aged 3-24 months with Rota-virus diarrhea attending Fort Portal Regional Referral hospital

Dehydration status	Rota Positive
No Dehydration	12 (28.6%)
Some dehydration	28 (66.7%)
Severe dehydration	2 (4.8)
Total	42 (100.0)

DISCUSSION

Rotavirus diarrhea is one the leading causes of dehydration among all the diarrhea causing organisms. In the present study some dehydration and severe dehydration accounted for 71.5% of the participants with rotavirus gastroenteritis. This could be attributed to increased loss of water and electrolytes without adequate replacement [18]. Additionally, loss of appetite, vomiting and fever associated with rotavirus impairs replacement and worsens the fluid loss [24]. The study findings were lower than that observed in a cross sectional study in Bandung, Indonesia where some dehydration and severe dehydration contributed 82.8% [6]. This could be because the study participants were children ≤6 months of age who are highly susceptible to fluid loss. Thus the urgent need to intervene in infants with rotavirus diarrhea with zinc and ORS to prevent the progression to dehydration since over more than 1.5 million cases of rotavirus diarrhea become severe enough requiring admission and intravenous fluid management [10, 25,26].

CONCLUSION

The prevalence of Rota-virus diarrhea was low in the post Rota-virus vaccination period. Majority of the participants with rotavirus diarrhea had some dehydration.

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