ORIGINAL ARTICLE

Assessment of severity of acute gastroenteritis in the paediatric Pakistani population by Modified Vesikari Score

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Abstract

Objective: To assess the severity of acute gastroenteritis in paediatric population.

Methods: This observational cross-sectional study was conducted at 93 randomly selected outpatient centres with paediatric practice across Pakistan between July 2014 and January 2015, involving children between 3 to 48 months of age suffering from acute gastroenteritis. The severity of acute gastroenteritis was measured using Modified Vesikari Score. SPSS 18 was used for data analysis.

Results: There were 1,756subjects having a mean age of 18.6±12.0 months. There were 220(12.52%) children ?6 months out of whom 73(33%) were exclusively breastfed. Most children had moderate 1,041(59.3%) and severe 403(22.9%) acute gastroenteritis. Overall 1,401(79.8%) carers were females, of whom 1,080(77.1%) were mothers with a mean age of 29.7±6.7 years. Oral rehydration solution 1,357(77.3%), plain water 1,083(61.7%), antipyretics 783(44.6%) and anti-diarrhoeals 645(36.7%) were most common medicines administered at home by the carers. Mean duration between gastroenteritis onset and seeking consultation was 2.7±1.7 days. Most common treatment provided by physicians were oral rehydration solution 1,451(82.6%), antibiotic 1,294(73.7%) and probiotic 1,105(62.9%). Worsening of symptoms 1,152(65.6%) was the most common reason for seeking consultation.

Conclusion: Most children assessed with acute gastroenteritis showed moderate to severe disease symptoms.

Keywords: Acute gastroenteritis, Paediatric, Pakistan. (JPMA 68: 159; 2018)

Introduction

Acute gastroenteritis (AGE) is characterised by diarrhoea of rapid onset with or without vomiting and is a leading cause of mortality among children under five years of age throughout the world.[1-3] Globally, diarrhoea accounts for 19% of deaths in children under five years of age.[4] The burden of diarrhoeal disease is especially high in young children from low and middle-income countries, due to inadequate clean water and sanitation and the presence of nutritional risk factors.[5] Pakistan ranks fifth among the 15 developing countries that account for 73% of all under-five diarrhoeal deaths occurring worldwide.[4] Diarrhoea accounts for 10.8% of under-five mortality in Pakistan, making it a leading cause of death in this age group.[6]

Death from diarrhoea is preventable if timely and appropriate care is provided.[7] The ability of parents/careers to recognise the need for help and seek appropriate care can help in reducing child deaths in low- and middle-income countries.[7,8] Studies have shown that if care is sought early, diarrhoeal morbidity and mortality can be reduced considerably.[8]

The importance of AGE as one of the leading causes of global morbidity and mortality necessitates the community-based epidemiological studies to quantify the burden of diarrhoeal disease and guide appropriate healthcare interventions aimed at reducing diarrhoeal morbidity and mortality in children. For this, it is essential to quantify factors, such as severity of diarrhoea, critical to estimating the overall disease burden.[9] In a clinical setting, physicians need to interpret patient's complaints about altered stool habits and often have difficulty in deciding on the seriousness of complaints.[10] As physicians in Pakistan are required to rapidly assess the severity of diarrhoea because of high patient workload, they are likely to mislabel and miss-assess the severity of diarrhoea.

Hence, adequate measures to assess severity of diarrhoeal disease are important for both clinical use and outcomes of research.[10] However, there is limited consensus on how best to measure the severity of disease and the impact of therapeutic interventions in clinical trials.[11] The Modified Vesikari Score (MVS), a validated history/symptom-based scoring system, effectively measures the global severity of disease in a cohort of children with AGE and can be used by physicians to treat patients according to the World Health Organisation (WHO) Integrated Management of Childhood Illness (IMCI) dehydration treatment guidelines.[11,12] A rapid assessment tool such as the validated MVS based on symptomatology is useful for assessing the severity of AGE particularly in the local setting where patient load is high.

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However, there is a scarcity of studies measuring severity of diarrhoea among children in Pakistan using MVS. Therefore this study was conducted to assess the severity of AGE using MVS in children presenting in outpatient settings of general practitioners (GPs), internists and paediatricians. The secondary objectives were to document other key factors including the profile of the child and the career, therapies administered at home prior to consultation, duration between gastroenteritis onset and seeking consultation, reason(s) for seeking consultation and the therapies recommended by the physician on consultation.

Patients and Methods

The nationwide community-based study was conducted in rural and urban cities of Pakistan between July 2014 and January 2015, involving children between 3-48 months of age, presenting with AGE (diarrhoea and/or vomiting) in the outpatient setting. It was conducted in accordance with the principles laid down by the 18th World Medical Assembly, including all subsequent amendments, in accordance with the guidelines for Good Epidemiology Practice,[13] at individual outpatient clinics under ambulatory care settings. Written permission was sought from all investigators and written, signed, informed consent was taken from each patient's carer enrolled in the study by the investigators.

Participants were randomly selected by simple random sampling without replacement technique from a list of physicians in Sanofi Pakistan database comprising urban and rural GPs, internists and paediatricians. They participated in the study as per protocol after signing confidentiality and service agreements.

Patients visiting a medical practitioner for the first time were included in the study, subject to the career's willingness to sign data release consent form.

Children with persistent or chronic diarrhoea or those admitted to a hospital were excluded.

Patients were recruited within a period of two months from the date of 'first patient in' in a given centre, and each selected investigator contributed their first 20 patients who met the eligibility criteria.

The registry was a single-visit cross-sectional survey with no planned follow-up. Data was collected on pre-printed case record forms (CRFs) and included information on the profile of the child with AGE, measurement of AGE symptoms on MVS, profile of the primary career seeking treatment for AGE, therapies administered for AGE at home, reason for seeking consultation for current episode of AGE and treatment provided at the time of consultation.

Descriptive statistics was used to summarise the continuous variables as mean and standard deviation. The categorical variables such as a MVS of <7 meant mild AGE, a score between 7-10 indicated moderate AGE and a score ≥11 depicted severe AGE. It was assessed as categorical variable and reported as frequency and percentages.

The numerical extent of severity of AGE in Pakistani children remains unknown. Therefore, based on the assumption that 50% of children suffer from severe or moderate disease with 95% confidence level and 2.4% margin of error, the sample size required for the study was 1668. In order to account for missing information and misplaced forms, 1850 patients were deemed appropriate to address the research question.

The data collected on CRFs was forwarded for double entry by data punch operator and SPSS 18 was used for data analysis.

For primary and secondary analysis, all categorical variables were analysed as frequencies and percentages. Besides, 95% confidence interval (CI) continuous variables were reported as means with standard deviation (SD).

Results

The study involved 93 investigators; 66(71%) GPs, 22(23.6%) paediatricians, and 5(5.4%) internists.

Data was collected from 1,776 children, but 20(1.12%) were excluded because their actual age was not recorded, allowing for data on 1,756(98.8) children to be analysed, of whom 1,029(58.6%) were male and 727(41.4%) females.

The overall mean age, height, weight and rectal

Table-1: Baseline characteristics.

Baseline characteristics	N=1756	(%)
Age (months), mean (SD)	18.6 (12.0)	-
3 to 12	770	(43.8)
13 to 24	560	(31.9)
25 to 48	426	(24.3)
Sex		
Male	1029	(58.6)
Female	727	(41.4)
Number of siblings, mean (SD)	2.7 (1.7)	-
Ranking of child among siblings, mean (SD)	2.5 (1.5)	-
Rectal Temperature (°C), mean (SD)	38.5 (6.7)	-
Feeding practices		
Animal (Cow, buffalo or goat) milk	900	(51.3)
Breast milk3-24 months	854*	(64.2)
Independent diet	720	(41.0)
Formula milk	502	(28.6)
Others	369	(21.0)

Abbreviations: SD - standard deviation. All values indicate n (%) except wherever specified.
* There were 1330 children between 3-24 months (denominator).

Table-2: Measurement and assessment of severity of AGE symptoms on MVS.

AGE symptoms on MVS	Score	N=1756	(%)
Duration of diarrhoea in days			
0	0	19	(1.1)
1-4	1	1459	(83.1)
5	2	150	(8.5)
≥ 6	3	128	(7.3)
Number of diarrheal stools in last 24 hours			
0	0	12	(0.7)
1-3	1	493	(28.1)
4-5	2	696	(39.6)
≥ 6	3	555	(31.6)
Duration of vomiting (days)			
0	0	683	(38.8)
1	1	1001	(57.0)
2	2	45	(2.6)
≥ 3	3	27	(1.5)
Number of vomiting episodes in last 24 hours			
0	0	680	(38.7)
1	1	689	(39.2)
2-4	2	273	(15.5)
≥ 5	3	114	(6.5)
Fever/Temperature (rectal) (°C)			
<37.0	0	437	(24.9)
37.1 - 38.4	1	945	(53.8)
38.5 - 38.9	2	220	(12.5)
≥ 39.0	3	154	(8.8)
Health care provider visit			
Outpatient	2	1756	(100)
Treatment provided at this consultation			
None	0	225	(12.8)
Rehydration	1	1438	(81.9)
Hospitalization	2	93	(5.3)
AGE severity	**Score**	**N=1756**	**(%)**
Mild AGE	(<7)	311	(17.7)
Moderate AGE	(7-10)	1042	(59.3)
Severe AGE	(≥11)	403	(22.9)

Abbreviations: AGE - Acute Gastroenteritis; MVS - Modified Vesikari Score
All values indicate n (%)

Table-3: Profile of primary career.

Profile of primary career	N=1756	(%)
Mean age of carer (years)	29.7±6.7	-
Gender		
Male	354	(20.2)
Female	1402	(79.8)
Relationship to the child		
Mother	1354	(77.1)
Father	322	(18.9)
Siblings	4	(0.2)
Others	66	(3.8)
Educational level of career		
Primary	361	(20.6)
Middle	291	(16.6)
High	245	(14.0)
Intermediate	249	(14.2)
Graduate	253	(14.4)
Informal education	319	(18.2)
None	38	(2.2)
Occupation		
Skilled	234	(13.3)
Semi-skilled	477	(27.2)
Unskilled	1045	(59.5)

Abbreviations: SD - standard deviation
All values indicate n (%) except wherever specified.

Table-4: Source of AGE awareness.

Source of AGE awareness	N=1756	(%)
Personal experience	1075	(61.2)
Elderly relatives	901	(51.3)
Lady health visitor	312	(17.7)
None	153	(8.7)
Internet	85	(4.8)
Others	78	(4.4)
Doctor	29	(1.7)
Electronic media	31	(1.8)
Print media	9	(0.5)
Neighbor	2	(0.1)

Abbreviations: AGE - Acute Gastroenteritis
All values indicate n (%) except wherever specified.

temperature was 18.6±12.0 months, 59.4±24.0cm, 10.1±7.4kg and 38.5±6.7°C respectively. Mean number of siblings per child was 3.0±2.0. The patients in this study were on an average the third amongst siblings (Table-1).

There were 220(12.52%) children ≥6 months of age, of whom 73(33%) were exclusively breastfed.

Overall, 1,459(83.1%) children had diarrhoea for 1-4 days. Besides, 1,247(71%) children had suffered more than three episodes of diarrhoea during the last 24 hours. Besides, 1,001(57%) children had vomiting on the preceding day, while 685(39%) had one episode of vomiting in the last 24 hours prior to consultation. Also, 1,317(75%) children were reported with fever >37°C, whereas, 1,440(82%) required rehydration and 88(5%) needed hospitalisation. Of the total, 1,042 (59.3%) reported with moderate AGE, and 403(22.9%) with severe AGE (Table-2).

The overall mean age of the careers was 29.7±6.7 years, of whome 1,402(79.8%) were females and in 1,354(77.1%) cases the career was the child's mother. All careers, except 38(2.2%), had some level of education; 1,399(79.7%) had formal education, but 1045(59.5) were unskilled individuals (Table-3).

Table-5: Therapies and medications administered for AGE at home.

Therapies	N=1756	(%)
Fluids		
ORS (either home-based or commercial)	1357	77.3
Plain water	1084	61.7
Milk (breast feed/cow)	954	54.3
Herbal fluids (mint/gripe water)	292	16.6
Juices	273	15.5
Soft drink	243	13.8
Soups	89	5.1
Others	70	3.9
Foods		
Khichdi	846/1536	55.1
Banana	816/1536	53.1
Yogurt	710/1536	46.2
Others	61/1536	3.9
Medications	**N**	**(%)**
Antipyretic	783	44.6
Antidiarrhoeal	645	36.7
Antiemetic	462	26.3
Antibiotic	419	23.8
Antiparasitic	167	9.5
Probiotic	127	7.2
Antispasmodic	97	5.5
Others	13	0.7
Herbal	10	0.6
Vitamins	1	0.1
Zinc	2	0.1

Abbreviations: AGE - Acute Gastroenteritis; ORS - Oral rehydration solution.

Past personal experience 1,075(61.2%) and information from older relatives 901(51.3%) were the major sources of AGE awareness (Table-4).

A wide array of fluids was administered at home prior to consultation. The most commonly used were oral rehydration solution (ORS) 1,357(77.3%) and plain water 1,084(61.7%). Out of the 1,536(87.47%) children above 6 months of age, over half 846(55.1%) were given Khichdi (mixture of cooked lentils and rice), while 816(53.1%) and 710(46.2%) were given banana and yogurt respectively. Antipyretics 783(44.6%) and anti-diarrhoeals 645(36.7%) were the two most common medicines administered at home. Only 127(7.2%) children were given a probiotic prior to consultation (Table-5).

The mean duration between gastroenteritis onset and seeking consultation was 2.7±1.7 days.

The most common treatment administered by physicians was ORS 1,450(82.6%) and antibiotic 1,295(73.7%). Probiotics were prescribed to 1,105(62.9%) children. Zinc was prescribed to only 154(8.7%) (Table-6).

Table-6: Treatment provided at the time of consultation.

Medications	N=1756	(%)
ORS	1450	(82.3)
Antibiotic	1295	(73.7)
Probiotic	1104	(62.9)
Antipyretic	853	(48.6)
I/V fluids	636	(36.2)
Antiemetic	527	(30.0)
Antidiarrhoeal	486	(27.7)
Antiparasitic	222	(12.6)
Zinc	154	(8.7)
Antispasmodic	91	(5.2)
Others	19	(1.1)

Abbreviations: ORS - Oral rehydration solution; I/V - intravenous.

Among the 403(22.9%) severe cases of AGE, intravenous (IV) fluids were administered to 286(71%) children. Besides, 562(32%) children with moderate AGE, of whom 382(68%) had vomiting, were administered IV fluids at the time of consultation.

The most common reason for seeking consultation was worsening of symptoms 1,152(65.6%). Besides, 920(52.4%) careers sought consultation because they failed to observe an adequate response to therapies initiated at home prior to consultation.

Discussion

This national, cross-sectional, multi-centre disease registry showed that of the total 1,756 children included, most suffered from moderate and severe AGE. Most careers were females (in most cases the child's mother) with a mean age of 29.7 years. At home, ORS and plain water, and antipyretics and anti-diarrhoeals were the most commonly administered fluids and medicines respectively. The most common treatments provided by physicians were ORS, antibiotics and probiotics. The mean duration between gastroenteritis onset and seeking consultation was 2.7 days. Worsening of symptoms was the most common reason for seeking consultation.

The global burden of diarrhoea necessitates the classification of data into mild, moderate and severe episodes, to assist formulation of global policies and planning of interventions.[9] As seen in our study, most children in primary care settings in Pakistan report with moderate (59.3%) and severe (22.9%) AGE. Likewise, a systematic review of severity of diarrhoea in children from low- and middle-income countries shows that moderate and severe episodes constitute a sizeable proportion (35.2%; about 588 million episodes) of the total envelope of diarrhoea among children under-five.[9] In another

case-control study of moderate-to-severe diarrhoea in seven developing countries, including Pakistan, 15.4% of children had diarrhoea for at least 1 day during the preceding 2 weeks, of which 74.2% presented with moderate-to-severe diarrhoea.[14] However, considering that recognition and care-seeking for diarrhoea in children below five is generally poor in developing countries,[8] it is likely that the burden of moderate and severe episodes (calculated using the proportion of episodes for which care is sought) is underestimated.

Our study shows that the mean duration between gastroenteritis onset and seeking consultation is 2.7 days. Another study in Karachi reported that nearly two-third (69%) of mothers visit a doctor after two days on average, while 4% never visit the doctor for their child's illness.[15] As seen in our study, majority of the carers are females and in most cases the carer is the child's mother. While in this study all carers (except 2.2%) had some level of education, with 79.8% having formal education. However, a cross-sectional study in a paediatric ward and OPD in Civil Hospital of Karachi during July-August 2013 showed that more than half (62.5%) of the mothers were illiterate, majority (54%) of them had poor knowledge about diarrhoea, 40% did not know the signs of dehydration, and 39.4% mothers followed poor practices when their children suffered from diarrhoea.[15] The most common reason for seeking consultation in 65.6% of children was worsening of symptoms. Over half (52.4%) of the carers seek consultation because they fail to observe an adequate response to therapies initiated at home prior to consultation. A demographic surveillance study in three contiguous low-income communities approximately 20 km outside Karachi in 2013 showed lack of transport (13.3%), lack of childcare for other children (9.4%), heavy rains or flooding (9.2%), high cost of therapy (7.6%) as some of the reasons for not seeking care.[7] Other studies show that financial issues (23.5%), self-medication (6.5%), transport issues (5%), and domestic remedy (65%) are some of the reasons for not visiting physicians.[15] These results highlight the need for carer education in Pakistan to promote appropriate and timely care-seeking practices, considering that early intervention can reduce severity of dehydration.[16]

Severe dehydration with hypovolemia requires the prompt restoration of intravascular volume through the intravenous administration of fluids and/followed by oral rehydration therapy (ORT).[17] Among children with severe AGE on MVS, 29% do not receive IV fluids exposing them to further risk of severe dehydration and possible death. However, a wide array of fluids like ORS (77.3 %) and plain water (61.7%) is administered at home prior to consultation. Children above 6 months of age are given Khichdi (55.1%), banana (53.1%) and yogurt (46.2%) respectively. The results are similar to another cross-sectional study in Pakistan that show Khichdi (12.5%), ORS (10%), both Khichdi and ORS (6%) and other diet like banana, porridge (71.5%) as the most common diet preference administered at home.[15]

The European Society for Paediatric Gastroenterology, Hepatology and Nutrition and European Society of Paediatric Infectious Diseases (ESPGHAN/ESPID), and the National Institute for Health and Clinical Excellence (NICE) guidelines recommend ORT with early resumption of feeding after rehydration therapy, and continuation of breastfeeding throughout rehydration.[18,19] Studies have shown that despite being introduced over forty years ago, the use of ORT remains disappointingly low in Asia (34.0%).[8] In contrast, our study shows that ORS (82.6%) is the most common treatment provided by the physician, which is higher than that observed (40.8%) in an earlier cross-sectional study conducted in the low-income peri-urban settlements of Karachi.[7] However, the percentage of exclusive breast feeding in children $\leq$ 6 months is low (33%). Both ESPGHAN/ESPID as well as NICE treatment guidelines recommend against the routine use of antibiotics and anti-emetics, while the ESPGHAN/ESPID guidelines strongly recommend the use of probiotics for the management of AGE.[17,18] Our study shows that as per treatment guidelines, probiotics are given to 62.9% patients. However, antibiotics (which are not recommended) are one of the most commonly administered treatments (73.7%), and anti-emetics were given to 48.6% patients, which is not in line with treatment guidelines. Also as seen in this study, physicians are not a source of information on health education. In contrast, cross-sectional studies conducted in other countries show that physicians, health centre, educational programmes and personal reading are major sources of knowledge about diarrhoeal disease.[20,21]

This multi-centre, disease registry presents vital data from primary care settings that represent a good mix of urban and rural areas of Pakistan, and hence the results may be applicable to primary care settings across Pakistan. In addition to assessing the severity of AGE, the study also explores other key factors like the profile of the carer and the duration between gastroenteritis onset and seeking consultation, which provide an insight into the existing scenario/ situation, and can form the basis for policy recommendations and future healthcare interventions. Further, the results are limited to children presenting in outpatient settings and may not be applicable to the situation in the community or to children who are directly taken to secondary and tertiary hospitals.

Conclusion

This study shows that majority of children with AGE presenting in primary care settings in Pakistan suffer from moderate and severe AGE. Most carers use ORS for the correction and prevention of dehydration at home, though

this practice was not universal. Despite breastfeeding being recommended in diarrhoea, exclusive breast feeding rate was low and treatment guidelines are not strictly adhered to by the carers. Targeted interventions such as carer education to improve care-seeking behaviours and promote breastfeeding, and physician education to promote adherence to treatment guidelines can go a long way in reducing the outpatient morbidity and economic burden associated with AGE.

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