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Diarrhoea and Comorbidities Seen at University of Port Harcourt Teaching Hospital, Nigeria

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Authors' contributions

This work was carried out in collaboration between both authors. Authors LEYI and BAAH designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author BAAH managed the analysis of the study and literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

Background: Diarrhoea illnesses continue to cause major sickness and death in children in developing countries. They often occur simultaneously in association with other illnesses as comorbidities, especially in children under five years of age. There is a dearth of literature on these comorbidities.
Objective: To evaluate the pattern of diarrhoea and associated comorbidities in children with diarrhoea diseases at the University of Port Harcourt Teaching Hospital, Nigeria.
Methods: This was a descriptive, retrospective cross sectional study carried out in the Department of Paediatrics, University of Port Harcourt Teaching Hospital, between January 2011 to December 2014. The case notes of all children with diarrhoea who presented to the Diarrhoea Training Unit (DTU) and children's emergency ward were retrieved and studied. Information sought included the biodata, type of diarrhoea, presence and level of dehydration, year and month of presentation, outcome of illness and comorbidities.
Results: There were 394 subjects, males were 215(54.6%), females 179(45.4%). Their ages ranged from 1 month to 168 months, mean age 17.1±2.8 months. Acute watery diarrhoea was the most common type 321 (81.47%), followed by dysentery 47 (11.93%). Two hundred and thirty nine

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(60.7%) patients had no dehydration, 37 (9.46%) mild dehydration, 107 (27.2%) moderate dehydration and 11 (2.8%) severe dehydration. Malaria was the most common comorbidity 66 (16.8%), followed by tonsillitis 65(16%) and pneumonia 45 (11.4%). Two hundred and eighteen (55.3%) were discharged following treatment and 14 (3.6%) died.
Conclusion: The commonest type of diarrhoea found was acute watery diarrhoea and malaria was the most frequent comorbidity found.

Keywords: Diarrhoea; comorbidities; children; outcome.

1. INTRODUCTION

Diarrhoea has continued to be an endemic disease of the tropics and subtropics. Children less than 5years of age are most commonly affected in developing countries. Early childhood is faced with on the average 2.9 occurrences of diarrhoea annually and it is worse among children six to eighteen months [1]. Children less than 2 years of age also have repeated episodes of upper respiratory tract infections, one out of every 5 children annually will have an established case of pneumonia [2]. Diarrhoea and pneumonia continue to be major reasons of death and sicknesses in children less than five years of age in developing countries [2]. Deadly diseases in young children in under-developed countries are commonly branded by the simultaneous happening of over one illness— a conditioned termed comorbidity [3]. Considering that this term applies to many of the developing countries, it may be feasible to prevent many of these mortalities using interventions targeted at one or the other. Since comorbidity in young children is rampant, this might change the grading of diverse community health strategies with respect to the amount of children that could be protected from death. Regrettably, it is tough to measure the accurate extent of comorbidity in illness in young children as there is a dearth of literature on comorbidity in children. This study therefore aimed at evaluating the pattern of diarrhoea and associated comorbidities in children with diarrhoea diseases at the University of Port Harcourt Teaching Hospital.

2. MATERIALS AND METHODS

This was a descriptive cross-sectional retrospective study carried out in the Department of Paediatrics, University of Port Harcourt Teaching Hospital (UPTH) over a period of three years from 2011-2014. The hospital numbers and names of all children managed for diarrhoea within the study period were retrieved from the nurses' records in DTU and children's emergency ward. The records were highly underreported as there were a lot of industrial actions during this period resulting in disruptions in clinical work.

Patients' case notes were retrieved using their hospital numbers and names. Information sought included biodata, type of diarrhoea, level of dehydration, month and year of presentation, type of comorbidities and outcome. Diarrhoea was defined here as passage of three or more loose stools in a 24 hour period. A loose stool being one that takes the shape of the container in which it is put. Data was entered into Microsoft excel spread sheet and analysed using Epi-info version 7.

3. RESULTS

There were 394 subjects, 215 (54.6%) were males and 179 (45.4%) females, with male to female ratio of 1.2: 1. Their ages ranged from 1month to 168 months, with mean age of 17.1±2.8 months. Their age category was as follows: 1 -11 months 249 (63.2%); 12 -59 months 123 (39.2%); ≥60 months 22 (5.6%). Two hundred and fifty-one (63.7%) patients were seen in 2012, 99 (25.1%) in 2013 and 44 (11.2%) in 2014.

Fig. 1 shows the distribution of diarrhoea amongst the patients. Acute watery diarrhoea was the commonest type of diarrhoea (81.47%, 321/394) recorded amongst the patients. Their mean ages at presentation were 2.16±1.33 months for acute diarrhoea, 2.2±0.70 months for persistent diarrhoea, 1.51±0.75 months for dysentery and 2.0±0.01 months for chronic diarrhoea and this was statistically significant (p=0.01). Table 1 shows the association between type of diarrhoea and year at presentation. Acute watery diarrhoea was the commonest type of diarrhoea in 2012 (85.70%, 215/251), 2013 (75.80%, 75/99) and 2014 (70.50%, 31/44). There was persistent decline in the frequency of acute watery diarrhoea and dysentery over the years. This was statistically significant (x^2=32.01, p=0.00). Two hundred and thirty nine (60.7%)

patients had no dehydration, 37 (9.4%) had mild dehydration, 107 (27.2%) had moderate dehydration and 11 (2.8%) had severe dehydration.

Table 2 shows the association between age group and degree of dehydration with type of diarrhoea. The age group 1 month to11 months had the highest proportion of those with acute watery diarrhoea 65.1% (209/321), persistent diarrhoea 55.00% (11/20) and dysentery 53.3% (26/47). This was not statistically significant (x^2=7.97, p=0.24). Majority of those with acute watery diarrhoea (60.40%, 194/321), persistent diarrhoea (70.00%, 14/20), dysentery (55.30%, 26/47) and chronic diarrhoea (83.30%, 5/6) had no dehydration. This is statistically significant (x^2=119.77, p=0.00).

Table 3 shows that Malaria was the most common comorbidity 66 (16.8%), followed by tonsillitis 65 (16.06%) and pneumonia 45 (11.42%). Two hundred and eighteen (55.3%) patients were discharged, 87 (22.1%) were transferred to the ward for further management, 14(3.6%) died, the parents of 9 (2.3%) patients signed against medical advice, 1 (0.3%) absconded and 87 (22.1%) had no recorded outcome.

Table 4 shows that majority of those who died had acute watery diarrhoea. These observations were not statistically significant (x^2=16.45, p=0.353). Majority of those who died (64.30%, 9/14) had no dehydration. This was statistically significant (x^2=119.77, p=0.00).

Table 5 shows the association between diarrhoea comorbidities and outcome. Majority of those who died (57.10%, 8/14) had no comorbidity. This was statistically significant (x^2=281.50, p=0.000).

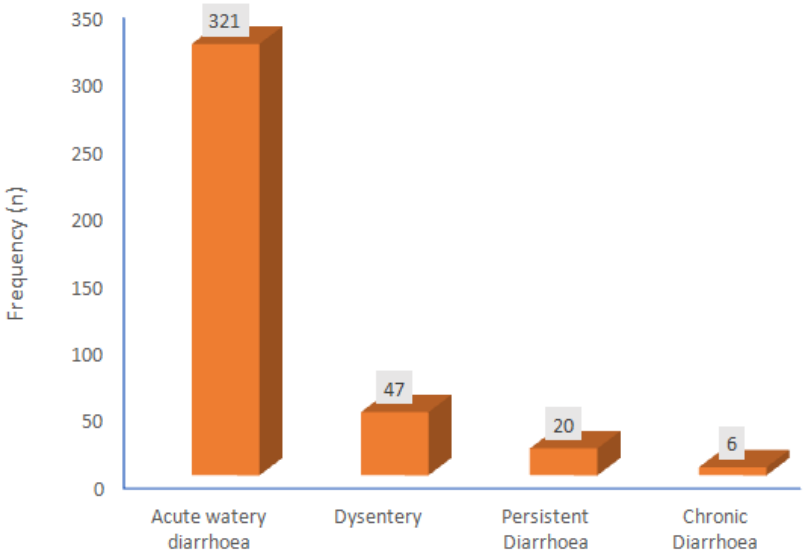

Fig. 1. Types of Diarrhoea

Table 1. Association between types of Diarrhoea and year of presentation

Diarrhoea	2012 n (%)	2013 n (%)	2014 n (%)	Chi-Square (p-value)
Acute watery diarrhoea	215 (85.70)	75(75.80)	31(70.50)	32.01(0.00)*
Persistent Diarrhoea	6 (2.40)	8 (8.10)	6(13.60)	
Dysentery	30 (12.00)	10 (10.10)	7(15.90)	
Chronic diarrhoea	0 (0.00)	6 (6.10)	0 (0.00)	
Total	**251(100.00)**	**99(100.00)**	**44(100.00)**	

**Distribution is statistically significant (p < 0.05)*
***Distribution is not statistically significant (p > 0.05)*

Table 2. Association between age groups and type of Diarrhea

Age groups	Acute watery diarrhoea n (%)	Persistent Diarrhoea n (%)	Dysentery n (%)	Chronic Diarrhoea n (%)	Chi-square (p-value)
1-11 months	209(65.10)	11(55.00)	26(53.30)	3(50.00)	7.97(0.24)**
12-59 months	93(29.00)	8(40.0)	19(40.40)	3(50.00)	
Above 60 months	19(5.90)	1(5.00)	2 (4.30)	0(0.00)	
Total	**321(100.00)**	**20(100.00)**	**47(100.00)**	**47(100.00)**	
Dehydration					
None	194 **(**60.40**)**	14 (70.00)	26 (55.30)	5 (83.30)	119.77
Mild	30 (9.30)	1 (5.00)	5 (10.60)	1 (16.70)	(0.00)*
Moderate	89 (27.70)	4 (20.00)	14 (29.80)	0 (0.00)	
Severe	8 (2.50)	1 (5.00)	2 (4.30)	0 (0.00)	
Total	**321 (100.00)**	**20 (100.00)**	**47 (100.00**	**6 (100.00)**	

**Distribution is statistically significant (p < 0.05)*
***Distribution is not statistically significant (p > 0.05)*

Table 3. Diarrhoea comorbidities

Comorbidities	Frequencies	Percentages
None	98	24.87
Malaria	66	16.80
Tonsillitis	63	16.06
Pneumonia	45	11.42
HIV/AIDS	33	8.38
Septicaemia	17	4.31
Malnutrition	16	4.06
Meningitis	7	1.78
Acute renal failure	6	1.52
Haemolytic uremic syndrome	5	1.27
Others	38	9.64
Total	394	100

4. DISCUSSION

We observed a slight male preponderance in the incidence of diarrhoea, which is similar to the reports of Getachew et al. [4], Ucheh et al. [5] and Tornheim et al. [6] but contrasts with the report of Siziya et al. [7] who found an equal incidence of diarrhoea in both sexes. The male preponderance found in our study may be explained by the fact that perhaps males are more likely to explore unsanitary surroundings more than females [7] or by the fact that males are generally more susceptible to diseases compared to females [8]. However, it is also possible that it may have to do with discriminate care seeking for the males [9]. Whichever it is, this gender difference in the incidence of diarrhoea may need to be further explored for the benefit of interventions.

We found a higher incidence of diarrhoea amongst the age group 1 to 11 months, supporting the report of Ahmed et al. [10] who found a high incidence of diarrhoea among the 6 to 11 months age group and Getachew et al. [4] who found higher incidence among children less than 1 year. The high incidence of diarrhoea amongst infants in this study may be related to the declining levels of maternally acquired antibodies, lack of active immunity in infancy, ingestion of contaminated feeds during weaning and the introduction of contaminated objects into the mouth while crawling [4,11]. We further observed that the incidence of diarrhoea decreased as age increased. This observation has also been made by other researchers [12,10]. The decrease in frequency of diarrhoea with age may be related to the maturation of the immune system with age and improvement in active immunity.

Table 4. Association of type of Diarrhoea and degree of dehydration with outcome

Type of Diarrhoea	Discharge	SAMA	Died	Absconded	Transferred	NA	Chi-Square (p-value)
Acute watery diarrhoea	179 (82.10)	9(100.00)	13(92.90)	1(100.00)	68(78.20)	51(78.50)	16.45 (0.353)**
Persistent Diarrhoea	12(5.50)	0(0.00)	0(0.00)	0(0.00)	5(5.70)	3(4.60)	
Chronic Diarrhoea	2(0.90)	0(0.00)	0(0.00)	0(0.00)	0(0.00)	4(6.20)	
Dysentery	25(11.50)	0(0.00)	1(7.10)	0(0.00)	14(16.10)	7 (10.80%)	
Total	**218(100.00)**	**9(100.00)**	**14(100.00)**	**1(100.00)**	**87(100.00)**	**65(100.00)**	
			Dehydration				119.77 (0.00)*
None	170(78.00)	6(66.70)	9 (64.30	0 (0.00)	19 (21.80)	**35 (53.80**	
Mild	22 (10.10)	0 (0.00)	0 (0.00)	1 (100.00)	9 (10.30)	5 (7.70)	
Moderate	25 (11.50)	3(33.30)	3 (21.40	0 (0.00)	53 (60.90)	23(35.40)	
Severe	1 (0.50)	0 (0.00)	2 (14.30	0 (0.00)	5 (6.90)	2 (3.10)	
Total	**218 (100.00)**	**9 (100)**	**14 (100)**	1 (100.00)	**87 (100.00)**	**65(100.00)**	

**Distribution is statistically significant (p < 0.05)*
***Distribution is not statistically significant (p > 0.05)*

Table 5. Association between comorbidities and outcome

Comorbidities	NA	Discharge	SAMA	Died	Absconded	Transferred	Chi-square (p-value)
Malaria	5	28	0	2	0	0	281.50 (0.0001)*
	7.70%	12.80%	0.00%	14.30%	0.00%	0.00%	
Pneumonia	4	5	0	0	0	0	
	6.20%	2.30%	0.00%	0.00%	0.00%	0.00%	
Tonsillitis	5	4	1	0	0	1	
	7.70%	1.80%	11.10%	0.00%	0.00%	1.10%	
RVD	1	2	1	0	0	0	
	1.50%	0.90%	11.10%	0.00%	0.00%	0.00%	
Meningitis	0	3	0	0	0	0	
	0.00%	1.40%	0.00%	0.00%	0.00%	0.00%	
Malnutrition	1	5	0	0	0	1	
	1.50%	2.30%	0.00%	0.00%	0.00%	1.10%	
Measles	0	1	0	0	0	0	
	0.00%	0.50%	0.00%	0.00%	0.00%	0.00%	

Comorbidities	NA	Discharge	SAMA	Died	Absconded	Transferred	Chi-square (p-value)
Scabies	0	1	0	0	0	0	
	0.00%	0.50%	0.00%	0.00%	0.00%	0.00%	
Septicaemia	0	0	0	1	0	0	
	0.00%	0.00%	0.00%	7.10%	0.00%	0.00%	
Anaemia	0	4	0	1	0	2	
	0.00%	1.80%	0.00%	7.10%	0.00%	2.30%	
PTB	1	1	0	1	0	0	
	1.50%	0.50%	0.00%	7.10%	0.00%	0.00%	
SCD	0	1	0	0	0	0	
	0.00%	0.50%	0.00%	0.00%	0.00%	0.00%	
ARF	0	1	0	0	0	0	
	0.00%	0.50%	0.00%	0.00%	0.00%	0.00%	
ACHD	0	1	0	1	0	0	
	0.00%	0.50%	0.00%	7.10%	0.00%	0.00%	
Food Poisoning	0	1	0	0	0	2	
	0.00%	0.50%	0.00%	0.00%	0.00%	2.30%	
Electrolyte imbalance	0	1	0	0	0	2	
	0.00%	0.50%	0.00%	0.00%	0.00%	2.30%	
Persistent Vomiting	0	0	0	0	0	1	
	0.00%	0.00%	0.00%	0.00%	0.00%	1.10%	
Conjunctivitis	0	1	0	0	0	0	
	0.00%	0.50%	0.00%	0.00%	0.00%	0.00%	
None	48	158	7	8	1	78	
	73.80%	72.50%	77.80%	57.10%	100.00%	89.70%	
Total	**65**	**218**	**9**	**14**	**1**	**87**	
	100.00%	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	

Several studies [13,14] have reported a fluctuating trend in the incidence of diarrhoea with periods of decreasing and increasing incidence. We found a persistent decline in the incidence of diarrhoea from 251 (63.7%) cases seen in 2012 to 44 (11.2%) cases seen in 2014. This decline could be attributable to improvement in measures which reduce feco-oral transmission of diarrhoeal pathogens such as improvement in caregivers hand hygiene, water and sanitation [15]. It may also be as a result of improvement in breastfeeding, especially exclusive breastfeeding and vaccination against Rota virus, and measles [15]. Health talks during ante natal care and other hospital visits may have contributed significantly to the improved care givers knowledge of home management of diarrhoea. However, these factors were not explored in this study.

Acute watery diarrhoea made up more than four fifth of the diarrhoea cases seen (Fig. 1), making it the most common type of diarrhoea in our study. This is similar to the 97.8% of watery diarrhoea reported by Asamoah et al. [16], though in their study, acute watery diarrhoea and persistent diarrhoea were lumped together as watery diarrhoea. The study also showed that acute watery diarrhoea was the commonest in all the years under review and the decline in the incidence of diarrhoea in our study was actually brought about by steady decline in the incidence of acute watery diarrhoea (Table 1).

We equally observed that majority (60.7%) of the diarrhoea patients had no dehydration, despite the fact that acute watery diarrhoea (the most common type of diarrhoea in our study) is known to cause massive fluid loss with the diarrhoea stool [17]. Perhaps adequate fluid replacement at home by caregivers was responsible for this. Only 2.8% of the patients had severe dehydration, contrasting with the 24% rate of severe dehydration found by Andrews et al. [18] among hospitalized patients with diarrhoeal diseases in Bangladesh. The reason behind this difference in observation is that the Bangladesh study involved both children and adults and majority of them had culture proven cholera, hence the high level of dehydration found in their study [18].

A comorbidity is described as “any distinct additional clinical entity that has coexisted or that may occur during the clinical course of a patient who has the index disease under study” [19,20]. The commonest comorbidity found in this study was malaria (16.8%), followed by tonsillitis (16.08%) and pneumonia (11.42%) (Table 3). Different theories have been used to explain the existence of comorbidity. The first is the theory of shared risk factor. The coexistence of pneumonia and diarrhoea revealed in this study may be as a result of the presence of a risk factor common to both diseases, which is young age. The peak incidence rates for both diseases occur in infancy [19,21]. The other explanation is that malaria may have increased the risk of diarrhoea by suppressing host resistance to bacterial or viral pathogens [19]. Other studies have also reported the existence of comorbidities [19,20]. This issue of comorbidity was what informed the development of the Integrated Management of Childhood Illness Strategy to reduce under five mortality, especially in countries with very high under five deaths [22]. It became obvious that children are brought to the health facilities with more than one ailment and may require multiple diagnosis. The strategy addresses the various conditions which put a child at risk and provides combined treatment for the major childhood illnesses [22].

We observed very low mortality rate (3.6%) in this study and majority (92.90%) of those who died had acute watery diarrhoea (Table 4). The commonest cause of death in acute watery diarrhoea is dehydration [22], surprisingly, majority (64.30%) of those who died were not dehydrated (Table 4). Interestingly also is the fact that majority of those who died had no comorbidity (Table 5). The authors have no possible explanation for these observations

5. CONCLUSION

In conclusion, the age group 1 -11 months had the highest incidence of diarrhoea in this study. The commonest type of diarrhoea found was acute watery diarrhoea. Majority of patients with diarrhoea were not dehydrated. Malaria was the most frequent comorbidity found. The study recorded very low mortality rate.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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