

Prevalence and Correlates of Infectious Diarrhoea in Adults at Livingstone University Teaching Hospital, Zambia

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Abstract

Diarrhoea – defined as loose or watery stools for more than three times per day, is a common clinical problem. Worldwide, diseases causing infectious diarrhoea remain a major public health threat. Infectious diarrhoea in adults has been a major concern in developing countries, including Zambia. No study was conducted so far to estimate the infectious diarrhoeal load in the southern province of Zambia. Hence, the study aimed to determine the prevalence and factors associated with infectious diarrhoea in adults at Livingstone University Teaching Hospital.

This cross-section study was conducted from January 2019 to December 2020 using a structured data collection tool and random sampling technique to select participants for the research.

Of the 4,977 participants that were recorded, 7.9% reported having episodes of diarrhoea. The prevalence of diarrhoea was significantly more in females (55.2%) compared to males (44.8%). Additionally, a slightly high prevalence of patients with diarrhoea did not know their HIV status (35.9%), and more of these patients were from the rural areas (52.7%), and a significantly higher prevalence had no other underlying medical conditions (81.2%).

This study concluded that diarrheal diseases are significantly prevalent among adult patients reporting at Livingstone University Teaching Hospital. Age was highly associated with infectious diarrhoea.

Keywords: Infectious Diarrhoea, Prevalence, Livingstone

List of abbreviations:

UNICEF- United Nations International Children Emergency Fund

HIV- Human Immunodeficiency Virus

AIDS- Acquired immunodeficiency syndrome

ART/HAART- Antiretroviral therapy/ highly active antiretroviral therapy

Tb- Tuberculosis

IQR- Inter-quartile range

N/A- Not applicable

CI- Confidence interval

R- Reference

PIs- Protease inhibitors

NRTIs- Nucleoside reverse transcriptase

Introduction

Diarrhoea is defined as having loose or watery stools at least three times per day, or more frequently than normal for an individual¹

In Sub-Saharan Africa, infectious diarrhoea is related with poor financial conditions, for example, lacking access to safe water and sanitation, unhygienic practises and hazardous human waste transfer. Infectious diarrhoea can be caused by certain microbes, like rotavirus, Salmonella spp., Shigella spp., enteropathogenic Escherichia coli (EPEC), entero-aggregative E. coli (EAEC) and Vibrio cholera. Worldwide, infectious diarrhoea remain a major public health threat with nearly 1.7 billion cases per year, occurring in all ages² and over a million deaths – most of them in (90%) in Sub-Saharan Africa³.

Mortality due to infectious diarrhoea is about three times greater in adults than in children⁴. However, there is less research done on adult diarrhoea. This is due to the fact that diarrhoea in adults is mostly curable and diarrhoeal mortality is to a great extent avoidable and therefore endeavours to diminish the diseases that cause diarrhoea are desperately required⁴.

Infectious diarrhoea is among the top ten major causes of morbidity in Zambia⁵. Yet there have been few studies conducted so far on this topic. Moreover, there is no study conducted so far in the southern province of Zambia to estimate the burden of infectious diarrhoea and hence this study was undertaken in the Livingstone University Teaching Hospital.

This study explored the burden and factors associated with diarrhoea among adults at Livingstone University Teaching Hospital. The information that is generated in this research will be useful in adding up the knowledge about infectious diarrhoea in Zambia and to know its causes, and may also help in understanding the magnitude of infectious diarrhoea in Zambia and other parts of the world.

The aim of this study is to assess the prevalence and correlation of diarrhoea, to estimate the proportion of diarrhoea, and also to determine the risk factors associated with diarrhoea, in adults at Livingstone University Teaching Hospital, Zambia,

Methodology

The study was conducted at Livingstone University Teaching Hospital, Southern province, Zambia. Livingstone University Teaching Hospital is the largest hospital located within the city of Livingstone, and it is the largest hospital in the Southern province and a referral centre from other district within and outside Southern Province.

This was a cross-section study which was conducted from January 2019 to December 2020 at Livingstone University Teaching Hospital.

The study population were adults visiting Livingstone University Teaching Hospital.

Eligibility criteria

Inclusion criteria: All adults above the age of 18 years seeking medical treatment at Livingstone University Teaching Hospital.

Exclusion criteria: Adults having drug induced diarrhoea.

Sample size formula:

$$\text{Finite population: } n' = \frac{n}{1 + \frac{z^2 \times \hat{p}(1-\hat{p})}{\epsilon^2 N}}$$

Sample Size calculated

Confidence	Sample Size
95%	384

Margin of error 5%

Selection of participants sampling methods

Individuals were selected using random sampling method in order to calculate the prevalence of diarrhoea at Livingstone University Teaching Hospital. The number of patients that was recorded was 4,977.

Study variables

The research included both dependent and also independent variables. The dependent variable of this study was diarrhoeal diseases. The independent variables include; sex, age and residence, HIV, ART, Tb, other underlying medical condition, and medications.

Consider the variables of interest in the table below;

Variable	Scale	Variable outcome
Diarrhoea	Categorical	Dependent
Sex	Categorical	independent
Age	Categorical	Dependent
residence	Categorical	independent
HIV	Categorical	independent
ART	Categorical	Independent
Tb	Categorical	independent
Underlying medical condition	Categorical	independent
Medications	Categorical	independent

Data collection and tools

To determine the prevalence of diarrhoea, a structured data collection tool was used. In this study, secondary data sources were used to gather the possible information for the research.

Tool	Response
Sex?	M (), F ()
Age?	
Residence?	
Do you have diarrhoea?	Yes (), No ()
Is it infectious diarrhoea?	Yes (), No ()
Other underlying medical condition?	Yes (), No ()

	If yes, what?
Patient medications?	Yes (), no () If yes, specify?

Data management and storage

Data was tabulated in an MS Excel sheet to store all the necessary information that was gathered during the survey for future use and references. The data was encrypted and locked in secure digital folder to protect the identity of the participants.

Data analysis

The stored information from excel was then exported to Strata 12 for analysis. Descriptive statistics were used to understand the distribution of the data. The Chi-square was used to calculate categorical variables. Logistic regression, both invariable and multivariable was used to determine the factors associated with diarrheal diseases. Both 95% confidence interval and a 5% level of significance were used to ascertain the statistical difference.

Ethical consideration

The study was referred to Mulungushi University School of Medicine and Health Sciences Research Ethics committee for approval. Permission was sought from Livingstone University Teaching Hospital Management which was the proposed site of study for full access to the information that was required for the research.

Results

Basic characteristics of the study participants

The study comprised 4,977 participants of whom 2,639 (53.0%) were females and 2,338 (47.0%) were males and the median age was 38 years (IQR, 28, 52). About 393 (7.9%) patients presented with infectious diarrhoea and the majority of them had no diarrhoea (92.1%). See table 1.

Table1 shows the demographic and clinical characteristics of the study participants.

Variable	Median (IQR)	Frequency	Percentage (%)
Age (yrs)	38 (28,52)		
Sex			
Male		2,338	46.98
Female		2,639	53.02
Diarrhoea			
Yes		393	7.9
No		4,584	92.1
Underlying medical conditions			
HIV status			
Negative		1,897	38.12

Positive		1,110	22.3
Unknown		1,970	39.58
On ART			
No		41	0.82
Yes		1,077	21.64
N/A		3,859	77.54
Tb infection			
No		4,877	97.99
Yes		100	2.01
Other conditions			
No		319	6.41
Yes		73	1.47
N/A		4,585	92.12
Residence			
High cost		1,924	38.67
Low cost		2,667	53.6
Outside town		375	7.54
Outside country		10	0.2

Relationship between diarrhoea the and demographic factors and clinical factors

Participants with diarrhoea were slightly younger compared with those who had no diarrhoea (median age 37 yrs versus 39 yrs, with statistical difference $p=0.0085$). The majority of cases were observed in patients whose HIV status was unknown compared to those who were HIV positive and those who were negative (35.9% versus 32.3% and 31.8%, $p=0.000$). A significant number of patients whose status were not applicable to ART status were more compared to those who were on ART and those who were not on ART (67.7% versus 30.8% and 1.5%, $p=0.000$). Based on residence, a lot of cases were seen in those who came from low cost areas compared to those who came from high cost areas and those outside town and outside the country (52.7% versus 43.0%, 4.1% and 0.3%, $p=0.029$). A lot of cases were seen in patients who had no any association with other medical conditions compared to those who had diarrhoea and other medical illness and those who were applicable to this factor (81.2% versus 18.6% and 0.3%, $p=0.000$). See table 2

Table 2 shows the factors that are associated with diarrhoea.

Variable	Number	Diarrhoea		p-value
		Yes	No	
		393 (7.9%)	4,584 (92.1%)	
Age _median (IQR)		37 (27, 48)	39 (28, 52)	0.0085
Sex				0.364
Male	2,338	176	2,162	

		(44.8%)	(47.2%)	
Female	2,639	217 (55.2%)	2,422 (52.8%)	
HIV status				0.000
Negative	1,897	125 (31.8%)	1,772 (38.1%)	
Positive	1,110	127 (32.3%)	983 (21.4%)	
Unknown	1,970	141 (35.9%)	1,829 (39.9%)	
ART status				0.000
No	41	6 (1.5%)	35 (0.8%)	
Yes	1,077	121 (30.8%)	956 (20.9%)	
Data Not available	3,859	266 (67.7%)	3,859 (78.4%)	
Tb status				0.969
No	4,877	385 (98.0%)	4,492 (98.0%)	
Yes	100	8 (2.0%)	92 (2.0%)	
Residence				0.029
High cost	1,924	169 (43.0%)	1,755 (38.3%)	
Low cost	2,667	207 (52.7%)	2,460 (53.7%)	
Outside town	375	16 (4.1%)	359 (7.8%)	
Outside country	10	1 (0.3%)	9 (02%)	
Other conditions				0.000
No	319	319 (81.2%)	0 (0%)	
Yes	73	73 (18.6%)	0 (0%)	
N/A	4,585	1 (0.3%)	4,584 (100%)	

Univariable and multivariable analysis of factors associated with diarrhoea

It was observed that a year increase in age was significantly associated with 0.99 reduced chance of having diarrhoea (0.99; 95%CI 0.986-0.0999, significant difference $p=0.017$). Being HIV positive was significantly associated with 83% increased chance of having diarrhoea (OR 1.83; 95%CI 1.414-2.373; $p=0.000$). Additionally, during a multivariable analysis, age was significantly associated with 0.8% reduced chance of having diarrhoea (OR 0.9992; 95%CI 0.985-0.998; $p=0.014$). See table 3

Table 3 below shows the univariable and multivariable analysis of factors associated with diarrhoea.

Variable	Crude analysis		p-value	Adjusted analysis		p-value
	Odds ratio	95%CI		Odds ratio	95%CI	
Sex						
Male	R					
Female	1.10	0.895 to 1.350	0.364	1.069	0.869 to 1.317	0.529
Age	0.99	0.986 to 0.999	0.017	0.992	0.985 to 0.998	0.014
HIV status						
Negative	R					
Positive	1.83	1.414 to 2.373	0.000	4.766	0.564 to 40.282	0.152
Unknown	1.093	0.852 to 1.403	0.485	1.114	0.867 to 1.430	0.399
ART status						
No	R					
Yes	0.738	0.304 to 1.792	0.502	0.552	0.217 to 1.404	0.212
N/A	0.432	0.180 to 1.036	0.060	1.429	0.175 to 11.685	0.739
Tb status						
No	R					
Yes	1.015	0.489 to 2.105	0.969	0.702	0.331 to 1.489	0.356

Discussion

The present study estimated the prevalence (7.9%) and correlates of diarrhoea in adults at Livingstone University Teaching Hospital such as age etc.

Diarrhoea remains a worldwide problem among the population, although efforts have been made to reduce diarrheal cases, especially in children, improvement in the reduction of diarrhoea mortality in adults is not the same in the different parts of the world. This can be motivated by spreading more knowledge about the prevalence of infectious diarrhoea. The impact of infectious diarrhoea in older people is a growing public health problem that needs adequate consideration⁴

The present research study yielded a prevalence of 7.9% in adult patients with diarrhoea with a median age of 38 years. The reported prevalence from this study was lower compared to the prevalence (17.5%) that was found in a study in Beijing among the adult population⁶ and another study which was done in 11 countries with a prevalence of 16% to 23%⁷. The difference could be due to the fact that some adults with infectious diarrhoea in developing countries rarely seek medical attention compared to children, and also due to fact that majority of the population stays in rural areas, and some of the rural areas are quite remotely situated, and the people in those areas don't usually have access to healthcare facilities, so most of the times people in such rural areas seek treatment from non-healthcare personells and may also opt for traditional medicine as mode of treatment. The disparities may also be linked to discrepancies in causes of diarrhoea as well as people's behaviour models in industrialized and developing countries⁶. A study was done in France which showed that adults rarely seek medical treatment for infectious diarrhoea than children, because infectious diarrhoea is curable and self-limiting, and that adults seek medical treatment when symptoms are worse⁸. A study conducted in Gaza, showed

that many people with infectious diarrhoea sought treatment from non-health care personnel's⁹. There are a large number of unknown cases of infectious diarrhoea in adults, and this explains a few reported cases and they also reported that some people did not want to take diarrheal medications, and that they would love nature to do its function⁷. Seasonal changes in the occurrence of diarrhoea – which in many countries occur during rainy season, and disappear during summer and winter, may also cause a low reported diarrheal prevalence in adults¹⁰.

This study showed that patients who had infectious diarrhoea were of middle age with a median age of 38 years. These results were different compared to the study that was done in Taiwan in which diarrheal cases were reported more in elderly individuals more than 60 years old¹¹, and adults older than 70 years. This could be due to the fact that due to the work conditions in developing countries, the middle aged adult population is more exposed to infectious conditions where diarrhoea can spread easily. Also the living conditions in low cost urban areas are very much responsible for a high prevalence in middle aged adults- especially females. The elderly adult population in developing countries like Zambia is usually not exposed to the infectious conditions because most of the elderly people stop working after 60 years of age and settle down in rural areas where there are less chances of getting infected.

The majority of patients with diarrhoea were females (55.2%) compared to males (44.8%). A similar study was conducted in Beijing where diarrheal cases were recorded more in females⁶. Another study conducted in 11 countries showed that infectious diarrhoea was more in females (57%) than males and proposed that these were associated with factors such as psychological, food and menstrual related problems⁷. Additionally, when compared to males, females seek medical attention early and more seriously. Males on the other hand consult physicians only when they have severe diarrhoea.

In the present study it was found that most of the patients having diarrhoea did not know their HIV status (35.9%). About 32.3% HIV positive patients presented with diarrhoea, slightly higher to those who were HIV negative (31.8%), with no much big difference. However, a similar study found a high prevalence (60.39%) of HIV infected patients who presented with chronic diarrhoea, and concluded that these cases probably occurred due to the acute infectious aetiologies¹³. Furthermore, another study showed that the prevalence of HIV infected patients with diarrhoea was high (28.2%) compared to those who were HIV negative (7.1%)¹⁴. The occurrence of diarrheal diseases in HIV patients has been linked to the direct effect of HIV infection and also due to the affect of secondary infections.¹⁵

It was discovered that those who were on ART and had diarrhoea, had a high prevalence (30.8%) compared to those who were HIV positive with diarrhoea but not on ART (1.5%). A similar study found a high prevalence (60%) of HIV patients on ART who presented with diarrhoea, and clinically found that some of these cases (17.6%) were due to the ART effects¹⁶. And another study found that about 28% of ART patients had diarrhoea, and the most commonly ART-associated diarrhoea were PIs (13.6%) and NRTIs (10%)¹⁷. HIV-related diarrhoea has changed from mostly being a product of opportunistic infection to primarily being a side effect of HAART agents¹⁸.

Different studies show that diarrhoea is commonly seen in low socio-economical groups. This link was true to the findings of this study with a prevalence of 52.7%. Similar studies show that those who live in rural areas have difficulties in accessing good quality healthcare. This could be due to the reason that these families cannot bear the expense of professional therapies and transportation to primary health care providers⁹.

During the study, there were some limitations that were encountered. This study being a secondary study, in some cases it was found that the patient information is missing or incomplete on the files – for

example the information about age, sex, underlying diseases were missing in some files. All these factors were also responsible for low number of reported cases of infectious diarrhoea, and hence, this study might actually have found less prevalence of infectious diarrhoea among the adult population.

Diarrhoea was the eighth leading cause of mortality among adults aged 70 years and older. Mostly in Sub Saharan Africa. Mortality among adults older than 70 years was greatest in the lowest Socio-demographic Index (SDI) quartile and lowest in the high-middle quintile of SDI. The quantity of grown-ups more than 70 years has expanded by half (50%) from 1990 to 2016. Yet a significant part of the worldwide activity to lessen diarrhoea has been engaged in kids more youthful than 5 years⁴.

The majority of diarrhoeal cases are associated with faecal-oral organisms. Therefore, the key contributing factors to the high incidence of diarrhoea are low access to safe water and inadequate sanitation. Currently, there is low access to both of these in the rural areas and among the poor urban populations¹⁹. Through this study the use of clean drinking water and proper sanitation is emphasized.

Conclusion

Diarrhoea is prevalent among adults at Livingstone University Teaching Hospital. Age and socio-economic status was significantly associated with diarrhoea. Significant prevalence of diarrhoea was also observed in the patients with HIV and TB.

Recommendations

This study recommends that the prevalence of diarrhoea among adults should be taken more seriously, especially in the patients with HIV. People living with HIV, must have reviews once they are initiated on ART to check how they are coping with the side effects associated with the drugs. In the case of ART-associated diarrhoea, withdrawing and/or prescribing other drugs suitable for their health may be considered.

Cholera outbreaks which cause severe diarrhoea are very common in Zambia during rainy season and such diseases are caused by poor sanitation and poor and infected drinking water. Hundreds of people die due to such diseases in a short span and cause social disturbance, to an extent that routine public activities such as schools and colleges have to be suspended. A lot financial burden is put on the society to tackle such diseases. The society suffers financially causing inflation and more poverty due to such diseases which can be easily handled. Therefore, paramount importance should be given to the supply of clean drinking water and proper sanitation. Also there should be continuous monitoring of hygiene and healthcare facilities in shanty compounds in order to avoid such diseases.

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