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Prevalence And Mortality Rate of Diarrhoeal Infection on Under-Five Children with A Special Reference to Adamawa State, Nigeria

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Abstract: ***WHO defines diarrhoea as the passage of three or more loose or liquid stools per day in a period exceeding seven days. Diarrhoea is a common sign of many infections in an intestinal tract that is usually caused by different virus, bacteria and parasitic entities. Globally, diarrhoea accounts for almost 1.3 million deaths annually among under-five children making it the second most common cause of childhood mortality after pneumonia (Manetu, M'masi & Recha, 2021). Despite a fall in childhood diarrhoeal disease from 4.6 million to 0.8 million over the last three decades, about 1.8 million children die annually (Hashi, et al., 2016). Nigeria, with diarrhoea point prevalence of 18.8%, accounts for an estimated 150,000 deaths yearly among children under five years of age (Peter & Umar, 2018). This study used Ex Post facto design with retrospective data between 2001 and 2022. The study revealed the lowest and highest prevalence rate of diarrhoeal infection with 6,541 and 10,490 cases per 100,000 in 2004 and 2017 respectively. However, the study also revealed the child mortality rate due diarrhoeal infection with 14 deaths per 1,000 livebirths in 2003 before it declined to 6 in 2005, raised to 10 in 2010, 2011 and 2012. Furthermore, the child mortality rate then fluctuated between the period of 2014 to 2021, before it finally dropped to 1 death per 1,000 livebirths in 2022. The results from this research will serve as a spring board for policy formulation and implementation of Government/NGOs/Community Health Programmes in Adamawa State Nigeria.***

Keywords: ***Diarrhoeal Infection, Prevalence rate, Under-Five, Mortality rate and Childbirths.***

I. INTRODUCTION

The world health organization defines diarrhoea as the passage of three or more loose or liquid stools per day in a period exceeding seven days. Diarrhoea is a common sign of many infections in an intestinal tract that is usually caused by different virus, bacteria and parasitic entities. Globally, diarrhoea remains one of the most leading cause of death among children under-five after pneumonia. It accounts for almost 1.3 million deaths annually among children under-five years of age making it the second most common cause of childhood mortality (Manetu, M'masi & Recha, 2021). Globally, evidences have shown that childhood diarrhoea in the first-two years of life can negatively affects nutrient absorption that can lead to a poor physical growth (Kassebaum, *et al.,* 2019). Worldwide, diarrhoeal infection is one of the leading causes of child mortality in developing countries, and about 1.8 million children die per annum from this disease. These numbers of diarrhoeal deaths are still high despite a fall in childhood diarrhoeal disease from 4.6 million to 0.8 million over the last three decades (Hashi, Kumie & Ganasa, 2016).

In Africa, variations in childhood diarrhoeal morbidity and mortality have been reported, with the highest case fatality rates in Benin, Lesotho, Mali, Nigeria, and Sierra Leone (Reiner, *et al.*, 2018). Nigeria, with a prevalence rate of 18.8%, the disease accounts for an estimated 150,000 deaths yearly among children under five years of age. Its status as the second leading killer disease of children under five years of age provides an alarming reminder of the susceptibility of Nigerian children (Peter & Umar, 2018). Dehydration and electrolyte imbalance are the crucial reasons for death due to diarrhoea. However, water makes up a greater proportion of body-weight, therefore children are at a greater risk of life-threatening dehydration than adults. They also use more water over the course of a day, owing to their higher metabolic rates, and their kidneys are less capable of conserving water than older children and adults (Bottin, et al*.,* 2019). Apart from dehydration and electrolyte imbalance, extended and recurrent episodes of diarrhoea frequently lead to stunting and growth failure in early childhood. Consequently, malnutrition further leads to recurrent diarrhoea, and the cycle continues. To fight against dehydration due to diarrhoea among children under the age of five years, the World Health Organization and United Nations Children's Fund encouraged the use of Oral

Rehydration Salt solutions in 1978. Although this measure decreased the mortality rate among children younger than five years of age from 4.5 to 1.8 million annually, diarrhoea still remained the second leading cause of death in under-five children (Eyitope, *et al.,* 2022).

The prevalence rate of under-five children's diseases in Adamawa state has declined from 173 to 145 cases per 100,000 live births between 2001 to 2005, followed by also a sudden decline to 53 cases per 100,000 live births in 2008. In Adamawa state, diarrhoea infection has a prevalence rate of 91 cases per 1,000 live births in 2002. The study further revealed that there is a positive and significant relationship between the mortality due to diarrhoea and the overall child mortality in the state. The study also explained that the independent variables and immunization level had at least 60.9 percent cause-effect on the overall child mortality However, the research reported that there is a positive and significant causal relationship between the mortality due to diarrhoea infection and the overall child mortality in the state (Umar, *et al.*, 2023).

In a related investigation, diarrhoea, measles, pneumonia, polio and tetanus are the major diseases that are responsible for child mortality in Adamawa State. The study revealed that diarrhoea had a child mortality rate of 89 deaths per 1,000 live births in 2011. Still, the diarrhoeal infection also had a positively weak and insignificant relationship with the overall child mortality in the state (Dalatu *et al.*, 2024).

II. AIM AND OBJECTIVE OF THE STUDY

The aim and objective of this study is to determine the prevalence and mortality rates of diarrhoeal infection on under-five children in Adamawa State and recommend some preventive measures for reducing the infection among the vulnerable children.

III. LITERATURE REVIEW

Diarrhoea is the second commonest cause of childhood mortality among children under-five years of age (WHO, 2017). In developing countries, children under five years of age experience an average three episodes of diarrhoea every year and each episode contribute to a significant nutritional deprivation which negatively affects their growth (Black, Allen & Bhutta 2008). Young children are especially vulnerable to diarrhoeal disease, and most deaths related to diarrhoea took place in Africa and South Asia (Mohammed & Tamiru, 2014). Diarrhoeal disease has been a leading cause of global morbidity and mortality, particularly among children in resource-limited countries (Mokomane, *et al.,* 2018). The disease accounts for approximately 18% of child deaths and 13% of disability adjusted life years. Worldwide, approximately 3.5 billion cases of acute diarrhoea and 3.2 episodes per child occur each year in children under-five years of age (Eyitope, *et al.,* 2022).

The World Health Organization estimates that 525,000 under-five children die globally because of diarrhoeal diseases each year, with 1.7 billion cases of diarrhoeal disease diagnosed annually (WHO, 2017). Worldwide, there has been an improvement in reducing the under-five mortality and morbidity rate. Sub-Saharan Africa, a region with the highest child mortality rate around the world has shown an essential improvement in diarrhoea. Reduction of child mortality rate increased from 1.7 percent in 1990s to 4.2 percent in 2000 to 2015. This significant decline has prevented the death of over 48 million children under age of five. Regardless of the improvements, progress was not enough to reach the millennium development goal 4 to reduce to child mortality rate by two-thirds in many regions. In 2016, Sustainable Development Goals took effect succeeding Millennium Development Gools that ended by 2015 and only 47 countries, out of which 34 are in Sub-Saharan Africa will not meet the intended Sustainable development goal target of 25 deaths per 1,000 live births by 2030 if they maintain their present trends in decreasing under-five mortalities and more than half of under-five child deaths are due to diseases that are avoidable and curable through simple and reasonable interventions (Manetu, M'masi & Recha, 2021).

Lukman & Umaru, 2017 in a related study in Adamawa state reported that; the largest contributor of disease prevalence rate among under-five children in the state was diarrhoeal infection with a prevalence rate of 91 persons per thousand live births in 2002, followed by pneumonia with 87 persons per thousand in 2001; measles with 20 persons in 2001, tetanus with 3 persons in 2001 and polio did not register any prevalence rate during the 15-years period of study.

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According to Manetu, M'masi & Recha, (2021), India is the country that has the highest childhood diarrhoea prevalence with more than 381,000 children die from the diarrhoea infection and its complications every year. However, India has made progress in reducing deaths in under-five years children where this reduction has been possible due to success and inception to many universal programs such as the expanded programs on immunization. Despite this decline, the proportion of mortality accounted by diarrhoea infection in India still remains high. Diarrhoea disease remains one of the leading causes deaths in children younger than five years of age. Diarrhoea disease in African countries was responsible for more than 30 million cases of severe diarrhoea and 331,000 deaths in 2015. Where the severity and frequency of diarrhoea in African countries is aggravated by lack of access to environmental sanitation, clean water, and good hygiene practices. Additionally, in Kenya diarrhoeal diseases remains to be among the major public health problems where the mortality rate of children under the age of five years due to diarrhoea is very high with about 16% surpassing deaths from HIV and Malaria combined. In Sub-Sahara Africa, Nigeria is the only country that accounts for the highest under five child mortalities due to diarrhoea in 2015 with 151,700 child deaths.

According to an investigation in Dale district of Ethiopia, the odds of having diarrhoeal diseases among under-five years were 3.3 times higher among children from households that disposed refuse improperly compared with the odds of diarrhoeal diseases among children from households which properly disposes of refuse (Melese, *et al.* 2019).

Plateau is a state in the North-central zone of Nigeria with over 4.2 million people and more than 17.6 percent f the entire population are children under five years of age. The state about has 1000 health facilities which comprises both private-owned and government facilities. These include 940 primary, 59 secondary and 3 tertiaries health care facilities. In a retrospective investigation, a total of 60,933 cases and 133 mortalities were recorded between 2013 to 2017 and results further shows that the state has a child mortality rate of about 2.18 deaths per 1,000 livebirths (Jiwok, *et al.,* (2021).

IV. METHODS AND MATERIALS

This investigation used Ex post facto design with quantitative approach. A retrospective data of under-five diseases and deaths were obtained from Adamawa State Primary Health Care Development Agency, for the period of 2001 to 2022. The data obtained consist of the number of under-five children immunised and number of under-five children that were infected and later died due to the diarrhoeal infection within the time frame.

The method used to determine the prevalence rate of the diarrhoeal diseases in the study area is given by equation (1):

$$\text{Prevalence Rate} = \frac{\text{No. of persons infected by diarrhoeal disease at time t}}{\text{Number of persons at risk at time t}} \times 100{,}000 \ldots (1)$$

While the method used to determine the mortality rate due to diarrhoeal infection in the study area is given by equation (2):

$$\text{Child Mortality Rate} = \frac{\text{No. of deaths due to diarrhoeal disease at time t}}{\text{Number of persons at risk at time t}} \times 1{,}000 \ldots \ldots (2)$$

V. RESULTS

This section of the study analysed the prevalence rate of the diseases for the period under review. Using equation (1), the Prevalence rate of the diarrhoeal diseases in the study area was determined as shown below:

Table 1: Prevalence Rate of the Diarrhoeal Disease in the Study Area

Years	Children Immunized	Diarrhoeal Diseases	Prevalence Rate
2001	148,001	9,959	6,729
2002	149,701	10,002	6,681
2003	150,309	10,651	7,086
2004	150,982	9,875	6,541

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2005	151,569	13,431	8,861
2006	151,859	10,975	7,227
2007	154,879	11,032	7,123
2008	155,123	12,797	8,250
2009	155,703	14,532	9,333
2010	156,962	12,451	7,932
2011	158,021	13,679	8,656
2012	158,888	10,783	6,787
2013	159,936	11,963	7,480
2014	166,872	16,208	9,713
2015	168,953	15,119	8,949
2016	169,887	15,333	9,025
2017	177,879	18,659	10,490
2018	189,963	15,863	8,351
2019	197,773	17,782	8,991
2020	209,996	17,788	8,471
2021	216,985	14,002	6,453
2022	224,940	19,195	8,533

Source: Researcher's Results, 2025

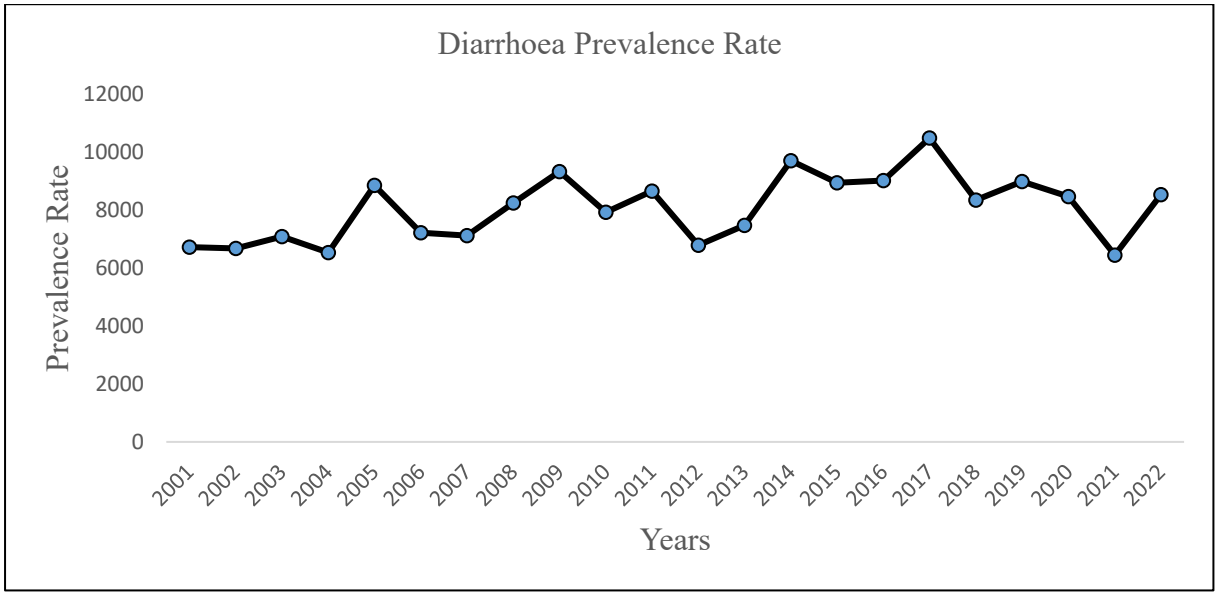

Figure 1: *Diarrhea Prevalence Rate*

Source: Researcher's Results, 2025

Based on Table 1 and Figure 1, the prevalence rate of diarrhoeal infection fluctuated between the range of almost 7,000 to 10,000 cases per 100,000 livebirths throughout the study period. The results also revealed the lowest and the highest prevalence rate of diarrhoeal infection with 6,541 and 10,490 cases per 100,000 livebirths in 2004 and 2017 respectively.

This section of the study analysed the pneumonia mortality rate for the period under review. Using equation (2), the pneumonia mortality rate in the Study Area was determined as shown below:

Table 2: Child Mortality Rate due to Diarrhoea Diseases

Years	Diarrhoeal Diseases	Diarrhoeal Mortality	Mortality Rate
2001	9,959	62	6
2002	10,002	104	10

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2003	10,651	152	14
2004	9,875	94	10
2005	13,431	86	6
2006	10,975	99	9
2007	11,032	107	10
2008	12,797	45	4
2009	14,532	74	5
2010	12,451	127	10
2011	13,679	140	10
2012	10,783	110	10
2013	11,963	51	4
2014	16,208	62	4
2015	15,119	93	6
2016	15,333	49	3
2017	18,659	37	2
2018	15,863	87	5
2019	17,782	27	2
2020	17,788	43	2
2021	14,002	21	1
2022	19,195	10	1

Source: Researcher's Results, 2025

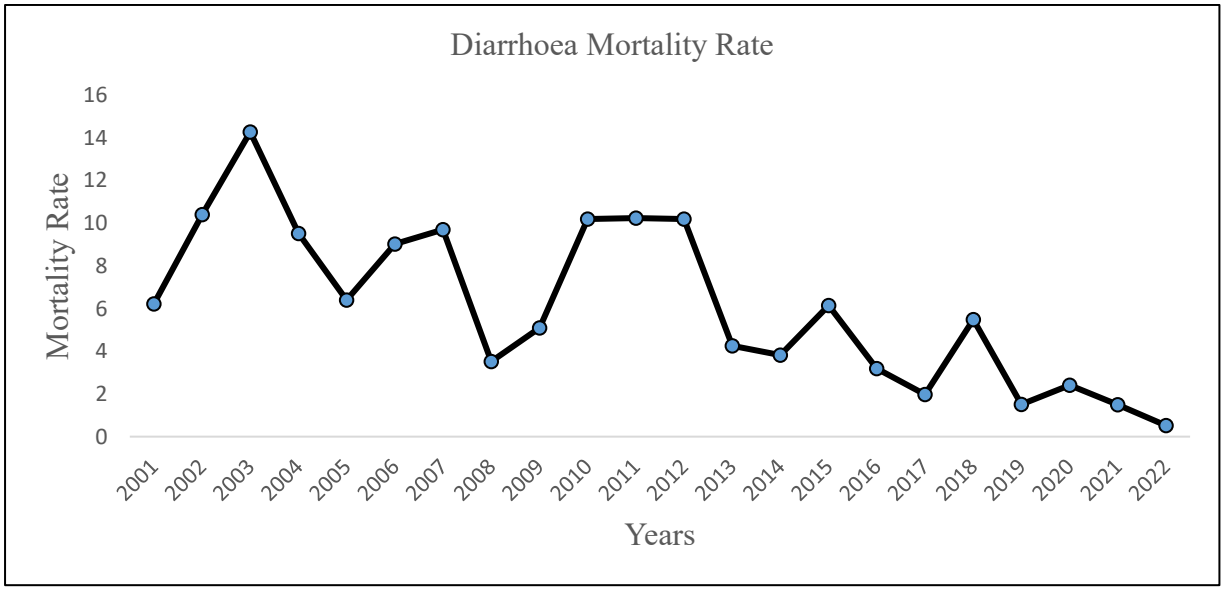

Figure 2: *Diarrhoea Mortality Rate*

Source: Researcher's Results, 2025

The results in Table 2 and Figure 2 revealed that, the child mortality rate due diarrhoeal infection was 6 in 2001 before it sharply increased to its peak with 14 deaths per 1,000 livebirths in 2003. However, the rate declined down to 6 in 2005, raised to 10 in 2010, 2011 and 2012 before it dropped again to 4 deaths per 1,000 livebirths in 2014. Furthermore, the child mortality rate then fluctuated between the period of 2014 to 2021, before it finally dropped to 1 death per 1,000 livebirths in 2022.

VI. DISCUSSION OF FINDINGS

Peter & Umar, 2018 in a related investigation revealed that diarrhoeal infection recorded the second leading killer disease of children under five years of age with an annual national point prevalence of 18.8% and accounts for an estimated 150,000 deaths yearly. However, this study revealed an annual average prevalence rate of 8,076 cases per 100,000 livebirths equating it to annual point prevalence of

8.076% with an average annual death of 76.36 and average annual child mortality rate of 6.1 deaths per 1,000 livebirths. In view of the above, under-five children in Adamawa state have a higher chance of survival than the national from the diarrhoeal infection during the period under review.

Jiwok, *et al.,* 2021, in a retrospective investigation in Plateau state revealed that; a total of 60,933 cases and 133 mortalities were recorded between 2013 to 2017, while this study revealed that; Adamawa state had a total of 77,282 cases and 292 deaths between the year 2013 and 2017. Jiwok, *et al.,* 2021 further reported that, Plateau state has a child mortality rate of about 2.18 deaths per 1,000 livebirths within the study period, while this study revealed that Adamawa state had an average child mortality rate of 3.78 deaths per 1,000 livebirths between the year 2013 and 2017. Based on the above results, under-five children in Adamawa state have a lower chance of survival compare Plateau state from the diarrhoeal infection during the period under review.

Lukman & Umaru, 2017 in a related study reported that; Adamawa state had a prevalence rate of diarrhoea infection with 91 cases per 1,000 live births in 2002, while this study revealed that Adamawa state had prevalence rate of 6, 681 case per 100,000 livebirths, equating to 66.81 cases per 1,000 livebirths in 2002. The variation in these two studies might be due to variation in their methodologies.

Similarly, Dalatu *et al.*, 2024 in a related investigation revealed that; diarrhoea infection is one the major diseases that frequently responsible for child mortality in Adamawa State. The infection accounted for a prevalence rate of 8,656 cases per 100,000 livebirths with a child mortality rate of 89 deaths per 1,000 livebirths in 2011. This study is partially in agreement with Dalatu *et al.*, 2024 since both studies revealed a prevalence rate of 8,656 cases per 100,000 livebirths. Furthermore, this study disagreed with Dalatu *et al.*, 2024 and revealed a child mortality of 10 deaths per 1,000 livebirths in 2011. The variation in the studies might be due variation in their methodologies. This study used the ratio of deaths to children with the disease per 1,000 livebirths, while Dalatu *et al.*, 2024 used ratio of deaths to children immunization level per 1,000 livebirths.

VII. CONCLUSION

Despite the immunization exercises and other preventive measures such as provision of drugs and good health facilities, the prevalence and mortality rate due to diarrhoeal infection is becoming an issue of concern in Adamawa state. However, the study revealed an annual average prevalence rate of 8,076 cases per 100,000 livebirths with an average annual death of 76.36 and average annual child mortality rate of 6.1 deaths per 1,000 livebirths. Within the period under review, the study recorded the lowest and the highest prevalence rate of diarrhoeal infection with 6,541 and 10,490 cases per 100,000 in 2004 and 2017 respectively. Furthermore, the investigation also recorded its lowest and peak child mortality with 1 and 14 deaths per 1,000 livebirths in 2022 and 2003 respectively.

VIII. RECOMMENDATION

Since the under-five children in Adamawa state have a lower chance of survival compare to Plateau state from the diarrhoeal infection during the period under review, Adamawa State Government need to address, strategize and implement the Global Action Plan for Diarrhoeal infection with immediate effect as campaigned by WHO and UNICEF.

Both government and individual should promote adequate nutrition as a key factor to improve children's natural defences against the diarrhoeal infection, starting with exclusive breastfeeding for the first 6 months of life.

Adamawa State Primary Health Care Development Agency whose primary responsibility among orders is to curb and reduce the spread of the diarrhoeal infection among vulnerable children of age needs to revise and strategies their act plans.

Addressing environmental factors such as encouraging sanitation and good hygiene in respective areas would be an ideal solution to reduce the prevalence of the diarrhoeal infection among children of various ages.

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