

# Cause-Effect of Five Child-Killer Diseases on Under-Five Mortality in Adamawa State, Nigeria

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**Abstract** - This study investigated the Cause-Effect of Five Child-Killer Diseases on Under-Five Mortality (Deaths) in Adamawa State, Nigeria. The study used Ex post facto and quantitative design. A secondary data was obtained from Adamawa State Primary Health Care Development Agency (PHCDA), Yola across the study area for the period of 2001 to 2020. The study used Multiple Regression Analysis to determine the Cause-effect of the Five Child-Killer Diseases on Under-Five Mortality in the study area. The study revealed that; Polio needs to be excluded from the Five Child-Killer Disease since there is no death associated with polio disease for the period under review in the study area. The results also revealed that the deaths due to diarrhoea have a significant causal relationship on Under-Five Mortality, while deaths due pneumonia, measles and tetanus has insignificant causal relationship on Under-Five Mortality in the study area. Based on the overall model, the Five Child-Killer Diseases have a Cause-effect of 64% on Under-Five Mortality in the study area. In view of the above, the study recommends that Adamawa State Primary Health Care Development Agency, Yola whose primary responsibility among orders is to curb and reduce the spread of Child-Killer Diseases among vulnerable children of ages; needs to review and strategies their action plans, since the Cause-effect is still high.

**Keywords:** Child-Killer, Under-Five, Immunization, Cause-effect, Diseases, and Mortality.

## 1. Introduction

Under-Five Mortality rate is the number of deaths in children 0-5 years of age per time, usually expressed per 1,000 or 100,000 persons per year (Norman, Spilsbury & Semmens, 2011). The Preventable or treatable infectious Five Child-Killer Diseases used in this study are Pneumonia, Measles, Diarrhoea, Polio, and Tetanus. However, the Five Child-Killer Diseases are grouped classification of the five diseases that are frequently responsible for the death of children in Adamawa State, Nigeria.

Globally, under-five mortality has dropped from 12.7 million per year in 1990 to 5.9 million in 2015; this being the

first year the figure has gone below the 6 million mark; according to the 9 September 2015 WHO report. New estimates in “Levels and trends in child mortality report 2015,” released by UNICEF, WHO, the World Bank Group, and the Population Division of UNDESA, indicates that although the global progress has been substantial, 16 000 children under-five still die every day. The 53% drop in under-five mortality however is not enough to meet the Millennium Development Goal of a two-thirds reduction between 1990 and 2015 (Adebayo, Fahrmeir & Klasen, 2004).

The risk of a child dying before completing five years of age is still highest in the WHO African Region (81 per 1000 live births), about 7 times higher than that in the WHO European Region (11 per 1000 live births). Many countries still have very high under-five mortality – particularly those in WHO African Region, with an under-five mortality rate above 100 deaths per 1000 live births. In addition, inequities in under-five mortality between high-income and low-income countries remain large. The under-five mortality rate in low-income countries was 76 deaths per 1000 live births – about 11 times the average rate in high-income countries (7 deaths per 1000 live births). Reducing these inequities across countries and saving more children’s lives by ending preventable child deaths are important priorities (Adetunji, 1995).

Nigeria, in the past few years has experienced some worsening of under-five mortality. The under-five mortality rate was evaluated at 100 per 1000 in 2003 and at 87 per 1000 in 1990. This can be in part explained by the persisting low numbers of births occurring in health centres and the low number of births attended by trained healthcare service providers. In 2003, two third of the births in Nigeria still occurred at home. In addition, only slightly more than one-third of births are attended by doctors, nurses, or midwives (Mathews & Mac Dorman, 2011).

Underneath the statistics lies the pain of human tragedy, for thousands of families who have lost their children. Even more devastating is the knowledge that, according to recent research, essential interventions reaching women and babies on time would have averted most of these deaths. Although

analyses of recent trends show that the country is making progress in cutting down under-five mortality rates, the pace still remains too slow to achieve the Millennium Development Goals of reducing under-five mortality by a two-third by 2015. The deaths of newborn babies in Nigeria represent a quarter of the total number of deaths of children under-five (Orubuloye & Caldwell, 2011). The majority of these occur within the first week of life, mainly due to complications during pregnancy and delivery reflecting the intimate link between newborn survival and the quality of maternal care. The main causes of these deaths are birth asphyxia (suffocation), severe infection including tetanus and premature birth. Preventable or treatable child-killer diseases such as: pneumonia, diarrhoea, measles, tetanus and polio etc, account for more than 70 per cent of the estimated one million under-five deaths in Nigeria (Orubuloye & Caldwell, 2011).

In Adamawa State, among other states in Nigeria, there are about 31 under-five die daily in 2003, and 147 die daily in 2008 (Okechukwu, Benedict, John, 2015).

The prevalence of tetanus among children investigated in Adamawa State were found to be 4% in 2008, 8% in 2009 and 12% in 2013 (Jalal-Eddeen, 2014).

Umar (2015), explained that the five child-killer diseases which consist of pneumonia, diarrhoea, measles, tetanus and polio account for 60.94 percent under-five mortality in Yola, Adamawa State Nigeria.

## Research Questions

What is the Cause-effect of five child-killer diseases on under-five mortality in the study area?

### 2. Objective of the Study

The objective of this study is to determine the Cause-effect of the five child-killer diseases on under-five mortality and to develop a model for future prediction of mortality in the study area.

## Hypothesis

H<sub>0</sub>: There is no Cause-effect of five child-killer diseases on under-five mortality.

### 3. Literature Review

Studies have shown that out of the more than 4 million neonatal annual global deaths, 38% is as a result of NNT. It is overwhelming to note that Nigeria is not an exception to this scourge, as NNT remains a significant cause of death among children under the age of 5 years. Literature has shown that in spite the increase in use of tetanus toxoid immunization across

the globe and the significant reductions in deaths due to NNT, it is still far from reality in some developing countries especially from the sub-Saharan Africa (Jalal-Eddeen, 2014). The slow implementation of the recommended tetanus elimination strategies by countries around the world resulted in a change in the target date for tetanus elimination to 2000. The WHO, UNICEF, and UNFPA came together to review progress towards the attainment of the global elimination goal in 1999; these bodies realized that there was a need for review of the initiative, adding elimination of maternal tetanus to the initial tetanus elimination goal with a change in date to a 2005 target, which was subsequently changed to 2015 (WHO, 2014; UNICEF, 2014). In the 2010 report, the WHO estimated that 58,000 new-borns died as a result of tetanus, a 93% reduction from the late 1980s. In spite the appreciable progress made in this regard, statistics show that as of December 2013, 25 countries still have not reached the tetanus elimination status (UNICEF, WHO, UNFPA, 2000; WHO, 2014). However, there is optimism that many additional countries are likely to meet the revised deadline of 2015 (UNICEF, WHO, UNFPA, 2000; WHO, 2014). It was observed that the prevalence of tetanus in the north-eastern region of Nigeria was due to poor utilization of antenatal services by pregnant women, reasons behind the lack of trained birth attendants to receive deliveries, the unclean birth practices among rural women and in proper disposal of waste materials. The global tetanus elimination initiative, which aims to reduce the disease to a level that is no longer a major public health problem, requires achieving the following: Immunization of pregnant women and other women of reproductive age and practice of hygienic deliveries and clean cord care (Jalal-Eddeen, 2014).

Scott et.al (2008) noted that historically, pneumonia was the main cause of under-five mortality in developed countries, and in the United States in 1900, it is estimated that pneumonia killed 47 of every 1,000 children before the age of 5 years. Improvements in nutrition and living standards in the United States in the first 40 years of the 20th century led to a substantial reduction in pneumonia mortality well before antibiotics became available. However, in the low-income countries of Asia and Africa, pneumonia is still the main cause of under-five mortality. In developing countries, over one-quarter of children have an episode of clinical pneumonia each year throughout the first 5 years of their lives. Dieckmann et.al (2005) writes that mortality and morbidity from pneumonia were measured among 3000 children under the age of 5 years in a rural area of Gambia, West Africa. Using a post-mortem questionnaire technique, pneumonia was identified as the probable cause of 4% of infant deaths and of 25% of deaths in children aged 1 to 4 years. The pneumonia mortality rate was 6.3 per 1000 per year in infants and 10.7 per 1000 per year in children aged 1 to 4 years. In Nigeria, Esangbedo (2010)

explained that pneumonia kills nearly 1.6 million children under five annually worldwide. An estimated 98 percent of children who die of pneumonia live in developing countries and according to 2008 estimates, about 177,000 children under the age of five died of pneumonia in Nigeria. This means that within an hour, 20 children across Nigeria will die from pneumonia.

Childhood diarrhoea is caused by many organisms, mainly viral, bacterial, and protozoan. When associated with passage of blood in stool, this is referred to as dysentery. Diarrhoea can also be due to intolerance of some types of food especially lactose containing milk. Infections in other parts of the body can lead to parenteral diarrhoea.

By far the foremost cause of diarrhoea leading to death and morbidity worldwide in childhood is rotavirus infection. It is only second to pneumonia as a killer in children (Okoro&Itombra-Okoro1996). ORT which consists of rehydration, continued feeding of normal diet, and replacement of continuous fluid loss, now saves more than 1 million children annually (Oral rehydration Therapy in Children with Acute Gastroenteritis2009)Since this treatment can be successfully applied at home, it is necessary to reassess the knowledge and practice of ORT by mothers in our locality since its campaign was launched in Nigeria in 1985.This will help ascertain whether the gains made after the introduction of this mode of therapy in Nigeria in the late 1980s and early 1990s is being sustained (Oral rehydration Therapy in Children with Acute Gastroenteritis 2009).The efficacy of existing interventions to prevent or treat diarrheal diseases and to thereby reduce diarrhoea mortality has been proved. Large reductions in child mortality could be achieved with their implementation. Therefore, careful planning and evaluation of interventions to control cases and deaths due to diarrhoea will be important if under-five mortality is to be reduced and goal four of the Millennium Development Goals (to reduce under-five mortality by two-thirds by 2015, from the base year 1990) is to be achieved in the African region (United Nations, 2000).

In Nigeria a study conducted by Onyiriuka (2011), it was clear that cases of measles accounted for 3.1% of all admissions in the Paediatric Department, with the age distribution as follows: 47.8% between 13 and 24 months of age; 18.1% were under 9 months old. Although 22.1% had vaccination against measles, 77.9% were not vaccinated against the disease. It was further observed that a significant number of the cases occurred in the dry season (80.5%) as compared to the wet season (19.5%) at  $P < 0.001$ . In addition, the two main reasons shared by the mothers for not immunizing their children against the disease were child ill (35.0%) and child <9 months old (23.3%). Grais et.al (2007)

conducted a study to investigate measles mortality in three recent epidemics in Niamey (Niger), N'Djamena (Chad), and Adamawa State (Nigeria). Children in these countries still face unacceptably high mortality from a completely preventable disease. They conducted three exhaustive household retrospective mortality surveys in one neighbourhood of each of the three affected areas: Boukoki, Niamey, Niger (April 2004,  $n = 26,795$ ); Moursal, N'Djamena, Chad (June 2005,  $n = 21,812$ ); and Dong District, Adamawa State, Nigeria (April 2005,  $n = 16,249$ ), where  $n$  is the total surveyed population in each of the respective areas. While the successes of measles mortality–reduction strategies and progress observed in measles control in other countries of the region are laudable and evident.

Umar (2015), in related study explained that the five child-killer diseases which consist of pneumonia, diarrhoea, measles, tetanus and polio account for at least 60.92 percent of the overall variation in the under-five mortality in Yola, Adamawa State Nigeria. He further explained that there exists a causal relationship between the deaths due pneumonia, diarrhea, measles and tetanus on total under-five mortality with 3.233, 1.038, 5.197 and -3.505 respectively in Yola, Adamawa State Nigeria.

#### 4. Methods and Materials

The research design used in this study is ex post facto and quantitative design. A secondary data of Five Child-killer Diseases and Under-Five Mortality was obtained from Diseases Surveillance and Notification Office (DSNO) of Adamawa State Primary Health Care Development Agency (PHCDA), Yola across the study area for the period of 2001 to 2020.The data consist of the number of children immunized and number of children that were infected and later died due to the Five Child-killer Diseases(Pneumonia, Diarrhoea, Measles, Tetanus, Polio) and the Overall Under-Five Mortality irrespective of the Diseases(OU5MID) within that timeframe

The study used Multiple Regression Analysis to determine the Cause-effect of the Five Child-killer Diseases on Under-Five Mortality in the study area.

The deaths arising from the four child-killer diseases and immunization level after excluding polio was regressed against the Overall Under-Five Mortalities Irrespective of Disease (OU5MID) at 95% confidence interval to examine the extent of the relationship between the child-killer disease and the under-five mortality in the study area. The deaths arising from polio were inherently dropped in this analysis since the data has no mortality or incidences associated with polio. SPSS Version 25 software was used to run the analysis as shown in the output in table 1.

Table 1: Regression Output of the Child-Killer Diseases on Under-Five Mortality

		Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	58.235	19.291		3.019	.009	17.117	99.353
	Pneumonia	2.383	1.515	.334	1.573	.137	-.846	5.611
	Diarrhoea	1.487	.693	.346	2.147	.049	.011	2.964
	Measles	2.740	2.409	.220	1.138	.273	-2.394	7.875
	Tetanus	8.741	11.859	.158	.737	.472	-16.537	34.018

A. Dependent Variable: OU5MID

Source: Researcher’s Results, 2023

**Hypothesis:** There is no Cause-effect of five child-killer diseases on under-five mortality in Yola, Adamawa state Nigeria.

The table 1 above shows that there exists a positive causal relationship between the deaths due pneumonia and the under-five mortality in Yola with  $\beta = 2.383$  and  $p - value > 0.05$ . This results shows that such a relationship is insignificant enough because it was associated with a relatively high level of significant.

The above table 1 also shows that there exists a positively weak causal relationship between the deaths due diarrhea and the under-five mortality in Yola with  $\beta = 1.487$  and  $p - value < 0.05$ . This results shows that such a relationship is

significant enough because it associated with a relatively low P- value.

The above results in table 1 also shows that there exists a positive causal relationship between the deaths due measles and the under-five mortality in Yola with  $\beta = 2.740$  and  $p - value > 0.05$ . This results shows that such a relationship is not significant enough because it also associated with a relatively high P- value.

From table 1 above, the results further shows that there exists a positive causal relationship between the deaths due to tetanus and the under-five mortality in Yola with  $\beta = 8.741$  and  $p - value > 0.05$ . This result also shows that such a relationship is insignificant enough because it also associated with a relatively high P- value.

**Regression Model for Future Prediction/Forecast of Under-Five Mortality**

From table 1 above, the regression model for future prediction of under-five mortality in the study area is given by:

$$OU5MID_t = 58.235 + 2.383Pne_t + 1.487Dia_t + 2.740Mea_t + 8.741Tt_t + \epsilon_i$$

Where:  $\epsilon_i$ , the error term also called the stochastic error term is used to represent all the other variables, that were not captured due to the scope, which includes: access to health services, and demographic, and socio – economic factors, etc which may have influence in the model.

The model explains that; at zero Five Child-Killer Diseases, the Under-Five Mortality is more than 58 deaths.

Table 2: Model Summary of Regression Output of the Child-Killer Diseases on Under-Five Mortality

Model Summary									
Model	R	R Square	Adjusted Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.846a	.716	.640	39.100	.716	9.445	4	15	.001

A. Predictors: (Constant), Tetanus, Diarrhoea, Measles, Pneumonia

Source: Researcher’s Results, 2023

From table 2, the result of the regression analysis shows that, the Five Child-Killer Diseases has a Cause-effect of 64% on Under-Five Mortality in the study area. This shows that a substantial percentage of overall variation in under-five mortality.

It also shows from table 2 that, the overall model is statistically significant with F-statistic,  $F = 9.445$  and  $P - value < 0.05$ .

## 5. Discussion of Findings

In a related study by Umar (2015), the five child-killer diseases account for 60.94 percent under-five mortality in Yola, Adamawa State Nigeria, while this study revealed that the child-killer diseases account for 64 percent of the overall variation in the under-five mortality. This implies that the two studies are in agreement.

Similarly, Orubuloye and Caldwell (2011) in a related study revealed that the child-killer diseases account for than 70 percent under-five mortality, while this study revealed that the child-killer diseases account for 64 percent of the overall variation in the under-five mortality. This can be acceptable due to the fact that the Adamawa state government is succeeding in reducing the under-five mortality due to child-killer diseases in Adamawa State.

Umar (2015), also explained that there exists a causal relationship between the deaths due pneumonia, diarrhea, measles and tetanus on total under-five mortality with 3.233, 1.038, 5.197 and -3.505 respectively in Yola, Adamawa State Nigeria, while this study revealed that the causal relationship between the deaths due pneumonia, diarrhea, measles and tetanus on total under-five mortality with 2.383, 1.487, 2.740 and 8.741 respectively. The two studies are in agreement with causal relationship between the deaths due pneumonia, diarrhea, measles but not in agreement with causal relationship between the deaths due tetanus on total under-five mortality.

## 6. Conclusion

Polio needs to be excluded from the five child-killer disease since the investigation shows that no deaths associated with polio disease for the period of 20 years in the study area.

Although the number of immunised children are increasing year by year, the deaths due to diarrhoea still has a significant causal relationship on total under-five mortality in the study area. In fact, its causal relationship on under-five mortality can call for a significant change in policies for immunisation.

The results also show that the deaths due pneumonia, measles and tetanus have insignificant causal relationship with under-five mortality under period of review in the study area.

Based on findings, the five child-killer diseases considered in this study explain 64% of the overall under-five deaths which is also statistically significant.

The regression model for future Prediction/forecast of under-five mortality in the study area is statistically significant. The model also explains that; at zero five child-killer diseases, the under-five mortality is 58 children.

## 7. Recommendations

Since the study has discovered that; diarrhoea associated significantly with deaths compared to other diseases like Pneumonia, tetanus, measles and polio, Adamawa State Government need to implement the Global Action Plan for Pneumonia and Diarrhoea (GAPPD) 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 child-killer diseases, starting with exclusive breastfeeding for the first 6 months of life.

Adamawa State Primary Health Care Development Agency (PHCDA), Yola whose primary responsibility among orders is to curb and reduce the spread of child-killer diseases among vulnerable children of age; needs to revise and strategies their act plans, because the cause-effect of five child-killer diseases on under-five mortality is still high.

Addressing environmental factors such as air pollution, encouraging sanitation and good hygiene in crowded area would be an ideal solution to reduce the prevalence of the child killer-diseases.

Children infected with HIV/AIDs should be given daily vaccines to reduce the risk of contracting the child killer-diseases like pneumonia and diarrhoea.

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