Prevalence and Trend of Under-Five Mortality in Enugu State

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Abstract

This study focused on the prevalence and trend of under-five mortality in Enugu State (2012-2017). The study adopted the descriptive survey research design. The population for the study was 5241 available health records on under-five morbidity and mortality in Enugu State (2012-2017). All the available 5241 health records on under- five morbidity and mortality was used for the study. The instrument used for the research was the adapted proforma also known as the under-five mortality inventory (U5MI). The validity and reliability of the instrument were established using Pearson reliability and split half method. The research questions were answered using frequencies and percentages as well as index numbers. The Chi-square statistics was used to test the null hypotheses at .05 level of significance. The findings of the study were as follows: Under-five mortality (U5M) of 83 per 1000 live births (8.3%) was recorded in Enugu State between 2012 and 2017 which was high when compared with the Sustainable Development Goal recommendation of 25 per 1000 live births. The highest U5M was recorded in 2017 (117- 26.8%). The U5M in Enugu State showed an upward trend between 2012 and 2017 as 2017 was seen to have the highest cases. Age has a statistical significant difference in U5M ($x^2 = 117.812$, df = 64, P = .000 < .05). Gender has no statistical significant difference in U5M ($x^2 = 37.937$, Df = 32, P = .217 > .05). Place of residence of the under-fives has a statistical significant difference in U5M ($x^2 = 47.779$, Df = 32, P= .036 < .05). It is therefore recommended among other things that there should be substantial improvement and implementation of health policies by under-five children stakeholders to improve their health care for increased health and survival in order to be able to meet the SDG4 which is U5M of not more than 25 per 1000 live births in Enugu State before the year 2030.

Keywords: Prevalence, Trend, Under-five, Mortality, Under-five mortality

Introduction

Under-five mortality represents one of the most serious challenges facing the international community because of insufficient decrease in under- five mortality rate in most developing countries. Despite government, health professionals and policy makers' exclusive interest in reducing the prevalence of under-five mortality, the UN reported insufficiency in the effort among most African countries. World Bank [WB] (2016) reported that the under-five mortality reduction is one of the goals that lagged farthest behind in the MDG. This according to the WB is because more than half (65%) of the countries globally was not on track to reduce under-five mortality as stipulated by the Sustainable Development Goals three, Nigeria inclusive. In developed countries, the under-five mortality is at 7 per 1000, while in the least developed countries, it is as high as 63 per 1000 (Lockyer, 2014). This is supported by Kweifio-Okai and Galatsidas (2016) where it was observed that there had been substantial progress in reducing under-five mortality over the past 15 years in the world, but not enough to achieve the goal of a reduction by two- thirds especially in developing countries.

The goal four of the MDGs set out by the United Nations in the year 2000 was to reduce under-five mortality by two thirds (i.e. 90 to 30 per 1000 live births) in 2015. With the end of the MDG era, the international community agreed on a new framework- the Sustainable Development Goals three (SDG3) where the target is for all countries to reduce under- five mortality to at least as low as 25 per 1000 live births by 2030 (WHO, 2019). Therefore, with the SDG3 substantially reducing under- five child mortality rate by 2015, the momentum to promote under- five children survival must be improved (Tsai, 2016). Currently 47 countries will not meet the SDG target of 25 deaths per 1000 live births by 2030 if they continue their current trends in reducing under-five mortality and 34 of these countries are in sub-Sahara Africa (African Health Organization [AHO], 2020).

Adeyele (2015) reported that although commendable reduction in under-five mortality has been made and recorded in most developing countries in the recent past, it remains a major public health issue in Nigeria. Additionally, World Health Organization (2015) reported that more than 90 percent of under-five mortality occurs in African countries including Nigeria which account for 13 per cent of all the deaths. In close proximity with the earlier observations United Nation's Children Fund (UNICEF, 2015b) estimated that Nigeria alone has a share of 11 per cent of the burden of under-five mortality and that every single day Nigeria loses about 2,300 under-five year old which make the country the second largest contributor to under-five mortality rate in the world. Estimates developed by the UN inter-agency group for child mortality estimation which projected data for 2015 from UN population division observed that under-five mortality in Nigeria from the periods of 2011-2015 is 126, 121, 117, 113, and 109 per 1000 live births respectively (World Bank, 2016). This made Nigeria to be included among the five countries where about half of all under- five deaths in the world took place (United Nations, 2017).

Under-five is a period between 0-5 years of age. The under-five according to Herring (2022) have been used in many societies to indicate lack of self-sufficiency, understanding and wisdom which makes them vulnerable and dependent on adult protection and development of welfare for reduction in infant and child mortality. Additionally, Raising children Network (2023) described under-five as the first five years of life; a time when children grow strong and confident with the love and encouragement of their family and an extended community of caring adults; and which also refers to the state and condition of a child's life and to the quality of those years. Under- five children survive and develop in good health when their right to good quality health care, clean and safe drinking water, nutritious food and safe environment and information are achievable for them to stay healthy (UNICEF, 2015d). Therefore more prosperous states have better laws, increased budget allocations, and better services created for the survival of the under- fives. In the context of this work under-five is defined as the first five years of life in which there is significant need and dependence on adults (especially parents) due to exposures to risks that may lead to death or mortality.

Children between 0-5 years old need to be protected from death. According to Socially Responsible Society (SOS, 2015), under-five mortality is the death of children under the age of five years. This is similar with the definition of the World Bank (2016) which defined under-five mortality as the probability per 1000 that a new born baby will die before reaching the age of five years. In the context of this work, under-five mortality is defined as undesirable occurrence which is the death of children before reaching the age of five years old as a result of some avoidable risk factors and preventable causes. Precious, but vulnerable lives of under- five children can be lost early when adequate care is not taken. According to Murrithi, and Murrithi (2015), under-five U5M can be caused by a myriad of factors and analyzed in three age periods: Mortality from birth to one month, referred to as neonatal mortality, mortality from one month to the age of 12 months, referred to as infant mortality; and mortality from above 12 months to the age of 60 months, referred to as child mortality.

This study focuses on the three groups because they all fall within 0-5 years of age and are considered most vulnerable in public health. The loss of children's life at the tender age of 0-5 can be presented in frequencies and rates for clearer pictures. Under-five mortality rate (U5MR) as defined by Byiringiro (2021) is the annual number of deaths of children under 5 years of age per 1000 live births. UNICEF (2023b) also defined U5MR as the probability that a newborn would die before reaching exactly 5 years of age, expressed per 1000 live births. This according to Tekin (2021), is directly related to the development and economic level of a country whereby high rates are observed in low and middle income countries. Under-five mortality data can be examined with rates as well as trend.

Prevalence means the proportion of people with a particular attribute in a given population at a given time period. National Institute of Mental Health (NIMH, 2016) defined prevalence as the proportion of a population that has specific characteristics in a given time period. Prevalence is usually expressed as a percentage (5% or 5 people out of 100) or as number of cases per 1000, 10, 000 or 100, 000. Therefore, the prevalence of mortality among children (0-5 years) in this study is seen as the total number of deaths of children within a specific time frame which also helps to indicate the state of health of other children in the same age. This study covers the prevalence of U5M from 2012 through 2017. Determining the prevalence of under-five mortality with the socio- demographic variables of age and gender will help in identifying the under- fives that are most vulnerable to disease and death.

Examining data on under-five mortality over time with the use of trend makes it possible to predict future frequencies and rates of occurrence. In the Glossary of Epidemiology Terms (2015) trend is defined as a long term movement or change in frequency, usually upwards or downwards. Barratt and Shantikumar (2018) noted that trend in factors such as rates of diseases and death are often used by public health professional to assist in health care need assessments, service planning and policy development. In time trend analysis, comparisons are made between groups to help draw conclusions and observations are recorded using prevalence reports.

Determining the prevalence of under-five mortality with the socio- demographic variables of age and gender will help in identifying the under- fives that are most vulnerable to disease and death in order to make relevant decisions concerning reduction in under-five mortality. Socio- demographic variables in a population are characteristics of that population. These characteristics include age, gender, educational level, and others which can be expressed statistically (Cheprasov, 2016). Under-five mortality variables of age and gender were determined in this study. UNICEF (2018) observed that the first 28 days of life- the neonatal period is the most vulnerable time for a child's survival, while Byiringiro (2021) opined that high mortality rates persist in older children in developing countries, although the first year may represent the period of highest risk. WHO (2019) highlighted that male infants have a higher risk of mortality during the first year of life than the female, although there may be differential treatment of boys and girls which may also affect chances of survival during the under-five. Therefore, this indicates that female infants receive less attention than males in some cultures, especially where there are already several female children (Van Malderen et al., 2019).

The study of the prevalence and trend of under-five mortality is based on the recommendation of the Life History Theory which explains that the study of observed life patterns of living organisms over time is important to expose certain conditions that affects survival. Obstacles in reducing under-five mortality abound in developing countries. Many developing countries suffer from a lack of services supporting adequate living conditions, nutrition and health care that contributes to the increased under-five mortality rate (SOS, 2015). But, Malawi's notable progress proves developing and impoverished countries are capable of keeping more kids alive by committing more government funds to healthcare,

prioritizing maternal care and bringing health resources to rural areas (Global Motherhood Save the Children, 2015). Under- five children survive and develop in good health when their right to good quality health care, clean and safe drinking water, nutritious food and safe environment and information are achievable for them to stay healthy (UNICEF, 2015d). Therefore more prosperous states have better laws, increased budget allocations, and better cares and services created for the survival of the under- fives at homes and in communities. The most important reason to review under-five mortality is to help improve the under-five children health and safety and to prevent them from dying (Examplars, 2023). The situation becomes more worrisome when researchers are not certain about the prevalence and trend of under-five mortality in Enugu State people. The purpose of this study was to determine the prevalence and trend of under-five mortality (U5M) in Enugu State within the period of 2012-2017.

Right data interpretation has not been established in Enugu State for under-five mortality which is necessary to form the basis of advocacy because data inform policy decision and help to track progress of goal. Hence, U5M indicator is very vital for evaluation and planning of public health strategies. Nigeria continues to bear the heaviest burden of under- five children's deaths as the second largest contributor to under-five mortality in the world. This implies that threats still face under- five survivals, requiring additional attention. While Argentina has a record of 7 per 1000 live births, Nigeria still has a record of 111 per 1000 live births in 2021 (World Bank, 2024). Prevalence and trend of U5M in Enugu State has not been statistically established and understood to address continuous improvement in the health and survival of the under-fives through policies and interventions to reduce mortality and nudge up health and life expectancy for the achievement of the SDG3. It is against this backdrop that the present study becomes crucial. The question arose as to what is the prevalence and trend of under-five mortality in Enugu State, Nigeria?

Purpose of the Study
The purpose of the study was to determine the prevalence and trend of under-five mortality in Enugu State (2012-2017). Specifically, this study sought to determine:
1. the rate of under-five mortality in Enugu State;
2. the prevalence of under-five mortality from 2012-2017 in Enugu State; and
3. the trend of under-five mortality in Enugu State;

Research Questions
Based on the purpose of the study, the following research questions were posed.
1. What is the rate of under-five mortality in Enugu State?
2. What is the prevalence of under-five mortality in Enugu State from 2012-2017?
3. What is the trend of under-five mortality in Enugu State?

Hypotheses
The following hypotheses were postulated to further guide the study and were tested at .05 level of significance.
1. There is no significant difference in the prevalence of under-five mortality from 2012-2017 based on the child's age.
2. There is no significant difference in the prevalence of under-five mortality from 2012-2017 based on the child's gender.

Methods
The study adopted the descriptive survey research design. Shuttleworth (2017) defined descriptive research design as a scientific method which involves observing and describing the behaviour of a subject without influencing it in any way. The area of the study is Enugu

State. The population for the study comprised all the 5241 available health records on under-five morbidity and mortality between 2012 and 2017 in the health facilities.

The instrument used for data collection for the study was the Pro- forma known as under-five Mortality Inventory (U5MI) adapted from the United Nations High Commissioner for Refugees- UNHCR (2020) guidelines for mortality surveillance. The face validity of the U5MI was established through the services of five experts from the Department of Human Kinetics and Health Education, University of Nigeria Nsukka. Frequency and percentage were used to answer research questions 1 and 2. Index number statistics was used to answer research question 3 which was on trend. Chi-square statistics was used to test the null hypotheses at .05 level of significance.

Results

Table 1: **Under-five Mortality Rate in Enugu State (n=437)**

Year	Under5 Admission	Under5 deaths	Under5M rates	%
2012	673	39	58	5.8
2013	921	69	75	7.5
2014	537	41	76	7.6
2015	967	68	70	7.0
2016	1053	103	98	9.8
2017	1090	117	107	10.7
Total	**5241**	**437**	**83**	**8.3**

Results in Table 1 showed that the overall under-five mortality rate in Enugu State from 2012 to 2017 was 83 per 1000 live births. The table showed that the rates increased over the years until 2017 emerged with the highest number of deaths and rate.

Table 2: Prevalence of Under-five Mortality in Enugu State from 2012- 2017(n=437)

S/N	Causes	2012 f	2012 %	2013 f	2013 %	2014 f	2014 %	2015 f	2015 %	2016 f	2016 %	2017 f	2017 %
1	Abdominal trauma	0	0	0	0	0	0	0	0	1	0.3	0	0
2	Acute gastroenteritis	9	23.1	15	21.7	6	14.6	5	7.4	24	7.5	11	3.5
3	Acute kidney injury	0	0	0	0	0	0	1	1.5	1	0.3	0	0
4	Anaemia	2	5.1	4	5.8	4	9.8	8	11.8	3	0.9	10	3.1
5	Aspiration	0	0	0	0	0	0	0	0	0	0	1	0.3
6	Brain disease	0	0	0	0	1	2.4	3	4.4	2	0.6	0	0
7	Cancer	0	0	0	0	0	0	2	2.9	0	0	0	0
8	Chronic gastroenteritis	0	0	1	1.4	0	0	0	0	0	0	0	0
9	Coagulopathy	0	0	2	2.9	1	2.4	2	2.9	3	0.9	2	0.6
10	Dactylitis	0	0	0	0	0	0	1	1.5	0	0	0	0
11	Diarrhoea	0	0	0	0	0	0	1	1.5	0	0	0	0
12	Down syndrome	0	0	1	1.4	0	0	0	0	0	0	1	0.3
13	Febrile seizure	0	0	0	0	1	2.4	1	1.5	1	0.3	0	0
14	Failure to thrive	0	0	0	0	0	0	1	1.5	0	0	0	0
15	Heart disease	0	0	2	2.9	2	4.9	3	4.4	4	1.3	5	1.6
16	Hepatitis	0	0	1	1.4	0	0	0	0	0	0	0	0
17	Hyperglycaemia	0	0	0	0	0	0	0	0	2	0.6	0	0

| #	Disease												
18	Hypoglycaemia	0	0	0	0	1	2.4	0	0	0	0	2	0.6
19	Injury	0	0	0	0	0	0	1	1.5	0	0	0	0
20	Intussusception	0	0	0	0	0	0	1	1.5	2	0.6	2	0.6
21	Kidney disease	0	0	0	0	0	0	1	1.5	0	0	0	0
22	Malaria	4	10.3	9	13.0	2	4.9	3	4.4	3	0.9	8	2.5
23	Malnutrition	3	7.7	2	2.9	1	2.4	2	2.9	3	0.9	4	1.3
24	Marasmus	0	0	1	1.4	0	0	0	0	0	0	0	0
25	Meningitis	4	10.3	4	5.8	2	4.9	4	5.9	7	2.2	7	2.2
26	Pneumonia	4	10.3	5	7.2	6	14.6	8	11.8	2	0.6	10	3.1
27	Poliomyelitis	2	5.1	0	0	0	0	0	0	0	0	0	0
28	Respiratory disease	0	0	0	0	1	2.4	0	0	1	0.3	3	0.9
29	Sepsis	11	28.2	21	30.4	12	29.3	18	26.5	42	13.2	50	15.7
30	Sickle cell anaemia	0	0	0	0	0	0	2	2.9	0	0	1	0.3
31	Subcutaneous emphysema	0	0	1	1.4	0	0	0	0	0	0	0	0
32	Tonsilitis	0	0	0	0	1	2.4	0	0	1	0.3	0	0
33	Urinary tract infection	0	0	0	0	0	0	0	0	1	0.3	0	0
	Total	**39**	**100**	**69**	**100**	**41**	**100**	**68**	**100**	**103**	**100**	**117**	**100**
	Overall %		8.9		15.8		9.4		15.6		23.6		26.8

Results in Table 2 showed that under-five mortality in Enugu state increased from 39(8.9%) in 2012 to 69(15.8%) in 2013 and slightly decreased to 41(9.4%) in 2014. Subsequently, the number of under-five deaths continued to increase from 68(15.6%) in 2015 to 103(23.6%) and 117(26.8%) in 2016 and 2017 respectively. Therefore, it can be seen that 2017 has the highest number of under-five deaths.

Table 3: The Trend of Under-five Mortality in Enugu State (n=437)

Year	U5M Cases	Index Number	Number of Females	Index Number	Number of Males	Index Number
2012	39	100	18	100	21	100
2013	69	177	30	167	39	186
2014	41	105	18	100	23	110
2015	68	174	34	189	33	157
2016	103	264	51	283	52	248
2017	117	300	53	294	64	356
Total	**437**	**1120**	**204**	**1133**	**233**	**1157**

Results in Table 7 showed that under-five mortality in Enugu State increased from 39 in 2012 to 69 in 2013 with index number of 177 in 2013.There was a slight decrease to 41 with index number 105 in 2014 followed by continued increase in 2015 followed by a sudden surge in 2016 and the highest occurrence in 2017 which has 117 cases with index number of 300.The Table also shows variation in the male and female trends with the males having more cases. In general, the under-five mortality is described in this Table as increase in trend using 2012 as the baseline year.

Graphic Representation of Under-five Mortality in Enugu State (2012-2017)
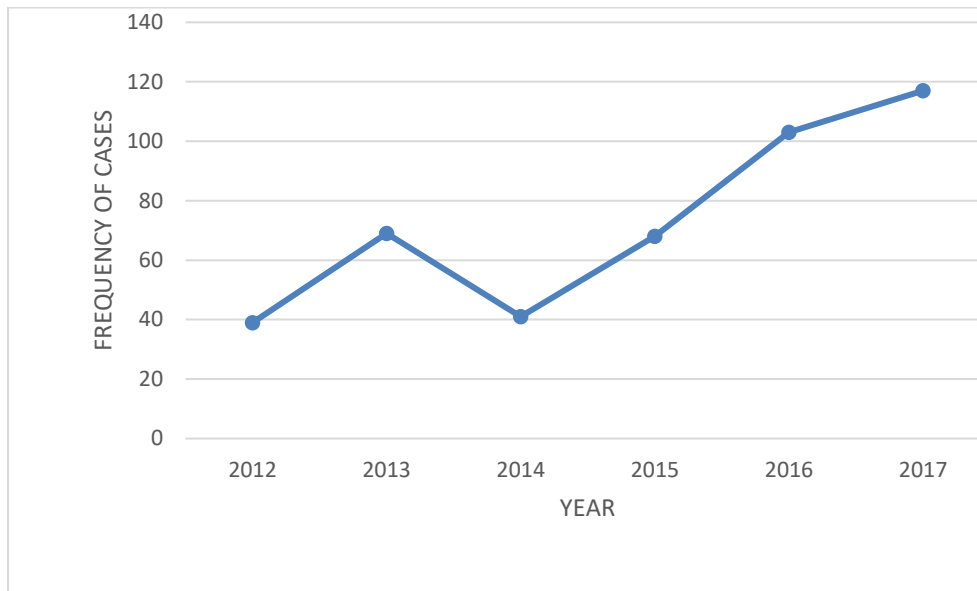
The above graph showed that the under-five mortality for the five years period (2012-2017) is described as increase in trend using 2012 as the baseline year

Table 4: Summary of Chi-square (x^2) Testing Null Hypothesis of no Significant Difference in the Prevalence of Under- five mortality from 2012 – 2017 based on the Child's Age

S/N	Causes of Mortality	Age						Total	
		0-1m		1m-1yr		1ys-5ys			
		O	E	O	E	O	E	O	E
1	Abdominal trauma	0	.0	0	.6	1	.4	1	1.0
2	Acute gastroenteritis	1	2.3	46	40.1	23	27.6	70	70.0
3	Acute kidney injury	0	.1	2	1.1	0	.8	2	2.0
4	Anaemia	0	.6	1	10.3	17	7.1	18	18.0
5	Aspiration	1	.0	0	.6	0	.4	1	1.0
6	Brain disease	1	.2	3	3.4	2	2.4	6	6.0
7	Cancer	0	.1	0	1.1	2	.8	2	2.0
8	Chronic gastroenteritis	0	.0	0	.6	1	.4	1	1.0
9	Coagulopathy	1	.3	4	5.7	5	3.9	10	10.0
10	Dactylitis	0	.0	0	.6	1	.4	1	1.0
11	Diarrhoea	0	.0	0	.6	1	.4	1	1.0
12	Down syndrome	0	.1	2	1.1	0	.8	2	2.0
13	Febrile seizure	0	.1	0	1.7	3	1.2	3	3.0
14	Failure to thrive	0	.0	1	.6	0	.4	1	1.0
15	Heart disease	2	.5	8	9.2	6	6.3	16	16.0
16	Hepatitis	0	.0	0	.6	1	.4	1	1.0
17	Hyperglycaemia	0	.1	1	1.1	1	.8	2	2.0
18	Hypoglycaemia	0	.1	3	1.7	0	1.2	3	3.0
19	Injury	0	.0	0	.6	1	.4	1	1.0
20	Intussusception	0	.2	3	2.9	2	2.0	5	5.0
21	Kidney disease	0	.0	0	.6	1	.4	1	1.0
22	Malaria	0	1.0	9	16.6	20	11.4	29	29.0
23	Malnutrition	0	.5	10	8.6	5	5.9	15	15.0
24	Marasmus	0	.0	1	.6	0	.4	1	1.0
25	Meningitis	1	.9	22	16.0	5	11.0	28	28.0
26	Pneumonia	2	1.2	22	20.1	11	13.8	35	35.0
27	Poliomyelitis	0	.1	1	1.1	1	.8	2	2.0
28	Respiratory disease	0	.2	1	2.9	4	2.0	5	5.0

29	Sepsis	5	5.1	99	88.3	50	60.7	154	154.0
30	Sickle cell anaemia	0	.1	1	1.7	2	1.2	3	3.0
31	Subcutaneous emphysema	0	.0	1	.6	0	.4	1	1.0
32	Tonsilitis	0	.1	1	1.1	1	.8	2	2.0
33	Urinary tract infection	0	.0	1	.6	0	.4	1	1.0
	Total	14	(14.0)	243	(243.0)	167	(167.0)	424	(424.0)

where O is the observed frequency and E the expected frequency

x^2**cal = 117.812, P-value= 0.000**

Data in Table 4 shows that the Chi- square value of 117.812 with a p- value of .000 which is less than .05 level of significance was observed. This indicates that there is significant difference in under-five mortality based on the age of the child. The null hypothesis of no significant difference in the prevalence of under-five mortality based on the age of the child was therefore rejected. This implies that U5M varies as a child move from one age of under-five to another.

Table 5: Summary of Chi-square (x^2) Testing Null Hypothesis of no Significant Difference in the Prevalence of Under- five mortality from 2012 – 2017 based on the Child's Gender

S/N	Causes of Mortality	Gender				Total	
		Females		**Males**			
		O	**E**	**O**	**E**	**O**	**E**
1	Abdominal trauma	0	.5	1	.5	1	1.0
2	Acute gastroenteritis	33	31.7	37	38.3	70	70.0
3	Acute kidney injury	0	.9	2	1.1	2	2.0
4	Anaemia	13	14.0	18	17.0	31	31.0
5	Aspiration	1	.5	0	.5	1	1.0
6	Brain disease	4	2.7	2	3.3	6	6.0
7	Cancer	0	.9	2	1.1	2	2.0
8	Chronic gastroenteritis	0	.5	1	.5	1	1.0
9	Coagulopathy	5	4.5	5	5.5	10	10.0
10	Dactylitis	1	.5	0	.5	1	1.0
11	Diarrhoea	1	.5	0	.5	1	1.0
12	Down syndrome	1	.9	1	1.1	2	2.0
13	Febrile seizure	2	1.4	1	1.6	3	3.0
14	Failure to thrive	0	.5	1	.5	1	1.0
15	Heart disease	1	2.3	4	2.7	5	5.0
16	Hepatitis	0	.5	1	.5	1	1.0
17	Hyperglycaemia	2	.9	0	1.1	2	2.0
18	Hypoglycaemia	1	1.4	2	1.6	3	3.0
19	Injury	0	.5	1	.5	1	1.0
20	Intussusception	0	2.3	5	2.7	5	5.0
21	Kidney disease	0	.5	1	.5	1	1.0
22	Malaria	18	13.1	11	15.9	29	29.0
23	Malnutrition	7	6.8	8	8.2	15	15.0
24	Marasmus	1	.50	0	.5	1	1.0
25	Meningitis	16	12.7	12	15.3	28	28.0
26	Pneumonia	14	15.9	21	19.1	35	35.0
27	Poliomyelitis	0	.9	2	1.1	2	2.0
28	Respiratory disease	1	2.3	4	2.7	5	5.0
29	Sepsis	69	69.8	85	84.2	154	154.0
30	Sickle cell anaemia	0	1.4	3	1.6	3	3.0)
31	Subcutaneous emphysema	0	.5	1	.5	1	1.0
32	Tonsilitis	2	.9	0	1.1	2	2.0
33	Urinary tract infection	0	.5	1	.5	1	1.0
	Total	193	193.0	233	233.0	426	426.0

where O is the observed frequency and E the expected frequency

x^2cal = 37.937, p-value = .217

Data in Table 5 shows that the Chi- square value of 37.937 with a p- value of .217 which is more than .05 level of significance at 32 degree of freedom was observed. This indicates that there is no significant difference in under-five deaths based on the gender of the child. The null hypothesis of no significant difference in the prevalence of under-five mortality based on the gender of the child was therefore accepted. This implies that under-five mortality does not vary with the gender of the under-fives due to their level of vulnerability at this stage in life.

Discussion

Overall U5M of 437(8.3%) was recorded out of 5241 under- five children hospital admissions. Therefore, 437 out of the 5241 under five children admitted within the period of January 2012 to December 2017 died before their fifth birthday. This showed an under- five mortality rate of 83 per 1000 live births. Considering the recommendation of the Sustainable Development Goals (SDG) where the target is for all countries to reduce under- five mortality to at least as low as 25 per 1000 live births (2.5%) by 2030 (WHO, 2019) this result is high and does not show much progress, but still lower than the record of Aigbe and Zannu (2012) which showed that the entire Southeast recorded U5M of 153 per 1000 live births. Agbesanwa et al. (2023) recorded 7 percent deaths in Ekiti State. India has 824000 deaths while Nigeria recorded 858000 deaths out of 5.2 million under- five deaths in the world in 2019 to badge the new world capital of under-five deaths. U5M remain a critical issue in Enugu state which needs to be addressed for continued reduction. The result of the study shows that many under- five children do not survive to reach their full potential in Enugu State and less progress is made towards reduction. This may be because the quality of stimulation, support and nurturance given to them by their care givers is deficient and health policies for the under- fives are poorly implemented. Also, insufficient support for health intervention with less commitment given towards the prevention and management of certain diseases that cause death in the under- five children may also be contributory to the lack of progress. Therefore, there will be less mortality if more commitment and prioritization is shown in the management of diseases causing most of the deaths in the under-five children.

In Enugu State the lowest U5M of 39(8.9%) was recorded in 2012. The rate continued to increase from 41(9.4%) in 2014 to 68(15.6%), 103(23.6%) and 117(26.8%) in 2015, 2016 and 2017 respectively. This shows that U5M is on the increase from one year to another. Aigbe and Zannu (2012) also observed that under-five mortality of 1999 is lower than that of 2008 in Nigeria which is similar with the result of the present study. Contrary to the present study are the reports of Were et al. (2015) and Murrithi and Murrithi (2015) which states that U5M is decreasing in most developing countries. Also, the estimates developed by the UN inter- agency group for child mortality estimation projected data for 2015 from UN population division which observed that U5M in Nigeria from 2011-2015 is 126, 121, 117, 113, and 109 per 1000 live births respectively (World Bank, 2016) which is on the decrease although still high. This made the agencies to warn that huge challenge still remains in the reduction of U5M in Nigeria. In Ethiopia, Deribew et al. (2016) observed a total reduction of 64 percent in under-five mortality from 1990-2013 to meet the MDG4 in 2013 by making health a national priority. Adeyele (2015) opined that commendable reduction in U5M has been made and recorded in most developing countries in the recent years, but still remain a public health issue in Nigeria. This may be due to weak health system and poverty. Neglect of primary health care centers and unavailability of primary health care workers may be contributory to this because some health centers are left abandoned and the patients unattended to. Also, difficulties in practicing preventive cares, accessing health facilities and low health seeking behaviour of parents which are likely reasons for the persistent increase rather than decrease in under-five mortality in Enugu State may be as a result of lack of fund.

With the use of index number statistics under-five mortality is described in this study as increase in trend using 2012 as the baseline year. The result shows that under-five mortality in Enugu State increased from 39 in 2012 to 69 in 2013 with index number of 177 in 2013. There was a slight decrease to 41 with index number 105 in 2014 followed by continued increase in 2015 and a sudden surge in 2016 with the highest occurrence in 2017 which has 117 cases and index number of 300. The result also shows variation in the male and female trends with the males having more cases. This still indicate poor health outcomes for some under-five children in Enugu State. This result is similar with the record of Aigbe and Zannu (2012) that under-five mortality in the Southeast was 135 percent in 1999 and 153 percent in 2008. Nevertheless, this is contrary with the report of United Nation Inter-agency Group for child mortality estimation (2015) that in 2015 the number of under-five deaths fell to 5.9million due to increased efforts towards reduction in under-five mortality in some countries. Estimates developed by the UN inter- agency group for child mortality estimation which projected data for 2015 from UN population division observed that under-five mortality in Nigeria from the periods of 2011-2015 is 126, 121, 117, 113 and 109 per 1000 live births respectively (World Bank, 2016). This shows a downward trend when compared to the result in Enugu State which is continuously rising. Also, Morakinyo and Fagbamigbe (2017) reported that U5M reduced continuously in 2003, 2008 and 2013 (201, 157 and 128 respectively) in Nigeria. Rise in the U5M in Enugu state may be due to lack of or non-use of service supporting adequate living conditions, nutrition and health care as suggested by SOS (2015). Malawi which is also a developing country had notable progress in keeping more kids alive by committing more government funds to healthcare, prioritizing maternal care and bringing health resources to rural areas (Global Motherhood Save the Children, 2015). This proves that other developing countries can try better as well to reduce U5M by increasing the momentum to improve child survival (Tsai, 2016). Health care efforts have to improve to ensure that the recommended target is met in Enugu State. However, the cost of living in Nigeria (Enugu State inclusive) is continuously rising leading people to experience various deprivations in their daily lives such as under nutrition, inadequate living standard and poor access to health care which also contributes to the death of the under- fives. If the pace of progress does not increased in Enugu State the SDG target of an under- five mortality rate of 25 or fewer deaths per 1000 live births by 2030 will not be achieved.

Finding in Table 4 showed that the result of Chi-square found significant difference. Therefore, in this study age have strong links to under-five mortality because it was confirmed that one month- one year of life represent the period of highest risk for U5M in Enugu State. In this case, the null hypothesis of no significant difference in the child's age for under-five mortality was rejected. This is because the Chi- square value of 117.812 with a p-value of .000 which is less than .05 level of significance was observed. This portrays that there is significant difference in under-five mortality based on the age of the child, since under-five mortality was observed to vary as a child move from one stage of under- five to another in this study. The report of this study in Enugu State showed that in the recorded U5M, mortality of 0-1month children has 14 deaths (3.2%) followed by that of the 1yr-5yrs old which is 167(38.2%). The under-five mortality of the 1months-1year is highest according to the records with the number 256(58.6%). This is contrary to the report of BBC News (2015) stated that children have the greatest risk of dying during the first few days of life due to their high vulnerability at this period. Also, Ogbo et al. (2019) and Kartsson et al. (2022) noticed disparities in age distribution of U5M although the neonatal stage has greater share of the deaths. According to Morakinyo and Fagbamigbe (2017), deaths after the first month of life are tied to exogenous factors such as the wealth status of the household, environmental factors, health behaviours and nutritional factors. Therefore, the result of the present study is true considering the fact that majority of Nigerian households are presently facing hardship

due to economic recession which may reduce the care given to a child at the post neonatal stage. This could be because at this point children are at their crucial period of development and may be faced with lower living standards and exposures to malnutrition and infections (especially when they are not immunized or poorly immunized). When care givers are not encouraged with needed resources, they tend to make do with available ones which may not be sufficient to keep some sick under-fives alive at the infancy stage. This may also be due to reduced mother's attachment and attention as most mothers may resume trade or work after two or three months of child delivery which may lead to exposures to harmful external influences at the post neonatal stage.

Finding in Table 5 indicated that gender differentials in U5M was obvious, but without much demarcation with the report which showed that mortality occurred more among the males with the number 233(53.3%) than their female counterparts with the number 204(46.7%). Therefore, the Chi-square statistics of no significant difference in the prevalence of under-five mortality based on the gender of the child was accepted. This is because the Chi-square value of 37.937 with a p-value of .217 which is more than .05 level of significance at 32 degree of freedom was observed. This indicates that there is no significant difference in under-five deaths based on the gender of the child. This is not similar with the report of, Kayode et al. (2012) in a study to identify risk factors and predictive model for under-five mortality in Nigeria where it was discovered that being female reduced odds of U5M by 13 percent. Ezeh, et al (2015) also observed significant factors that influence under-five mortality to include being of male gender (HR= 1.24, Cl 1.12 to 1.38). This is unexpected considering Goli (2015) highlights that there may be differential treatment of boys and girls in favour of the boys because of cultural and socio-economic factors which may also affect chances of survival during the under-five period. This shows that female infants sometimes receive less attention than males in some cultures which includes Enugu State. Mortality is higher in boys especially in the absence of discrimination for both sexes. This is because male babies are biologically weaker can be greatly affected by a stressful environment and unresponsive care than the females because the male brain that regulate stress mature slower which cause them to show higher reaction to negative stimuli (Schore, 2017). The results of the various studies notwithstanding, the implication of the present study result is that under-five mortality does not vary with the gender of the under-fives because the level of female-male vulnerability at this stage in life appears to be the same. This shows that harmful influences can attack any under-five child and cause mortality notwithstanding the gender, depending on the immune status of the child which may help to prevent illness and death.

Conclusion

In an effort to examine the prevalence and trend of under-five mortality in Enugu State concepts, theories and empirical literatures were reviewed and data were collected and analyzed. Based on the results it was concluded that the U5M rate of 83 per 1000 live births (8.3 %) realized in Enugu State for the six years period of 2012-2017 was high. Although the U5M was high in all years, 2017 has the highest under-five deaths which also helped to indicate that the under-five mortality trend was upward in Enugu State. Furthermore, the socio-demographic variables of child's age and gender have joint influence on U5M although gender had no statistical significant difference on the mortality.

Recommendations

1. The best societal investment should be for the government, parents, health care providers and health educators to address the continuous increase rather than decrease in U5M in Enugu state through substantial improvement in under-five care and implementation of health policies and programmes in an effort to meet the Sustainable

Development Goals 3 (SDG3) target of not more than 25 per 1000 live births for U5M rate by 2030.

2. There should be improved commitment by the government, parents and health care providers to enhance chances of survival for all under- five children in Enugu State through efforts such as improved budget on health care, improved socio-economic condition of the people, reduced inequalities in access to care, responsive care for all under-fives and adequate protection of the under-fives against harmful influences.

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