International Journal of Medical and Clinical Research
ISSN:0976-5530 & E-ISSN:0976-5549, Volume 3, Issue 6, 2012, pp.-199-202.
Available online at http://www.bioinfo.in/contents.php?id=39

INVESTIGATION OF MORBIDITY AND MORTALITY RATES OF CHILDREN 0-11 MONTHS IN KENEMA DISTRICT, EASTERN SIERRA LEONE: 12 MONTHS DATABASE STUDY

KANGBAI J.B.

Department of Environmental Health Sciences, School of Community Health Sciences, Njala University Sierra Leone.
*Corresponding Author: Email- jiakangbai@hotmail.com

Received: July 06, 2012; Accepted: July 18, 2012

Abstract-
Objective- To investigate the 2010 reported morbidity and mortality rates for five major childhood diseases; malaria, anemia, diarrhea, acute respiratory infection (ARI) and worm infestation affecting children 0-11 months in Kenema District, eastern Sierra Leone.
Design and Setting- Analysis of admission data collected in 120 public health units for children 0-11months who sought healthcare interventions for malaria, anemia, diarrhea, acute respiratory infection (ARI) and worm infestation; and 60 questionnaires administered to primary health unit (PHU) in-charges in Kenema District in 2010. Kenema District has an area of 6,053km2 and is divided into sixteen chiefdoms with a total population of 497,948 inhabitants.
Subjects- Children 0-11months who received healthcare interventions for malaria, anemia, diarrhea, acute respiratory infection (ARI) and worm infestation in 120 PHUs in Kenema District in 2010. 82,161 children below five years reside in Kenema District. Children 12-59 months were excluded from this study so also are U5 children residing outside the study area but sought treatment in Kenema District in 2010.
Main Outcome Measures- Case specific morbidity and mortality rates for malaria, anemia, diarrhea, acute respiratory infection and worm infestation for children 0-11 months attending 120 PHUs in Kenema District, Sierra Leone.
Results- Malaria recorded the highest morbidity (51.56%) for the five major childhood diseases in 2010. Worm infestation recorded the lowest (0.88%) morbidity. May month recorded the highest (6.5%) cases of malaria for children 0-11months. Malaria accounts for the greatest (45.05%) cause of mortality; the highest (13.96%) mortality rate for malaria was recorded in June. Anemia and ARI have almost similar (22.07% Vs 22.56%) mortality rates for children 0-11months.
Conclusion- A large proportion (80%) of the mortality and morbidity rates for children 0-11 months in Kenema District occurred in the onset (May-June) of the raining season. Malaria accounted for the highest annual morbidity (51.56%) and mortality (45.05%) for children 0-11 months in the study area. Healthcare measures such as vaccinations, antibiotic and oral rehydration therapies that are often taken for granted in wealthy countries can save millions of lives for relatively little cost in Kenema District, eastern Sierra Leone.
Key words- Malaria, anemia, diarrhea, acute respiratory infection, infestation, morbidity, mortality, under-five, annual, healthcare, primary health unit.

Citation: Kangbai J.B. (2012) Investigation of Morbidity and Mortality Rates of Children 0-11 Months in Kenema District, Eastern Sierra Leone: 12 Months Database Study. International Journal of Medical and Clinical Research,ISSN:0976-5530 & E-ISSN:0976-5549, Volume 3, Issue 6, pp.-199-202.

Introduction

Majority of Sierra Leone's population live in rural areas where few healthcare services are available. The sources of healthcare services in Sierra Leone are the Government of Sierra Leone through the Ministry of Health and Sanitation (MoHS), non government organizations (NGOs), private and traditional healthcare givers.
The main causes of under-five children morbidity and mortality in Sierra Leone are related to preventable and communicable diseases including measles, acute respiratory infections, diarrhea, malaria, malnutrition and poor sanitary situation.

A 2003/2004 National Household Survey discovered that 70% of the total population in Sierra Leone lives below the National Poverty Line (0.5p a day) and 26% live in extreme poverty [1]. The infant mortality rate (IMR) for Sierra Leone dropped from 165 to 115 per 1000 live births from 1991 to 2004 respectively; its registered regional under-five mortality rates for 2004 were 147 Vs 180 per 1000 live births for eastern and southern Sierra Leone respectively [2].

The primary causes of childhood mortality changes with a child's age but most of the mortality for children below five years is mostly due to infectious diseases, malnutrition and accident [3]. Sierra Leone's national infants, child and U5 mortality rates differ by regions (Table 1).

Table 1- Regional Variation in Infant, Child and U5 Mortality Rates in Sierra Leone 2004

Location	IMR	CMR	U5MR
Sierra Leone	0.115	0.085	0.194
Eastern Province	0.124	0.096	0.211
Northern Province	0.109	0.08	0.182
Southern Province	0.129	0.1	0.216
Western Area	0.092	0.064	0.151

Source: 2004 National Population census data, Statistics Sierra Leone

Methods

We analyzed the 2010 admission data (Table 2) for 72,221 children 0-11months obtained from 120 PHUs in Kenema District. 82,161 children below five years reside in Kenema District [4]. Admission data were made available to us by the monitoring and evaluation officers attached to the Kenema District Health Information Centre (KDHIC). The KDHIC collates and processes PHU admission data obtained from all primary health units across Kenema District. Kenema District has an area of 6,053km^2 and a population of 497,948 [5]. There are sixteen chiefdoms in Kenema District.

Table 2- Reported Morbidity Rates for Children 0-11 months in Kenema District 2010

Disease	No. of U5 Morbidity (0-11months)	Percentage
Malaria	37234	51.56
Diarrhea	6849	9.48
ARI	26387	36.54
Anemia	1109	1.54
Worm Infestation	642	0.88
TOTAL	72,221	100

Additional data for analysis for this study was also obtained from questionnaires administered to 60 PHU in-charges, district health superintendents, personnel of the district disease surveillance unit and the Kenema Government Hospital pediatric wards. Kenema Government Hospital is the main government referral hospital in eastern Sierra Leone.

All PHU admissions of children above 11months were excluded in this study. The analysis was confined to the morbidity and mortality rates of children 0-11 months who are normal residents of Kenema District and excluded cases that have occurred elsewhere and brought for treatment to Kenema District.

We calculated the 2010 case specific morbidity and mortality rates for the five major childhood diseases (malaria, ARI, diarrhea, anemia and worm infestation) for children 0-11months.

Results

A total of 72,221 children 0-11 months were diagnosed and treated for malaria, ARI, diarrhea, worm infestation and anemia in Kenema District in 2010. The mean age of the children was 9 months.

Malaria recorded the highest (51.56%) morbidity rate but worm infestation cases increase as the child grows older. Worm infestation registered the lowest (0.88%) morbidity rate for this study. The month of May recorded the highest (6.8%) morbidity rate for children 0-11 months while November recorded the lowest (0.4%). The annual morbidity rate for diarrhea and anemia were 9.48% and 1.54% respectively (Table 2).

The highest (7.5%) case of ARI was recorded in May while November registered the lowest (0.4%). ARI accounted for 36.54% of the annual morbidity in 2010.

According to Table 3, malaria was recorded by PHU in-charges in Kenema District as the most common cause of U5 morbidity and mortality in 2010. 31.75% of PHU in-charges say malaria is the most common cause of U5 morbidity during the period under review. 7.14% of PHU in-charges say anemia is a common cause of U5 morbidity in Kenema District in 2010.

Table 3- Common Causes of U5 Morbidity Kenema District 2010

Disease	Frequency	Percentage
Malaria	40	31.75
Diarrhea	30	23.81
ARI	34	26.98
Anemia	09	7.14
Worm Infestation	13	10.32
TOTAL	126	100

45.05% of PHU in-charges say malaria is the most common cause for U5 deaths in Kenema District during the period under review compared to diarrhea, ARI and anemia which have 10.36%, 22.52% and 22.07% respectively (Table 4). Diarrhea was recorded by the PHU in-charges to be the lowest (10.36%) common cause for U5 mortality in this study. Worm infestation was not believed to be a common cause for U5 mortality in Kenema District in 2010. No PHU in-charge say worm infestation was the common cause of U5 mortality during the period under review.

Table 4- Reported Mortality Rates for Children 0-11 months in Kenema District 2010

Disease	No. of U5 Morbidity (0-11months)	Percentage
Malaria	100	45.05
Diarrhea	23	10.36
ARI	50	22.52
Anemia	49	22.07
Worm Infestation	00	00.00
TOTAL	222	100

There were stark differences with respect to the common cause for morbidity and mortality rates for anemia and worm infestation for the period under review. Morbidity rates for anemia and worm infestation were 7.14% and 10.32% respectively while their corresponding mortalities were 22.07% and 0.00% respectively.

February recorded the highest (16%) mortality for malaria. There was no mortality for diarrhea for the months of March and July. April, June and July recorded the highest (14.29%) mortality rate for anemia but there were equal mortalities (6.12%) for anemia in February, March, May, September and November. The months of April, June, October, November and December recorded equal mortality rate (8.70%) for diarrhea.

Discussion

The main strength of this study are that it is a large population base study of 72,221 children and it used database that had incorporated systematic follow up through admission record linkage to data from death certificates. The main limitation of the study is that clinical information recorded about individual patients was confined to basic diagnostic and demographic data.

Under-five children constitute 49% of consultations at PHUs in Sierra Leone [7]. 163,204 children below five years were diagnosed for the five major childhood diseases; malaria, anemia, diarrhea, ARI and anemia in 120 PHUs in Kenema District in 2010.

Malaria accounts for 38% of the overall national disease burden for under-five children [7] and is the largest cause of infant mortality; in 2008 it annually contributed 33% to the total deaths of children below five years [8] in Sierra Leone. Most malaria infections, and its most severe morbidity and mortality in Sub Saharan Africa are due to *Plasmodium falciparium* [9].

May recorded the highest (6.55%) morbidity for malaria affecting children 0-11 months. The high prevalence of malaria in May could be as a result of the sudden change in the climate and the resulting environmental modifications which led to an increase in the density and migration of the mosquito vectors that transmit malaria. The high malaria prevalence in the month of May may also not be unconnected to an influx of malaria non-immune into the study area.

In Sierra Leone, the early rain which prepares the land for farming activities usually comes in mid-April. Though these rains are not continuous or intense, their irregular occurrence coupled with the existing poor sanitation creates favourable breeding sites for mosquitoes.

Also connected to environmental modification and agriculture is the employing of community members from one community to assist in the agriculture activities in another community. Majority of Sierra Leoneans are malaria non-immunes. When malaria non-immunes community agriculture assistants influx into a malaria endemic community such non-immunes have the tendency to increase the malaria prevalence in their new environment because of their non immune status.

The high malaria mortality recorded in June may be accounted for by the fact that the month of May registered the highest morbidity for the infection in 2010. With the onset of the rains in mid-April there is an upsurge in malaria prevalence. This coupled with the lack of treatment or incomplete treatment may have led to the accumulation of malaria cases and hence high mortality in the subsequent June month.

About 1.4 million deaths per year among children under five are due to diarrhea [11]. May recorded the highest (8.5%) morbidity for this study which could be attributed to the switch from dry season to raining season, the poor hygienic practices, poor environmental sanitation and other environmental factors. The early rains in the month of April may have contaminated the sources of drinking water for communities located within the study site. Majority (90-95%) of the inhabitants of Kenema District do not have safe drinking water [11]. Their main source of drinking water is dug wells and streams which can be easily contaminated during the rains because of the poor construction of these wells and the lack of proper drainage facility.

Diarrhea is a water-borne disease and is mostly associated with unsafe drinking water and poor food handling practices. The disease which is also linked with poor sanitation and hygiene is further compounded by the lack of knowledge about its spread on the part of the local residents.

The high (5%) diarrhea fatality rate in May could be accounted for by the high (8.5%) reported morbidity rate for the disease that month. Diarrhea unlike the other diseases under consideration has a high case fatality rate because of the disease's ability to drain the body off its mineral contents and other vital bodily fluids resulting to wasting and hypovolamic shock.

ARI is an important cause of childhood mortality in developing countries [12]. The infection in the developing world is caused by two main pathogens; S*treptococcus pneumonia* and *Heamophilus influenze* type b (Hib). May recorded the highest (7.38%) morbidity for ARI. May also recorded the highest morbidity for all the diseases under consideration.

The high morbidity for ARI in May could be attributed to the high prevalence and presence of other health conditions such as malaria, measles and anemia which tends to weaken a child's immune system during that month. Malnutrition which also tends to compromise the immune system due to its influence on anemia is also rife among children in Kenema District.

Infant ARI in rural settings like Kenema District is primarily caused by inadequate breastfeeding and lack of or insufficient food supplements such as vitamin A. Infants exclusively breastfed in the first 6months of life are five times less likely to die of ARI (pneumonia) than those not breastfed [13].

ARI accounts for the second highest (22.52%) common cause for mortality for children 0-11months for the period under review. This high mortality rate for ARI could be associated to the fact that both malaria and ARI have similar symptoms including high fever, coughing and fast breathing hence it is possible that most fatalities from malaria may have been wrongly attributed to ARI by the PHU in-charges because of poor medical background and diagnostic techniques. The high ARI mortality compared to other diseases under investigation may also be related to the high (26.98%) morbidity rate of the infection among children 0-11months. ARI has the second highest morbidity rate for this study.

U5 anemia which is mostly associated with malaria, malnutrition and worm infestation is an important cause of morbidity. Anemia morbidity (1.5%) for children 0-11 months for this study tends to indicate that it is not malaria-induced. Malaria morbidity (51.56%) for children 0-11 months was 50 times greater than that for anemia (1.5%) for the period under investigation. This implies that other factors not related to malaria may be responsible for anemia in the study subjects.

The annual anemia mortality rate was greater than its recorded annual morbidity. This annual mortality for anemia may be attribut-

ed to faulty diagnosis and under reporting of anemia cases. Children 0-11months have immune system that is less developed and hence highly exposed to several infections and health conditions some of which have direct association with anemia. In the situation were the disease or condition is treated but the anemia remains unattended the health of the affected becomes compromised and the child still remains anemic. Worm infestation has the least morbidity for children 0-11 months for the study period. There was no reported mortality for helminthic infestation for the period under review. In general, the monthly worm infestation morbidity was below 1% and its annual morbidity is 0.88%. Worm infestation tends to increase in the first 4months of life and its prevalence peaked (1%) in May.

The generally low morbidity for helminthic infestation may be due to the regular de-worming exercise organized by some international healthcare charities and organization. In Sierra Leone some international charities like Hellen Keller, World Vision and USAID usually embarked on de-worming exercise for school children and U5s living in remote rural settings like Kenema District. This singular health routine has a tremendous impact in reducing the morbidity of helminthic infestation and anemia in rural communities.

Conclusion

PHU admission data obtained for 72221 children 0-11 months were analyzed using descriptive statistical techniques. Based on the findings, a number of issues have been highlighted regarding factors that are responsible generally for U5 morbidity and mortality in eastern Sierra Leone.

Majority (70-85%) of U5 mortality and morbidity occurred during the onset of the raining season with highest cases in the month of May. This revelation enhances the importance of U5 care during the raining season. Eastern Sierra Leone records the highest annual rainfall in the country. U5 morbidity and mortality can also be reduced in eastern Sierra Leone by improving the healthcare system at peripheral level in the rural areas since majority of the U5 population lives in those areas.

Malaria recorded the highest annual morbidity (51.56%) and mortality (31.75%) rates for U5 in general in eastern Sierra Leone. It thus appears that the infection is still responsible for majority of the public health problems affecting U5 in the country these days despite the efforts being made to eradicate and manage the spread of the disease. Malaria is still responsible for the highest morbidity and mortality rates in most developing countries.

This implies that few diseases and conditions are the biggest threat to U5 survival in eastern Sierra Leone. These diseases are preventable or curable with simple healthcare interventions. Low-techniques and inexpensive solutions exist to stop the high prevalence of U5 mortality and morbidity but they are simply not being deployed on the scale needed to tackle the problem.

Measures such as vaccinations, antibiotics and oral rehydration therapies that are often taken for granted in wealthy nations can save millions of lives for relatively little cost in Third World countries.

Contributors- JK is a tenure track lecturer at the Department of Environmental Health Sciences, School of Community Health Sciences, Njala University, Sierra Leone.

EJC is Program Manager, Community Monitoring Project at the International Rescue Committee, Kenema District, Sierra Leone.

Ethical Approval- Njala University's Institutional Review Board approved the study design, data collection and analysis plan.

Competing Interest- none

References

[1] Statistics Sierra Leone 2004 Report.
[2] Institute of Health Metrics and Evaluation (2008) *Sierra Leone Demographic Health Survey*.
[3] Revenue Watch Institute (2012) *Sierra Leone Transparency Snapshot*.
[4] Kamara J.A.L. (2004) *Analytical Report on the Mortality and Disability Status of the Population*.
[5] Tamashiro T. (2010) *Impact of Conflict on Children's Health and Disability*.
[6] National Accountability Group Report (2006) *Accountability in Local Government Initiative Sierra Leone*.
[7] Government of Sierra Leone (2010) *Basic Package of Essential Health Services of Sierra Leone*.
[8] WHO (2008) *Country Cooperation Strategy at a Glance, Sierra Leone*.
[9] Seisay M. (2008) *The infant mortality crisis, Combating the Death of Children due to Preventable Diseases*.
[10] Helen L., Guyatt Robert, Snow W. (2004) *Clinical Microbiology Review*, 17(4), 760-769.
[11] Goetghebuer T., West T.E., Wermenbol V., Cadbury A.L., Milligan P., Lloyd-Evans N., Adegbola R.A., Mulholland E.K., Greenwood B.M. and Webber M.W. (2000) *Tropical Medicine and International Health*, 5(3), 207-13.
[12] Hutton T. (2002) *Breastfed babies 'five times' less likely to catch colds*.