

**SCHOOL OF PUBLIC HEALTH
COLLEGE OF HEALTH SCIENCES
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**TRENDS OF DIARRHOEAL DISEASES AMONG CHILDREN UNDER
FIVE AT THE PRINCESS MARIE LOUISE CHILDREN'S HOSPITAL:
2011-2014**

BY

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DECLARATION

I, OWUSU BENSON hereby declare that with the exception of the references made to other peoples' work which I have duly acknowledged, this research which is my original work has neither in whole nor in part been presented to the University or elsewhere for another degree.

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Date

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(Supervisor)



DEDICATION

I dedicate this work to Dr Magdaline Ansah for her unwavering and unrelenting help throughout the period of my studies.



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My deepest gratitude goes to the Almighty God for His grace and enabling strength to successfully complete this dissertation. I am also sincerely grateful to my supervisor, Professor Col. (Rtd) Edwin Afari for his contribution and assistance in the completion of this thesis as well as Dr Ernest Asiedu, Dr Donne Ameme, Dr Kingsley Sekyi and Mr Harold Mireku for their invaluable support. I finally thank the management of Princess Marie Louise Hospital (PML) for allowing me access to their facility.



ABSTRACT

Introduction: In 2015, despite the availability of simple effective treatment, diarrhoeal diseases were noted as the leading killer of children accounting for 9 per cent of all deaths among children under age five worldwide. In Ghana, diarrhoeal diseases kill 14,000 children annually even though prevention and management is still available and accessible. The study was undertaken to assess the trends of diarrhoeal diseases among children under five years of age.

Methods: A review of secondary data of children under five years of age who attended Princess Marie Louise Children's Hospital from 2011-2014 and were diagnosed with diarrhoea was done. The data were exported from Microsoft excel 2010 to STATA 14 and analyzed by time, place and person. Frequencies and percentages were computed to describe the distribution of diarrhoea cases among the various age categories and place of residence. Time series analysis were used to evaluate the trend of diarrhoeal cases among children under five years of age.

Results: A total of 2081 diarrhoeal cases were reported to the hospital from January, 2011 to December, 2014. Out of this majority were males 1,254 (60.3%). The trend of diarrhoeal diseases showed periodic pattern with three peaks observed for each year. The highest peak occurred from January to March. Diarrhoeal diseases prevalence for the period (2011-2014) was 10.52% (2081/19782) and decreased by 60.46% from 17.28% in 2011 to 7.90% in 2014, within the same period fatality also declined by 78.57% from 1.53% in 2011 to 0.83% in 2014. Male children aged 1-4 years and males were more predispose to diarrhoeal disease. In addition, children residing within Accra Metropolis were more prone to diarrhoeal diseases.

Conclusion: The study found that during the study period, case fatality for diarrhoeal diseases declined from 10.14% in 2011 to 1.90 in 2014. The reasons for the decline included introduction of rotavirus vaccine, improvement in water supply, improvement in health promotion regarding safe water, etc. Majority of the children who reported to the hospital with diarrhoeal diseases were located within Accra Metropolis.



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LIST OF ABBREVIATIONS

LMIC	- Low and middle-income countries
OPD	- Out-Patient Department
PML	- Princess Marie Louise
UNICEF	- United Nations International Children`s Emergency Fund
WHO	- World Health Organization



CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the study

Diarrhoea is the passage of three or more loose or liquid stools per day or for an individual, the more frequent passage of such stools than is normal for him or her. According to the World Health Organization diarrhoeal diseases fact, diarrhoea is still the second leading cause of death globally among children under five. (World Health Organization, 2013). A joint report by United Nations International Children's Emergency Fund and World Health Organization in 2009 asserts that diarrhoea accounts for 15 million of deaths annually, that is, approximately one in five deaths are caused by diarrhoeal diseases. More young children are killed by diarrhoea than measles, malaria and AIDS put together (UNICEF and WHO, 2009).

Similar to the overall-cause mortality globally, the estimate of the number of diarrhoea associated deaths have shown a steady decline; 4.6 million in the 1980s, (Snyder and Merson,1982), 3.3 million in the 1990s (Bern et al., 1992) and 2.5 million in the year 2000 (Kosek et al, 2003) 21.9% of all deaths of children up to 4yrs of age in sub-Saharan Africa in the year 2000 were due to diarrhoea corresponding to 935,000 deaths attributable to diarrhoea (Morris et al., (2003).

A strong association exists between diarrhoeal diseases, poverty and unhygienic environments (MacDougall and McGahey, 2003; UNICEF and WHO, 2009). This perhaps gives credence to why the prevalence of diarrhoea is high among children whose mothers did not have formal education and/or among children dwelling especially in poorest households in Sub-Saharan Africa and Asia (UNICEF and WHO, 2009).

Classified according to their clinical patterns by the WHO and UNICEF (2009), diarrhoea can be categorized as;

- (i) Persistent diarrhoea that is, diarrhoea of at least 14 days
- (ii) Acute watery diarrhoea that is, diarrhoea without blood lasting less than 14 days
- (iii) Acute bloody diarrhoea that is, diarrhoea with blood lasting less than 14 days

Dehydration is the main contributor to death from acute diarrhoea though therapy with oral rehydration solution and zinc is effective. Persistent diarrhoea is however associated with malnutrition, delayed growth and development, vitamin A deficiency and systemic infections such as respiratory infections and urinary tract infection, making treatment more complex (Das et al., 2012).

An estimated 88% of all diarrhoeal diseases results from contaminated water and inadequate hygiene and sanitation (WHO, 2003). Worldwide, inaccessibility to potable water and adequate sanitation facilities is a great challenge. About 884 million people and 2.6 billion people lack access to improved water sources and sanitation facilities respectively. (Kosek et al., 2003). This leads to improper disposal of faeces. When these improperly disposed faeces end up in the source of drinking water, it can lead to diarrhoea. It is estimated that in developing countries, 25% of people defecate in the open (WHO & UNICEF, 2010). Microbiological culture and microscopy remain the standard for testing the presence of rotavirus, despite their limited sensitivity (UNICEF & WHO, 2011). Newer immunological and nucleic acid-based tests that detect pathogen-specific factors bring hope to finding all diarrhoea agents, but are not cost effective or require specialized instrumentation and expertise when testing for rotavirus (Lijmer et al., 1999).

The WHO recommends as treatment of diarrhoea, the use of oral rehydration therapy to replenish lost fluids and electrolytes, continued feeding and administration of zinc for 10-14 days (10mg for <6 months and 20mg for those >6 months). One of the most effective tools in reducing the global burden of the disease in children is improvement of domestic hygienic practices. (Baltazar, Nadera and Victor, 2002).

Wagner and Lanoix (1958) recommended that diarrhea can be prevented mainly by implementing water, sanitation and hygiene (WASH) programmes, which attempt interrupting faeco-oral transmission pathways, commonly referred to as five “F” (fluids, fields, flies, fingers and food).

Furthermore, implementing effective educational programs that lay emphasis on environmental health and sanitation practices would reduce childhood diarrhoeal morbidity.

1.2 Problem statement

In Ghana, diarrhoea is the second leading cause of death in children under five after malaria, taking the lives of over 14000 Ghanaian children annually (UNICEF, 2000). Osam-Tewiah (2010) study at Princess Marie Louise Children’s Hospital on under five years children showed that proportionate diarrhoea morbidity accounted for nearly 28 percent of total morbidity. At this same hospital, diarrhoea among children under the age of five years was among the top four causes of outpatient and inpatient attendance with the outpatient morbidity of 11.2% according to the 2016 mid-year report.

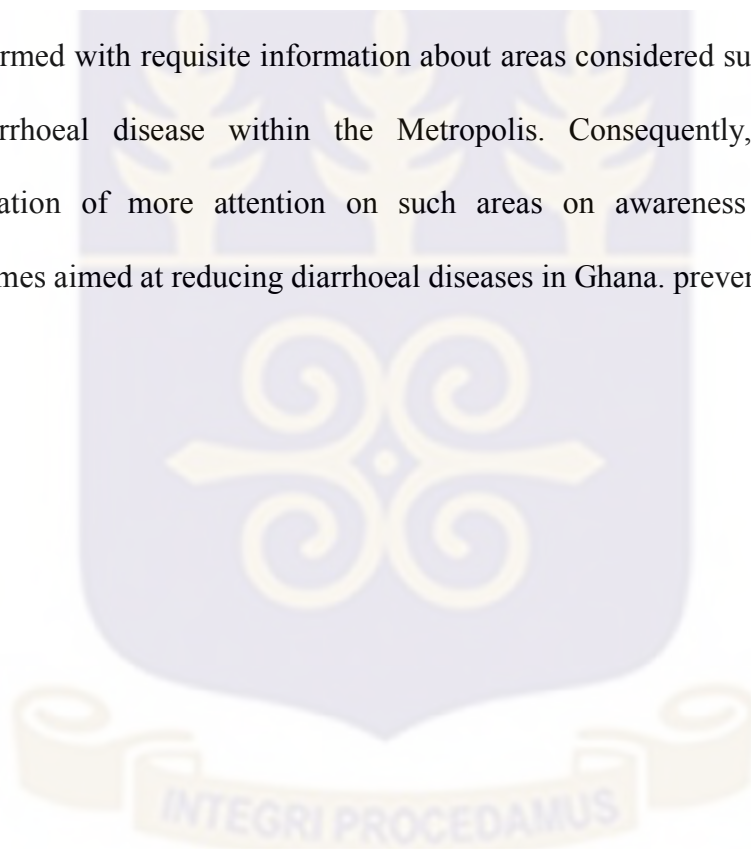
The Ministry of Health introduced the rotavirus vaccine so newborns are vaccinated to protect them from contracting the disease. In 2013, Ghana Health Service in collaboration with the United States Agency for International Development (USAID)

introduced Oral Rehydration Salt +zinc in the treatment of childhood diarrhoea into the Ghanaian market in an effort to reduce the duration and severity of diarrhoea and aid in the prevention of further occurrences (Ghana News Agency, 2013). The introduction of rotavirus led to a decline in diarrhoea hospitalization for children under five years (Enweronu-Laryea, Bomah, Sifah, Diamenu & Armah, 2014). Though there has been a decline at the national level, the extent to the declination is not known at the PML Children's Hospital thus, diarrhoeal diseases still remains a difficult phenomenon to eradicate in Ghana. It is reported that diarrhoeal diseases claiming 10 to 15% of Ghanaian children under five annually (Ghana News Agency, 2013). If this fatality trend continues the sustainable development goal 3, which seeks to promote health and well-being for all at all ages might not be attained for children under five years. Indirectly productivity at some point in time will reduce since parents of these children will have to stay off work to be with their children while on hospital admission. The burden on health workers will also increase especially in the peak seasons of diarrhoea. The trend analysis of diarrhoeal diseases remains crucial because it will bring to light the most affected place, gender and age group for policy intervention initiatives or programmes. Therefore, the study was conducted to assess the trends of diarrhoea cases among children under five in Ghana at Princess Marie Louise Children's hospital from 2011-2014.

1.3 Justification

Diarrhoeal disease is a common condition that affects children under five years in Ghana. Studies have explored the trends of diarrhoeal disease in Ghana but review of empirical literature found that, the Accra Metropolis has not been adequately covered. Hence there was the need to study the trend of diarrhoeal diseases in terms of

proportionate morbidity, by age, place and case fatality after the introduction of the rotavirus vaccine in 2012. The study highlighted the peak periods within the period, risk factors, morbidity and fatality trends. This will help the Ghana Health Services and Accra Metropolitan Health directorate in taking proactive steps in combating the disease. The age group and districts mostly affected by the disease was indicated by this research. Thus the Ghana Health Service and appropriate health organizations will be aware of the areas that demand more attention and the gender that is more susceptible to under five years diarrhoea. Thus, public health and community nurses will be armed with requisite information about areas considered susceptible to under-five diarrhoeal disease within the Metropolis. Consequently, it will lead to concentration of more attention on such areas on awareness and sensitization programmes aimed at reducing diarrhoeal diseases in Ghana. prevention.



1.4 Conceptual Framework

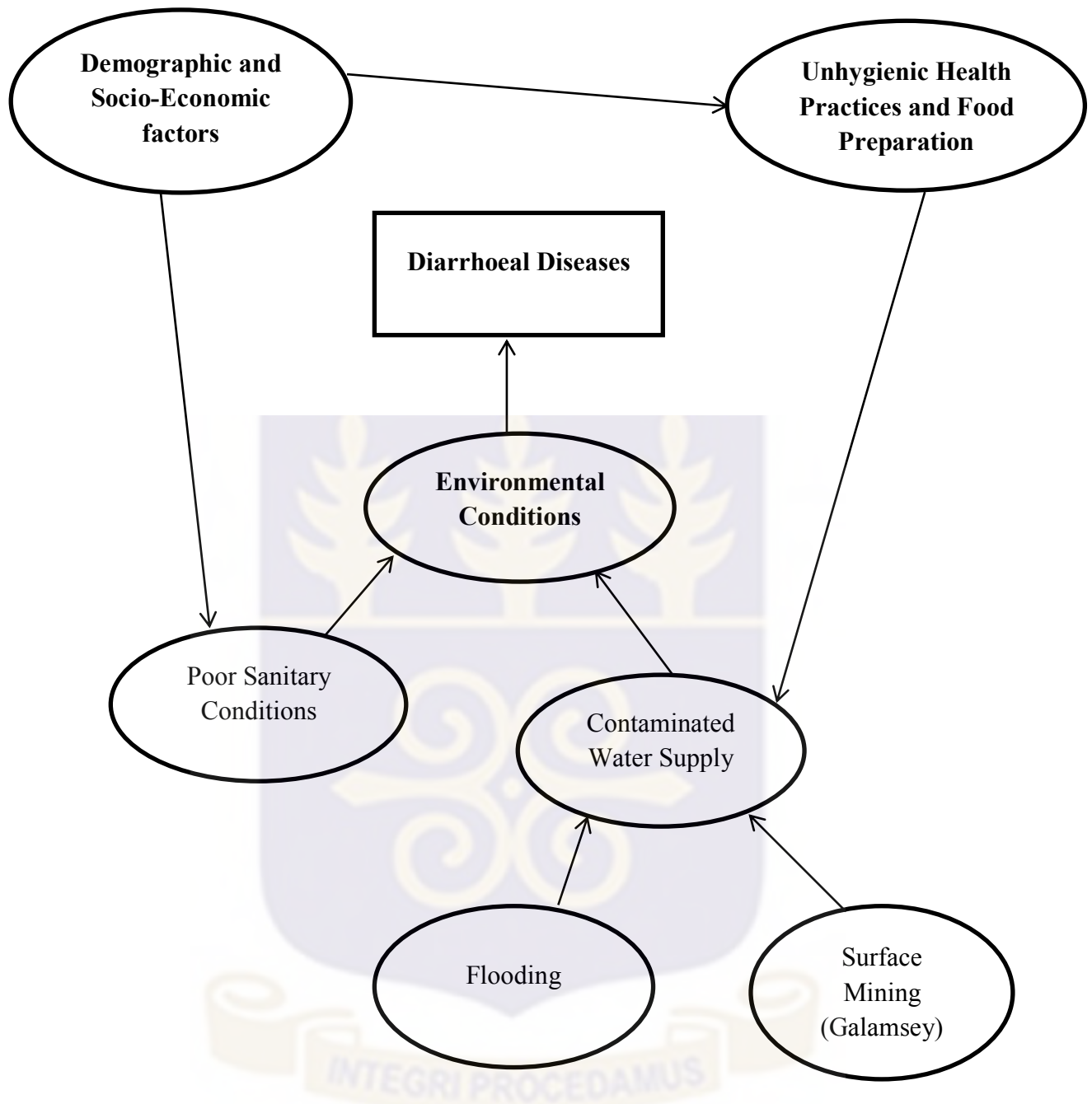


Figure 1: Conceptual Framework

Diarrhoeal diseases trend is influenced by various factors. These factors include; Demographic factors (Age, sex of the child as well as the place where he resides with the parents) and Socioeconomic status (educational level, occupation and marital status of the mother).

The trend in diarrhoea is influenced to some extent by the age of the child as well as where the child lives. This is because any child that lives in environmentally unhealthy condition with no proper toilet facility and poor hygienic condition will be predisposed to diarrhoeal diseases and the more children grow, the better their immune system in fighting diarrhoea. Occupation and level of education also accounts for diarrhoeal diseases among children under five. This is based on the fact that, high education is linked to improvement in personal hygiene, cleanliness and awareness on common diseases such as diarrhoea. Secondly, a good job allows a parent to choose an environmental space that is good for the baby as opposed to a parent who is engaged in an occupation that earns either the minimum wage or a little above or below the minimum wage. Hence, these factors (age of the child, location, occupation of parent, education of parent) are the independent variables (predictors of diarrhea) whilst diarrhoeal diseases is the dependent variable (predictor).

1.5 Objectives of the study

1.5.1 General objective

To determine the trends of diarrhoeal diseases among children under five at the Princess Marie Louise children's hospital from 2011-2014

1.5.2 Specific objectives

1. To determine the trends of proportionate diarrhoea morbidity in children under five
2. To determine the trends of under-five diarrhoeal diseases by age
3. To determine the distribution of diarrhoeal diseases by place
4. To determine the trends of case fatality of diarrhoeal diseases in children under five

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Diarrhoea among children under five

It generally suggests gastrointestinal infection, whose culprits are a diffusion of bacterial, viral and parasitic organisms. Enterotoxigenic *E. coli*, *Shigella* species, *Salmonella paratyphi* and virus seems to be the most common cause but certain circumstances have the tendency of being associated with and especially high incidence of acute diarrhoeal diseases (Hyams et al., 1993). However, the causes of approximately 40 % of the diarrhoea cases are still idiopathic (Finkbeiner et al., 2008).

Diarrhoeal diseases due to contamination of food or water poses a prime disease burden. Dehydration due to diarrhoea can be deadly and is the cause of about 1.8 million deaths annually. Majority of these deaths occur among children below five years of age living in low- and middle- income countries (Ahs et al., (2010). Provision of safe water, hand washing, the use of sanitation facilities, exclusive breastfeeding of babies and rotavirus vaccination are interventions used in preventing diarrhea. Clinical features are used to categorize the disease into three: acute watery diarrhea, acute bloody diarrhea, or persistent diarrhoea lasting more than 2 weeks. Treatment of diarrhoea in children includes oral rehydration with a pre-formulated solution or with domestic-made and administered fluids. Zinc supplementation is also recommended. Antibiotics are advised only in certain cases while anti-motility agents are discouraged (Ahs et al., 2010).

Diarrhoeal disease kills over 1,400 young children dying each day, or about 530,000 children per year, despite the availability of simple effective treatment (UNICEF, 2016).

Most deaths from diarrhoea occur among children under 2 years of age living in South Asia and sub-Saharan Africa. Notwithstanding this heavy toll, there has been some development. From 2000 to 2015, the total number of deaths from diarrhoea among children under 5 declined by more than 50 percent, that is from over 1.2 million to half a million. The lives of more children could be saved through basic interventions to improve drinking water, sanitation and hygiene (WASH) for diarrhea prevention, and the extensive use of a simple solution of oral rehydration salts (ORS) and zinc supplementation when there are occurrences of diarrhea (UNICEF, 2016).

2.2 Trends of diarrhoeal diseases in under fives

A cross-sectional survey done by Diouf et al in 2014 on prevalence of diarrhoeal diseases among children under five years of age in rural Burundi observed that, the general prevalence of diarrhoea was 32.6%. It was noted that 46% (n-255) of families fetched their drinking water from improved sources and 3% (n-17) had access to improved sanitation. Prevalence of diarrhoea among children whose primary caretakers received hygiene education was low (17.9%), boiled water before use (19.4%) and who were 40 years of age or more (17.9%). Diarrhoea was related to factors consisting of the age of the child's mother and the conviction that diarrhoea could not be averted. The prevalence of diarrhoea was not affected by gender differences or the caretaker's decision to treat. The study concluded that diarrhoea

prevalence can be reduced to the minimum through education on hygiene and point-of use of domestic water treatment such as boiling.

A conservative cross-sectional study by Emina and Kandala in 2012 in Democratic Republic of Congo showed that the total prevalence of diarrhoeal disease declined by 26 percent (from 22.1% in 2001 to 16.4% in 2007). There was a significant decrease in diarrhoea irrespective of socioeconomic characteristics. The most likely source of the change seemed to be change in behaviour and/or in public health policy. No significant change in diarrhoea prevalence was associated with variation of the population structure. It is however worth mentioning that although there were generally poor living conditions of the population, a contrasting decrease in diarrhoea prevalence existed. Therefore, it is difficult to ascertain whether the decline in diarrhoea prevalence was due to real improvement in public-health policy or to issue related to data quality. It was concluded that the decline of diarrhoea prevalence needed further investigation by conducting district-based or provincial-based research to confirm findings from household surveys such as Demographic and Health Surveys and Multiple Indicators Cluster Survey taking into account the country's prevailing conditions.

Another cross-sectional study done by Gebru, Taha and Kassahaun in 2014 on the risk factors of diarrhoeal diseases in under-five children among health extension model and non-model families in Ethiopia observed that the two weeks prevalence of diarrhoea in under-five children among health extension model and non-model households were 6.4% and 25.5%, respectively. The independent predictors of childhood diarrhoea found in the study were mothers not being able to read and write earning less than 650 Birr as monthly family income, hand washing not practiced at

the critical time, not using soap for hand washing, and improper refuse and being non-model families for the health extension programme. In conclusion, the level of diarrhoeal diseases variation was well explained by income, maternal education, waste disposal system, personal hygiene and the effect of health extension programme. Thus, encouraging families to being model families for the programme and enhancing community based behavioural change communication that highlights personal hygiene and sanitation to reducing childhood diarrhoea.

In a community based unmatched case-control study by Godana and Mengistie in 2013 on determinants of acute diarrhoea among children under five years of age in Ethiopia, the incidence of diarrhoea was substantially associated to lack of latrine ownership, lack of home-based water treatment, lack of improved water sources and eating of left-over food. The study concluded that the determinants of acute diarrhoea were of high preventive value (latrine ownership, availability of home-based water treatment, source of water and consumption of left-over food stored at room temperature). Health education on different mechanisms in diarrhoeal disease causation, and prevention methods, was recommended.

Furthermore in a 2016 community-based cross sectional study conducted by Alelign, Asegidew and Abera to assess the incidence and risk factors associated with diarrhoeal illness in Ethiopia, the findings from the study showed that out of the total of 312 children that participated in the study, 38 were suffering from diarrhoea, thus giving a two-week prevalence of 12.2%. The main risk factors for diarrheal illness were found to be lack of hand washing habits after latrine usage, household storage of water in a pot, observation of feces on the slab/latrine hole, lack of maternal education, age of mothers younger than 35 years and age of children being 3 to 5. The findings showed that there is a high prevalence of diarrhoeal illness associated with

various factors. Therefore, priority should be given to creating community awareness about diarrhoeal illness through addressing these risk factors.

To add to this, community-based cross-sectional study was conducted in Soddo town, Southern Ethiopia by Alambo in 2015 on the prevalence of diarrhoeal disease in under five children and associated risk factors in Southern Ethiopia. The prevalence of diarrhoeal disease over a period of two weeks preceding the study was about 11%. In the bivariate analysis, a number of risk factors including monthly income less than five hundred birr and age of the child ($P < 0.05$) appeared to be significantly associated with under-five childhood diarrhoeal disease. Also, the number of siblings under 5 years in a household, monthly income less than 500Birr and the age 12-23 months of the child were the only significant variables on multivariate analyses ($P < 0.05$). The study identified that diarrhoeal disease was major problem among under-five children in Soddo town. It was concluded that appropriate intervention programs targeting, child birth spacing and improving the monthly income of households should be designed.

George et al.'s study in 2014 on risk factors for diarrhoea in children under age five residing in peri-urban communities in Cochabamba, Bolivia observed in a survey of caregiver knowledge that more than 80% of caregivers were unaware that hand washing with soap could prevent childhood diarrhoea. Furthermore, only 17% of caregivers reported hand washing before cooking and feeding a child when asked how to keep food safe for children to eat. Cardinal risk factors in this cohort were lack of caregiver awareness of the importance of practices related to hygiene and sanitation for diarrhoea prevention. The knowledge findings from this study suggest that in promoting health in these communities, further emphasis should be laid on increasing

knowledge of how water treatment, hand washing with soap, proper child faeces disposal, and food preparation relate to preventing childhood diarrhoea.

In 2015, another case-control study by Bahartha and Alezzi on risk factors of diarrhoea in children under five years in Al-Mukalla in Yemen between February and April 2013 found that the significant risk factors associated with diarrhoea were crowded housing, incomplete vaccination of the child, and recurrent diarrhoeal illness during the last 3 months. The study concluded that diarrhoeal diseases are strongly associated with incomplete vaccination, recurrent diarrhoeal diseases, and crowded housing.

A community cohort study done by Mølbak, Jensen and Aaby in 1997 in Guinea-Bissau on the risk factors for diarrhoeal disease incidence in early childhood recorded comprehensive data on explanatory variables. Of 57 variables, 7 were independently associated with an increased incidence of diarrhoea. These were a recent (in the past 14 days) diarrhoeal episode, male sex, being weaned from breast milk, not being looked after by the mother, head of the household being <30 years old, eating cold leftovers, and drinking water from an unprotected public water supply. In breastfed children, only three variables were associated with diarrhoea including prior diarrhoea, male sex, and not being looked after by the mother. Among weaned children, six variables delineated increased rates of diarrhoea, including unprotected public water supply, eating of cold leftovers, and lack of maternal education. Major determinants of persistent diarrhoea included weaning, lack of maternal education, and having pigs in the home. It was concluded that, in addition to the promotion of breastfeeding, important interventions against diarrhoea include improvements in water supply, hygiene, and food handling. However, because of effect modification

by breastfeeding, the largest effects of these interventions will probably be among weaned children.

Gao, Liu and Yan in their 2015 study on the prevalence of diarrhoea among children less than 36 months of age in rural western China in 2001 and 2005 observed that in 2005, prevalence of diarrhea was approximately 7.4%, which compared with that for 2001 had decreased by 8.7%. The generalized estimated equation analysis showed that region affected the prevalence of childhood diarrhoea significantly. Age was negatively associated with childhood diarrhoea. Although childhood upper respiratory infections increased the risk of diarrhoea, the risk could have been decreased by use of vitamin A in the previous year. In addition, children of Han ethnicity or those living in one-child families had a lower risk of diarrhoea in 2001, but underweight children had a higher risk of having diarrhoeal disease.

2.3 Trends of proportionate diarrhea morbidity in children under five

Asamoah et al. in 2016 conducted a study on diarrhoea morbidity patterns in Central region of Ghana findings shown that the total cases of all morbidity from 2008 to 2012 were 7,642,431. Diarrhoeal diseases formed 4% (306854/7642431) of total morbidity. Children under one year (proportionate morbidity rates (pmr) = 8.4%) and males (proportionate morbidity rates (pmr) = 4.4%) were the most affected. Bloody diarrhea formed 2.2% (6835/306854) of diarrhoea cases with 0.7% (45/6835) laboratory confirmed. Diarrhoea cases peaked from January to March throughout the study period with highest frequency of 9.3% (28511/306854) occurring in June. The mean monthly distribution of diarrhoea cases was 25571.17 ± 1389.91 . Poorest districts had significantly lower odds of getting bloody diarrhoea than non-poorest districts OR = 0.73 (95% CI = 0.70-0.77). The study concluded that diarrhoea characterized 4% of

total morbidity presenting at health facilities in the region from 2008 to 2012. The diarrhoea morbidity rate decreased with increasing age. Diarrhoea was higher among non-poorest districts. The rate was highest in the month of June over the five-year period. Bloody diarrhea cases were mostly untested. The study recommended that stool samples should be taken for laboratory testing for bloody diarrhoea cases.

The trend in hospital admission and infant mortality from diarrhoea in Brazil was examined by De Olivera and Latorre (2010) using ecological time series. They found that from 1995 to 2000 there has been 39,421 deaths from diarrhoea and 1,505,800 hospitalizations from the disease. The Brazilian capitals contained 23.8% of these deaths and 12.8% of these hospitalizations. 13 Brazilian capitals displayed reductions in hospitalizations from diarrhoea, as well as in infant mortality from diarrhea (Macapá, Palmas, Fortaleza, Natal, João Pessoa, Salvador, Maceió, Belo Horizonte, Rio de Janeiro, Curitiba, Porto Alegre, Campo Grande and Cuiabá). The capitals Boa Vista, Belém, Teresina, Recife, Aracajú, São Paulo, Florianopolis and Goiânia had decline only in mortality from diarrhoea, while Rio Branco, Porto Velho and São Luís showed a declined only in the hospitalization rates for diarrhoea.

Looking at the study by on the trends and risk factors for childhood diarrhea in Sub-Saharan countries from 1990 to 2013, Bado, Susuman and Nebie observed that the proportion of diarrheal morbidity among under-5 children varied considerably across the cohorts of birth from 10 to 35%. There were large variations in the proportion of diarrheal morbidity across countries. The proportions of diarrhoeal morbidity were higher in Niger compared with Burkina Faso, Mali, and Nigeria. The risk factors of diarrhoeal morbidity varied from one country to another, but the main factors included the child's age, size of the child at birth, the quality of the main floor

material, mother's education and her occupation, type of toilet, and place of residence. The analysis showed an increasing trend of diarrhoeal inequalities according to DHS rounds. In Burkina Faso, the value of the intraclass correlation coefficient (ICC) was 0.04 for 1993 DHS and 0.09 in 2010 DHS; in Mali, the ICC increased from 0.04 in 1995 to 0.16 in 2012; in Nigeria, the ICC increased from 0.13 in 1990 to 0.19 in 2013; and in Niger, the ICC increased from 0.07 in 1992 to 0.11 in 2012.

2.4 Trends of under-five diarrhoeal diseases

A cross-sectional study by Karambu et al. in 2013 on the characterization and factors associated with diarrhoeal diseases caused by enteric bacteria pathogens among children aged five years and below in Kenya revealed that, the mean age was 27.25 months, median of 26.0 months and age range between 2-60 months. The bacterial isolation rates were ETEC 9.1%, EPEC 6.8% and EAEC 12.3%, *Salmonella* paratyphoid (10.4%), *Shigella flexneri* (1.9%) and *Shigella dysenteriae* (0.9%). Over 95 % of the isolates were resistance to Amoxicillin, Sulphinatozole, Cotrimoxazole. Six factors were independently associated with diarrhoeal diseases, occupation of the parent/ guardian (miraa business) (OR=1.8, CI:1.44-4.99), care taker not washing hands after changing napkins (OR= 1.6, CI:1.2-19.7), child drank untreated water from the river (OR= 2.7, CI:2.4-9.9) child not exclusively breastfed (OR= 2.4, CI:2.1-10.5), child did not wash hands before eating (OR=2.2, CI:1.91-16.3) and after visiting toilet (OR=3.7, CI:2.8-39.4). Eating of mangoes was found to be protective against diarrhoea (OR=0.5, CI:0.03-0.89). The study concluded that bacterial pathogens were found to be a significant cause of diarrhea in the study participants and established higher resistance to several commonly prescribed antibiotics. The study recommended

multifaceted approach that acknowledges the public health aspects that would reduce the burden of diarrhoea infectious as identified in this study.

Concerning diarrhoeal illness in a cohort of children 0-2 years of age in rural Bangladesh Pathela et al in 2006 assessed the incidence and risk factors and observed that the overall incidence of diarrhoea was 4.25 episodes per child per year. Peak rates of overall, acute, and persistent diarrhoea occurred in the 6-11-months and 12-17-months age groups. Diarrhoeal rates also peaked during the spring and summer. Among host-related characteristics, having a sibling in the household and having had prior diarrhoea were significant risk factors for diarrhoea. Highly statistically significant was spring season as an environmental characteristic risk factor for diarrhoea. The study concluded that diarrhoeal diseases continues to be a substantial burden in young children in rural Bangladesh. Most diarrhoeal episodes are of short duration, and should primarily be treated with oral rehydration therapy to prevent diarrhoea-related mortality. Improved knowledge of oral rehydration therapy, feeding during episodes to prevent further malnutrition, prolonged breastfeeding, and the keeping of livestock in enclosed areas of the home are advocated.

Nannan et al. in a study 2012 examined under five mortality statistics in South Africa and found that the majority of registered child deaths were infants (76%), with 22% of these deaths occurring in the first month of life, that is the neonatal period. The majority of the deaths (54%) occurred in the post-neonatal age group (1-11 months). Of the 61 335 under-5 deaths registered in 2007, diarrhoeal disease, lower respiratory infections and ill-defined natural causes accounted for 21%, 16% and 13% of deaths respectively. Only 1.2% of the deaths were certified as being due to HIV/AIDS. The number of registered child deaths increased steadily since 1997,

peaking in 2006. The greatest rate of increase was observed in the post-neonatal period, with a particularly marked rise in infection-related deaths including diarrhea and pneumonia. Interestingly, HIV/AIDS mortality is not particularly apparent in the neonatal period, but there is a definite 'AIDS signature' (a peak between months 2 and 4), which develops over the course of the epidemic.

Siziya et al's 2013 study on the correlates of diarrhoea among children below the age of 5 years in Sudan observed that half (50.0%) of the children were males, and 22.5% of them were of age less than one year. Boys were 3% ($p=0.044$) more likely to have diarrhoea compared to girls. Children less than 6 months of age and those aged 36-47 months compared with the oldest age group (48-59 months) had 25% and 18% lower prevalence of diarrhoea, respectively, while children aged 6-24 months and those aged 24-35 months had 1.5-fold and 1.17-fold higher prevalence of diarrhoea. Also, children in urban areas were 6% more likely to have diarrhea. Furthermore, children from households with 1 or 2 people per room were 8% less likely to have diarrhoea compared to children from households with more than 3 people per room. The study therefore concluded that diarrhoea was associated with child's age, gender, and social status.

A cross-sectional study by Tambe et al. in 2015 on childhood diarrhoea determinants in Sub-Saharan Africa with Tikro-Cameroon as the case study revealed that the prevalence of diarrhoea was 23.8% and children under 24 months were highly affected. Children using the main toilet and other types of toilet facilities such as bushes, diaper, and streams (OR: 0.194; $p < 0.001$, 95% CI) and usage of narrow-mouth container for storage of drinking water (OR: 0.492; $p < 0.001$, 95% CI) were found to be less likely to suffer from diarrhoea. Higher disease odds of diarrhoea

prevalence on the contrary were seen in children from households with two or more siblings (OR: 1.222; $p < 0.001$, 95% CI) and children whose mothers or caregivers never had the knowledge of safe sources of drinking water (OR: 1.849; $p < 0.01$, 95% CI).

2.5 Distribution of diarrhoeal diseases by place

In a 2014 World Health Organization's report on the childhood diarrhoea in seven low and middle income countries (Ghana, Bangladesh, Ethiopia, India, Pakistan, United Republic of Tanzania and Uganda), Eshur et al revealed that the proportion of childhood deaths due to diarrhoea varied considerably across the seven sites from under 3% to 30%. Acute watery diarrhoea accounted for 31% to 85% of diarrhoeal deaths, acute bloody diarrhoea, for 4.9% to 28% and persistent diarrhoea, for 10% to 61%. Among infants aged 1 to 11 months, persistent diarrhoea accounted for over 30% of diarrhoeal deaths in Ethiopia, India, Pakistan, the United Republic of Tanzania and Uganda. At most sites, more than 40% of children who died from persistent diarrhoea were malnourished. The report concluded that research is needed on the public health burden of persistent diarrhoea and current treatment practices to understand why children are still dying from the condition.

A systematic review of comprehensive literature on studies published since 1980 on diarrhoea mortality for children under five by Boschi-Pinto et al. in 2008 for the World Health Organization (WHO) observed that Global deaths from diarrhoeal disease among children aged less than 5 years were estimated to be 1.87 million (95% confidence interval, CI: 1.56–2.19), approximately 19% of total child deaths. WHO African and South-East Asia Regions combined contain 78% (1.46 million) of all

diarrhoea deaths occurring among children in the developing world; 73% of these deaths are concentrated in just 15 developing countries. The report concluded that planning and evaluation of interventions to control diarrhoea deaths and to reduce under-5 mortality is obstructed by the lack of a system that could regularly generate cause-of-death information.

2.6 Trends of under five diarrhoea case fatality

The findings of De Olivera and Latorre in 2010 brought to bear the mortality series and stability or reductions in the hospitalizations series in capitals from all regions, except the Southeast. Despite the marked fall throughout the study period, infant mortality rates remained high in 2005, in the capitals Macapá (20.1 deaths per 1,000 live births) and Natal (16.4 deaths per 1,000 live births). Curitiba, Porto Alegre and Campo Grande On the other hand had rates lower than 14 deaths per 1,000 live births. The capitals Macapá and Campo Grande presented the lowest values for the post neonatal infant mortality: 2.5 and 3.7 deaths per 1,000 live births, respectively. Reductions in the mortality series were observed along with stable or increasing trends for the hospitalization series, among capitals from all the Brazilian regions.

Melli and Waldman in 2009 analyzed the trend in mortality due to diarrhoea among children under 5 in the town of Osasco (SP), Brazil, between the years 1980 and 2000 in a descriptive observational study. Results showed a total of 1,360 deaths, 94.3% of which were before 1 year of age and 75.3% of which were before 6 months. There was a 98.3% reduction in mortality and the period of peak mortality shifted from summer to autumn through to the fall. The median age at death increased from 2 months at the first three quinquennium of study to 3 months at the last. The children of mothers aged 20 to 29 years and of mothers who had spent less than 8 years in

education formed the residual deaths. The relative risk comparing the worst-affected district and the average rate for the town reduced from 3.4 to 1.3 from the first 5 years of the 1990s to the year 2010.

Over the past two decades from an estimated 5 million deaths among children under five to 1.5 million deaths in 2004, mortality from diarrhoea has declined (WHO, 2004) which parallels downward trends in overall under-five mortality during this period. Despite this depreciation, diarrhea closely follows pneumonia as the second most common cause of death among children under five globally. Together, pneumonia and diarrhoea accounts for an estimated 40 per cent of all child deaths around the world annually. Nearly one in five child deaths is due to diarrhoea, a loss of about 1.5 million lives each year. The burden increases due to high prevalence of AIDS, malaria and measles. Africa and South Asia are home to more than 80 per cent of child deaths due to diarrhoea. Almost three quarters represented by 15 countries of all deaths accounted for diarrhoea among children under five years of age annually (UNICEF & WHO, 2009).



CHAPTER THREE

3.0 METHODS

3.1 Study design

A descriptive design was employed to determine the trends of diarrhoea among children under five was undertaken.

3.2 Study site

The study was done at the Out-Patient department of PML Children's hospital. It is located within the Ashiedu-Keteke sub-metro of the Greater Accra region of Ghana and is the only paediatric hospital of the Ghana Health service within the region. It provides medical care, offers reproductive and child health (RCH), family planning (FP) and nutrition services. The hospital has at present, 265 staff in total with 81 nurses and 6 permanent doctors. The framework of PML consists of 74 beds for in-patient care, an Out-Patient Department (OPD), Emergency ward, Laboratory unit/blood bank, X-Ray Unit, Diabetes and Environmental Health Unit, Mother's Hostel, Disease Control Unit, Family Planning and Reproductive and Child Health (RCH) units amongst others. Within the last decade, attendance to the PML Out-patient has increased from 45,000 in 1996 to nearly 73, 000 per year. Founded in 1926, it is one of the few specialized children's Hospital in West Africa and it was where kwashiorkor and marasmus were first described (Tette et al, 2016).

3.3 Variables

Dependent variable

The dependent variable was diarrhoeal diseases.

Independent variable

The independent variables of interest that were collected from the records were: the socio-economic status of the care giver (level of education and occupation) demographic characteristics of the child (age, sex and residence of the child)

Table 1: Variables determining diarrhoeal diseases

Demographic characteristics of child	Socio-economic status of the care giver	Diagnosis Of diarrhoea	Outcome
-Age -Sex --Residence	-Level of education -Occupation	-Persistent - Acute watery -Acute bloody	-Discharged -Died

Table 2: Operational definitions of variables

Variable	Operational Definition	Scale of Measurement
INDEPENDENT VARIABLES		
Age	Age of child in months	Continuous-discrete in months
Sex	Biological sex of child	Binary Male Female
Residence	Place where care giver and child lives at least 1 months	Binary Urban Rural
Level of education	Care givers educational background	Ordinal No formal education Primary Secondary Tertiary
Occupation/employment status	Care giver gainful job	Binary employed unemployed Binary
DEPENDENT VARIABLES		
Acute Watery diarrhoea	Diarrhoea without blood lasting less than 14 days	Yes No
Acute bloody diarrhoea	Diarrhoea with blood lasting less than 14 days	Binary Yes No
Persistent Diarrhea	Diarrhoea lasting 14 days or more	Binary Yes No
OUTCOME OF ADMISSION		
Discharged	Child recovered and went home	Binary Yes No
Died	Child did not recover and died	Binary Yes No

3.4 Study population

All reported cases involving children under five at the Out-Patient department of the Princess Marie Louise Hospital from 2011 to 2014.

3.4.1 Inclusion criteria

Records of all children who are under five years and had visited Princess Marie Louis Hospital from 2011 to 2014.

3.4.2 Exclusion criteria

Record of children diagnosed of diarrhoea at PML prior to 2011 and after 2014.

3.5 Sampling

3.5.1 Sample size and method

A survey of all the the records of diarrhoeal cases in children under five years who attended the PML Children Hospital from 2011 to 2014 were reviewed from the OPD.

3.6 Data collection technique and tools

The medical records from Out Patient Department attendance register at Princess Marie Louis Hospital were reviewed. Data capture sheet (APPENDIX 1) was designed for that purpose. The data capture sheet captured the socioeconomic status of the caregiver (level of education and occupation), demographic status of the child (Age, sex and area of residence), and year of admission, diagnosis and patient's folder number of children under five years of who were diagnosed of diarrhea between 2011-2014.

At PML Children's Hospital, diarrhoeal diseases are diagnosed as Acute bloody diarrhoea (<14days and blood stained), Acute watery diarrhoea (<14days) or persistent diarrhoea (>14days). Summary of monthly OPD attendance of all cause morbidity in children under five years were categorized under months for each year, sex and age. This assisted in determining the trends, severity as well as the OPD records of children under five years who had visited the Hospital from 2011 to 2014.

3.6.1. Data Quality control

All data gathered were audited and verified to check for accuracy using archived copy of the data. Data capture sheets was randomly examined and cross checked for any errors and omissions. To prevent double entry of the records, each record was assigned a unique identity number.

3.7 Data processing and analysis

Data were assigned codes and analyzed with Stata 14. The analysis of data produced frequency tables and graphs. Tables and graphs were further modified with the aid of Microsoft Office Excel 2010. Statistical tools from time series analysis were employed to examine the trend of diarrhea cases among children under five years.

3.8 Ethical Consideration

The Ghana Health Service Ethics Review Committee gave clearance. A letter of introduction was sent from the School of Public health, University of Ghana to seek administrative authorization from the medical superintendent of the PML-Children's Hospital. Names of patients were not included in data collection and analysis. The hospital authorities were assured that, the dissemination of the research findings will not be linked to the identity of the patient and that the findings are expected to benefit

the hospital, District Health Management Team, Ghana Health Service and the Ministry Of Health in planning health service delivery and intervention in controlling of diarrhoeal diseases.



CHAPTER FOUR

4.0 RESULTS

4.1 Introduction

This chapter presents the results of the study which was designed based on the objectives of the study. It includes the socio-economic status of caregivers, trend of diarrhoeal diseases, proportion of diarrhoeal diseases by demographic characteristics, trend of proportionate diarrhoeal by type and months, trend of diarrhoeal disease by age and distribution of diarrhoeal disease by place.

4.2 Socio-economic status of caregivers of children under five years at PML

Children`s Hospital

A total of 2081 cases of clinically diagnosed diarrhoea were recorded at the PML Children`s Hospital between January, 2011 to December, 2014. It was observed that most of the caretaker had formal education ranging from basic to tertiary level 1621(77.9%) whereas 460(22.1%) did not have any sort of formal education. The records on the caretakers at the Hospital with respect to their profession shows that majority were traders 1026(49.30%) and artisans 408(19.6%) (Table 3).

Table 3: Socio-economic characteristics of caretakers of children under five years at the PML Children's Hospital, 2011-2014

Characteristics of caretakers	Year				Total
	2011 n(%)	2012 n(%)	2013 n(%)	2014 n(%)	
Level of education					
None	219(23.99)	89(20.18)	82(22.40)	70(19.39)	460(22.10)
Primary	138(15.12)	89(20.18)	54(14.75)	69(19.11)	350(16.82)
Junior High	336(36.80)	146(33.11)	119(32.51)	121(33.52)	722(34.69)
Senior High	145(15.88)	71(16.10)	70(19.13)	61(16.90)	347(16.67)
Tertiary	75(8.21)	46(10.43)	41(11.20)	40(11.08)	202(9.71)
Profession					
Professional	67(7.34)	52(11.79)	40(10.93)	47(13.02)	206(9.90)
Trader	445(48.74)	202(45.80)	184(59.27%)	195(54.02)	1026(49.30)
Artisan	200(21.91)	96(20.63%)	57(15.57%)	55(15.24)	408(19.61)
Unemployed	201(22.02)	91(20.63)	85(23.22)	64(17.73)	441(21.19)
Total	913(100)	441(100)	366(100)	361(100)	2081(100)

4.3 Proportion of diarrhoeal diseases in children under five years at PML

Children's Hospital by demographic characteristics, 2011-2014

The records reviewed showed that most of the children with diarrhoeal diseases were males 1,254 (60.3%) and aged 12-48 months 1,033(49.3%). Additionally, it was discovered that under-five diarrhoea cases were common in Accra Metro 1607(77.2%) (Table 4). The results suggest male children aged 12-48 months, residing in Accra Metro are more at risk of been diagnosed of diarrhoeal disease.

Table 4: Background characteristics of children under five years

Characteristics of under five	Year				Total
	2011 n(%)	2012 n(%)	2013 n(%)	2014 n(%)	
Age (months)					
Less than 1 month	8(0.88)	16(3.63)	2(0.55)	9(2.49)	35(1.68)
6-11 months	213(23.33)	98(22.22)	72(19.67)	74(20.50)	457(21.96)
7-11 months	260(28.48)	129(29.25)	90(24.59)	85(23.55)	564(27.10)
12-48 months	432(47.32)	198(44.90)	202(55.19)	193(53.46)	1,025(49.26)
Sex					
Male	561(61.45)	250 (56.69)	230(62.84)	213(59.00)	1,254(60.26)
Female	352(38.55)	191(43.31)	136(37.16)	148(49.00)	827(39.74)
Location					
Accra Metro	735(80.50)	322(73.02)	274(74.86)	276(76.45)	1607(77.22)
Adenta	24(2.63)	6(1.36)	10(2.73)	3(0.83)	43(2.07)
Ashaiman	9(0.99)	7(1.59)	6(1.64)	4(1.11)	26(1.25)
Awutu Senya	15(1.64)	9(2.04)	6(1.64)	8(2.22)	38(1.83)
Ga Central	17(1.86)	19(4.31)	8(2.19)	14(3.88)	58(2.79)
Ga East	9(0.99)	7(1.59)	4(1.09)	3(0.83)	23(1.11)
Ga South	28(3.07)	23(5.22)	19(5.19)	22(6.09)	92(4.42)
Ga West	31(3.40)	14(3.17)	13(3.55)	10(2.77)	68(3.27)
Ledzokuku Krowor	30(3.29)	26(5.90)	21(5.74)	18(4.99)	95(4.57)
Tema Metro	15(1.64)	8(1.81)	5(1.37)	3(0.83)	31(1.49)
Total	913	441	366	361	2,081

4.4 The trend of proportionate diarrhoea morbidity in children under five (5) years

4.4.1 Trend of proportionate diarrhoea diseases in children under five years by diarrhoea types

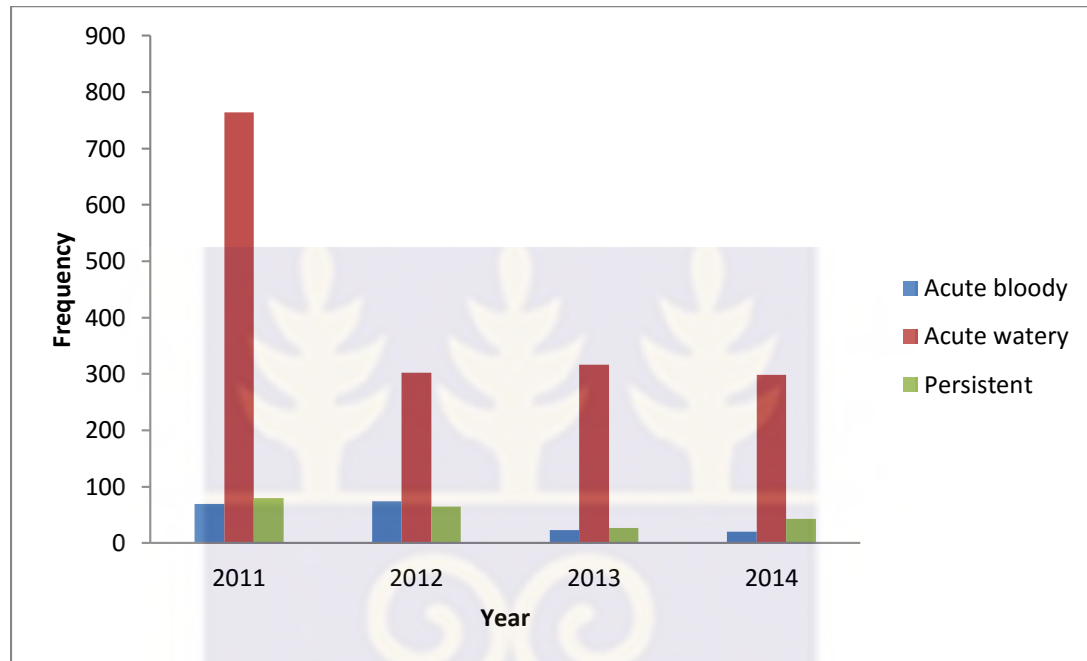


Figure 2: Trend of diarrhoea cases by type among children under five years

The trend of diarrhoeal diseases from 2011 to 2014 show that majority of the diarrhoeal disease manifested in the form of acute watery diarrhoea 1680(80.73%), followed by acute bloody diarrhoea 291(13.98) and persistent diarrhoea 110(5.29%). The rise in acute watery diarrhoea emanate from the fact that mothers perceive children under five year as been vulnerable to diseases. Therefore, if such mothers signale the onset of diarrhoeal disease (normally acute watery diarrhoea), they quickly rush the children to the hospital for medical attention.

This trend is supported by the results on year by year analysis from 2011 to 2014. For instance, in 2011, the most diagnosed form of diarrhoea was acute watery diarrhoea 764(14.46%). Likewise, acute watery diarrhoea was predominant 302(5.81%)

amongst children under five years in 2012. Similarly, with regards to the type of diarrhoea, acute watery diarrhoea was prevalent 316(6.69%) 2013. In 2014, acute watery diarrhoea 298(6.52%) was ranked the leading form of diarrhoeal disease.

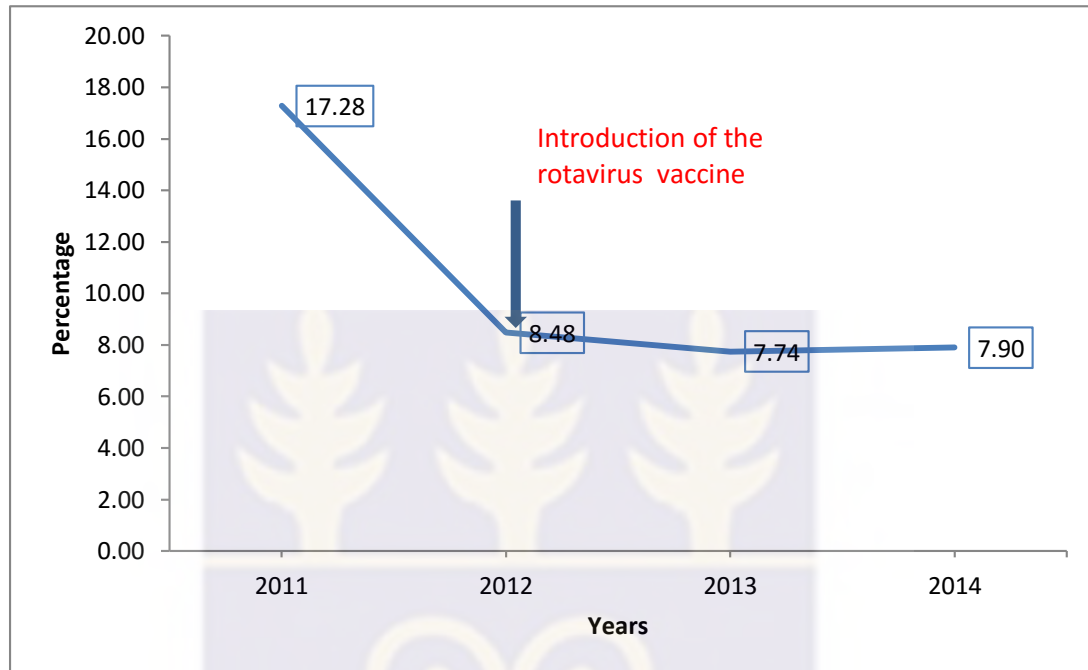


Figure 2: Yearly trend of diarrhoeal diseases in under five years

The figure above shows the trend of diarrhoeal disease from 2011 to 2014. It was identified by the records that diarrhoeal cases decreased from 913(17.28%) in 2011 to 361(7.90%) in 2014. There was a decline in the reported cases of diarrhoea from 5,293 in 2011 to 4571 in 2014. Additionally, 2013 recorded the lowest diarrhea cases. Overall prevalence of diarrhoeal disease from 2011 to 2014 was 10.52% (2081/19782). The decline in diarrhoea can attributed to the fact that most caretakers were literate amongst others such as improved drinking water, improved feeding practices and improved sanitation practices.

4.4.2 Trend of diarrhoeal diseases in children under five years at PML

Children`s Hospital by months, 2011-2014

The trend of diarrhoea from 2011 to 2014 shows that majority of diarrhoea disease for children under five years of age commonly occurred in February 298(14.32%), and the lowest in September 112(5.38%). This is however, a deviation from the anticipated high diarrhoeal cases which is usually expected in the rainy season (June and July). The cause of diarrhoea was attributed to inability of the Accra Metropolitan Assembly in managing waste, which accounted for the spread of diarrhoea in the city.

The distribution of diarrhoea for children under five years in 2011 denotes that diarrhoea was at its peak in February 147(16.10%) and lowest in October 34(3.72%). The major driving force for diarrhoeal diseases in the Metropolis has been improper waste management practices amongst others. Accra is the capital city and hence, during December a lot of folks travel from nearby and remote towns and cities to buy Christmas goods or take a tour of the city. This contributes increasing waste production and given that the Assembly is handicapped financially in managing the existing waste produced by the city, most of waste is left in the open for months and as such might account for the rising trend in diarrhoeal disease of children under five years.

The distribution of diarrhoeal diseases in children under five years in the year 2012 showed February had the highest reported cases 67(15.19%) whereas August recorded the lowest reported cases 20(4.54%). The most of August saw the biggest decline from 40 to 20 reported cases but September experienced a significant rise which continued up till October. The month of November was characterized with a fall (comparative decline of 15.63%) and a marginal rise in December (comparative rise

of 3.7%). The surge in diarrhoeal disease of under five could be attributed improper waste management practices due to a rise in waste production at the Metropolis which starts during December through to February.

The distribution of diarrhoeal diseases in 2013 signifies that January had the highest number of reported cases 43(11.75%) while the month of September recorded the lowest reported cases 18(4.92%). The peaks period for diarrhea disease in order of rank were recorded in January, February, March, May, July and November (43, 42, 38, 34, 37 and 35 respectively). The peak of diarrhoea in February could be attributed to poor waste management practices, choked gutters and poor personal hygiene which characterizes the month of December and January as festivities surge during that period.

The distribution of under five years diarrhoeal diseases in 2014 revealed that February recorded the highest number of cases 42(11.63%) but November had the lowest with 15(4.16%). The monthly trend shows a rise and fall pattern throughout the year. This results contradicts the reported outbreaks of cholera breakout in June 2014, however, it was believed to have started in December during the Christmas season but reached its crescendo in June because the rainfall brought out waste materials from choked gutters onto the streets of the capital.

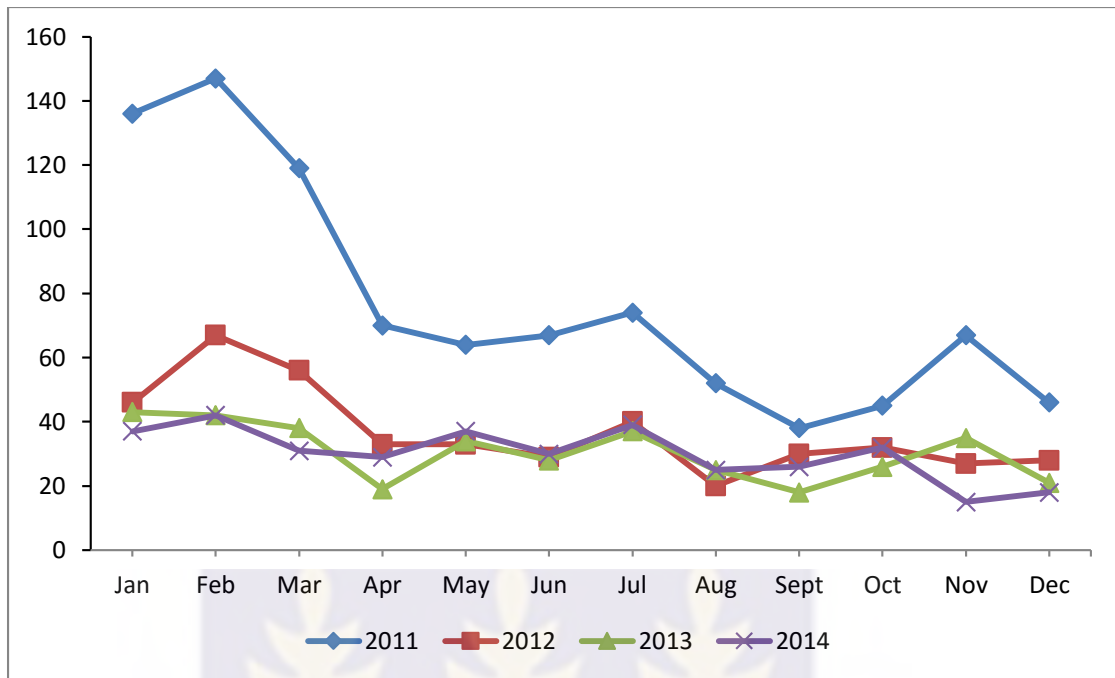


Figure 3: Monthly Trend of diarrhoeal diseases in children under five years

4.5 Trend of under-five years diarrhoeal diseases by age

Figure 4 depicts the trend of diarrhoeal diseases in children under five years for a year period (2011-2014). The trend showed that in the 2011, with the exception of children less than one month, all other group of children had their highest cases been reported in 2011. Children less than one month had the lowest cases of diarrhoea from 2011 to 2014. In contrast, from 2011 to 2014, children aged 12-48 months had the highest reported cases, followed by 7-11 months, 1-6 months respectively. In 2012, all age groups recorded an average of 50% decline in diarrhoea cases from the previous year (2011). For instance, in terms of significance of the decline in 2012, children aged 12-48 months was ranked first (with a fall of 54.17%), followed by 1-6 months (with a fall of 53.99%), 7-11 months (with a fall of 50.39%) and less than one month (with a fall of 50%).

Children aged 12-48 months trend signaled a rise and fall of reported cases for the period under consideration. For instance, the trend showed an initial huge fall from

432 in 2011 to 198 in 2012 and then a marginal rise (comparative increment of 2%) from 198 to 202 in 2013 and a marginal fall (comparative fall of 4.45%) again from 202 in 2013 to 193 in 2014.

Children aged 7-11 months cases showed a decreasing trend in the period of study. For example, it massively fell (comparative fall of 50.38%) from 260 to 129 in 2012, further declined (comparative decline of 30.23%) to 90 in 2013 and finally, a marginally fall (comparative fall of 5.5%) to 85 in 2014.

Children aged 1-6 months diarrhoea trend showed a decreasing movement from 2011 to 2013 and a marginal rise in 2014. For instance, there a significant fall (comparative increment of 57.75%) from 213 to 90 in 2012 and a further fall (comparative decline of 20%) from 90 to 72 in 2013 and a marginal increase (comparative increment of 2.78%) from 72 to 74 in 2014.

Children aged less than one month diarrhoea trend witnessed an initial increase from 2011 to 2012, a significant fall in 2013 and a notable rise in 2014. It was identified by the records that there was a 50% rise in 2012, 87.5% fall in 2013 and a 350% rise in 2014.

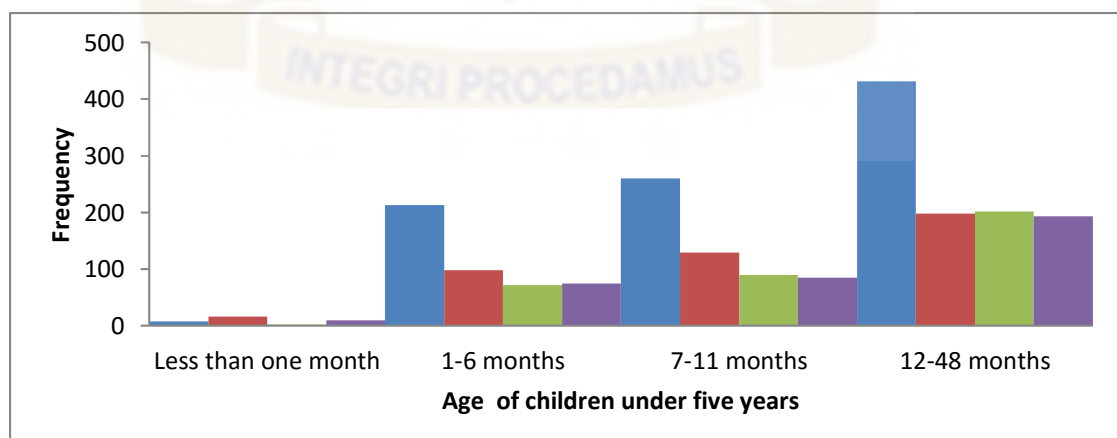


Figure 4: Trend of age distribution of diarrhoeal diseases in children under five years

4.6 Distribution of diarrhoeal diseases by place in children under five (5) years

Review of Diarrhoeal cases in PML Children’s Hospital by districts showed that in 2011, majority of the under-five diarrhea cases were mostly from the Accra Metro 735(80.50%) and the least recorded by Ashaiman 9(0.99%) and Ga East 9(0.99%). Most of the diarrhea cases were predominant at Accra Metro 322(73.02%), in 2012, and the least number of cases in Adenta 6(1.36%). In 2013, most of the under-five diarrhea cases were presently common in Accra Metro 274(74.86) and the lowest was recorded in Ga East 4(1.09%). Accra Metro recorded the highest number of cases in 2014 276(76.45) while the Tema Metro recorded the lowest 3(0.83%). (figure 5).



Figure 5: Trend of diarrhoeal diseases in children under five years by districts

4.7 Trend of case fatality of diarrhea disease in children under five (5) years

The trend analysis of fatality resulting from under five years diarrhea at the Hospital shows an initial decrease from 14(1.53%) in 2011 to 2(0.45%) in 2012 but stabilized from 2013 3(0.82%) through to 2014 3(0.83%). Fatality for the Hospital in 2014 was

the highest (158 deaths), followed closely by 2012 (157 deaths), with the lowest fatality recorded in 2013 (123 deaths).

From the records, the case fatality rate for children under five years was 10.14% out of total fatality in 2011. Out of the total diagnosed cases of diarrhea in 2012, the case fatality rate of under five children diagnosed with diarrhea was found to be 1.27% out of total fatality for the year. The results of the study shows that in 2013, under-five diarrhoea accounted for 2.44% of total fatality for the year. As indicated in figure 6, fatality rate of under-five diarrhoeal diseases for 2014 was 1.90% of the total fatality for the year. The decline in under-five diarrhoeal disease is due to the introduction of rotavirus vaccination for children aged below five years and others include personal hygiene, caretakers income, literacy and sanitary practices.

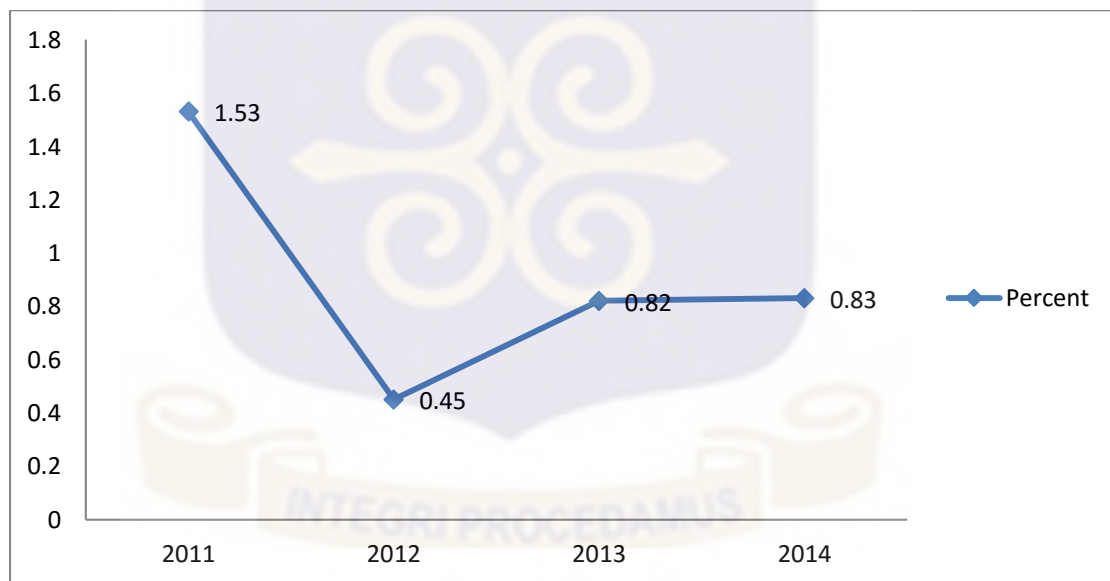


Figure 6: Fatality trend for diarrrrhoeal diseases in children under five years

CHAPTER FIVE

5.0 DISCUSSION

5.1 Summary of Findings

The study was conducted to determine the trends of diarrhoeal diseases among children under five at the Princess Marie Louise children's hospital from 2011-2014.

The **specific objectives of the study were:**

1. To determine the trends of proportionate diarrhoea morbidity in children under five
2. To determine the trends of under-five diarrhoeal diseases by age
3. To determine the distribution of diarrheal diseases by place
4. To determine the trends of case fatality of diarrhoeal diseases in children under five

A descriptive design was adopted for the study. The survey considered all reported cases involving children under five at the Out-Patient department of Princess Marie Louise (PML) Hospital from 2011 to 2014. The medical records were accessed from the Out-Patient department attendance register at PML Hospital and analyzed with STATA version 14.

The results of the study showed that the trend of under-five diarrhoeal diseases has declined from 913(17.28%) in 2011 to 361(7.90%) in 2014. Also, children aged 12-48 months had the highest risk of been diagnosed with under-five diarrhoeal disease. The children residing in Accra Metro are more predisposed to contracting diarrhoeal diseases. The case fatality for under-five diarrhoeal disease declined from 1.53% in

2011 to 0.83% in 2014. The main reason for the decline is attributed to the introduction of rotavirus vaccination for children.

5.2 Discussion of findings

The study sought to assess the trend of diarrhoeal diseases among children under five years of age at the Princess Marie Louise Children's Hospital from 2011-2014. The trends were described by time, place and person.

5.2.1 Trend of proportionate diarrhoea morbidity in children under five years

The trend of under-five diarrhoeal disease from 2011 to 2014 highlighted a decrease from 913(17.28%) in 2011 to 361(7.90%) in 2014. This can be attributed to a fall in total reported cases from 5, 293 in 2011 to 4571 in 2014. The rate of decline in prevalence found in this study is higher than similar study by Emina and Kandala (2012) that found the overall prevalence of diarrhoea decreased by 26 percent (from 22.1% in 2001 to 16.4% in 2007). A collaborated study by Gao et al. (2014) also found that prevalence of diarrhoea among children less than 36 months had decreased from approximately 7.4% to 8.7%. Overall prevalence from 2011 to 2014 was 10.52% (2081/19782) out of total morbidity. This rate of prevalence of diarrhoea found in this study is higher than a similar study done in 2016 by Asamoah et al. (2016) in the Central region of Ghana that found that, diarrhoeal diseases formed 4% of total morbidity. The records on under five years diarrhoeal diseases from 2011 to 2014 shows that reported cases was at its highest in February 298(14.32%), January 262(12.59%) and March 244(11.73%) but was at its lowest in September 112(5.38%). A corroboratory study by Asamoah et al. (2016) found that the diarrhoea peak period for under five years diarrhea disease was between January and March. The trend of

diarrhoeal diseases from 2011 to 2014 show that majority of the diarrhoeal disease manifested in the form of acute watery diarrhea 1680(80.73%).

Trend of under five years diarrhoeal diseases by age

It was observed that in 2011, the highest number of diarrhoea cases occurred in children aged 12-48 months 432(47.32%). Similarly, in 2012, 2013 and 2014, the highest number of diarrhoea cases were reported by children aged 12-48 months. These results suggest that children aged 12-48 months are mostly predispose to diarrhea than children less than one year. This result contradicts Pathela et al. (2006) that identified that diarrhea was at its peak amongst children aged 6-17 months but agrees with the peak period of the age group 12-17 months. Thus this result suggests that increase in age predisposes children more to diarrhea. A study by Siziya et al. (2013) likewise revealed that as children aged up they stand at more risk of developing diarrhoea.

5.2.2 Distribution of diarrhoeal diseases by place in children under five years

The records available in the year 2011 indicate that majority of the under five diarrhea cases were commonly in majority of the under-five diarrhoea cases were commonly at Accra Metro 735(80.50%). In 2012, most of the diarrhoea cases were predominantly at Accra Metro 322(73.02%). In 2013, it was found that most of the under five diarrhoea cases were presently common in presently common in Accra Metro 274(74.86%). It was discovered from the records available in 2014 that under five diarrhoeal diseases was common in common in Accra Metro 276(76.45%). These results indicate that children aged below five years that domicile in Accra Metropolis are mostly prone to diarrhoea. This result supports the findings made by Siziya et al. (2013) that diarrhea was more common in urban areas as compared with rural areas.

5.2.3 Trend of case fatality of diarrhoeal diseases in children under five years

The records showed that in 2011, death toll for the year was 138 and fatality rate resulting from under five years diarrhoea accounts was 10.14% out of total fatality for the year. In 2012, death toll for was 157 and fatality rate of under five children diagnosed with diarrhoea was found to be 1.27% out of total fatality for the year. In 2013, total death toll for the year stood at 123 and fatality rate of 2.44% was recorded against children under five years who have been diagnosed of diarrhoea. In 2014, total death toll for the year for was 158 and fatality rate resulting from under five diarrhoea cases was 1.90% of the total fatality for the year 2014.

The trend analysis of fatality resulting from under five diarrhoea at the hospital showed an initial decrease from 14(1.53%) in 2011 to 2(0.45%) in 2012 but stabilized from 2013 3(0.82%) through to 2014 3(0.83%). In contrast, fatality for the hospital in 2014 was the highest (158 deaths), followed closely by 2012 (157 deaths), with the lowest fatality recorded in 2013 (123 deaths). Overall fatality rate for the period under review (2011-2014) taking into consideration the overall death toll was 3.81% (22/578 deaths). The fatality rate for the period was significantly higher as revealed in Nannan et al. (2012), that discovered that the diarrhoeal diseases accounted for 21% of deaths in children under five years. Nevertheless, the fatality of 3.81% was within the range of childhood death due to diarrhoea that was found by Eshur et al (2014) on seven low and middle countries that included Ghana.

5.3 Limitation of the study

The weakness of retrospective descriptive design method is that measures of exposure are only a proxy based on the average in the population and does not show individual level experience. The findings of the study cannot be generalized for the whole

community because all the hospitals within the Metropolis were not included but it gives a snapshot of prevailing situation. The definition of diarrhoea was based on the clinical diagnosis and hence, there could be a case of misclassification of diarrhoea cases of children under five years at the health care facility.



CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The prevalence of diarrhoeal disease declined from over the study period by 60.46%, that is, from 17.28% in 2011 to 7.90% in 2014. Overall prevalence from 2011 to 2014 was 10.52% (2081/19782) out of total cases. Males recorded the highest number of under-five diarrhoea cases. The months of the year were closely associated with increased occurrence of diarrhoeal diseases. Diarrhoeal disease commonly occurred in the month of January to March. Accra Metropolis had the highest number of under-five diarrhoea cases with acute watery diarrhea being the most common form of diarrhoea. Overall fatality rate for the period (2011-2014) was 3.81% (22/578 deaths). The fatality rate for the period was within the fatality rate that commonly found in lower and middle-income countries.

6.2 Recommendations

1. The Ministry of Health in conjunction with Ghana Health Service and other health organizations both local and international organizations should intensify the sensitization of the public especially those living within the Accra metropolis about the risk factors, causes and prevention of under-five year diarrhoea. This is based on the fact that most of the under-five diarrhoe children resided within the Metropolis.
2. Mothers whose children are born outside hospitals should be educated and encouraged to bring their children to the Hospital for the rotavirus vaccination.

The vaccination will protect the children from diarrhoea and has been found to be effective.

3. The public health unit of the PML Children's hospital should intensify their monitoring and awareness initiatives and programmes especially from January to March since more diarrhoea cases were recorded within these months.



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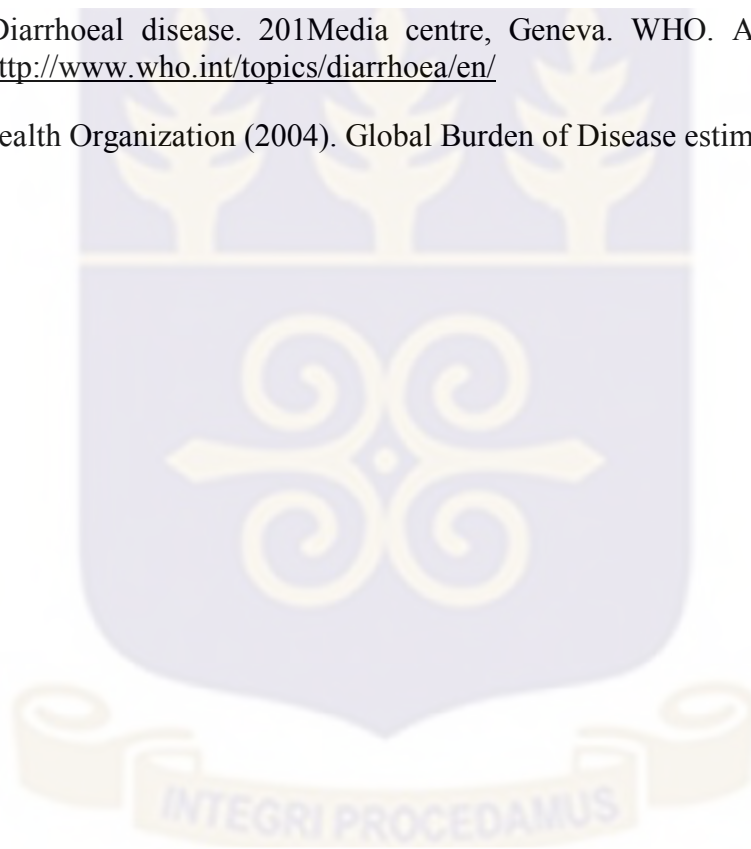
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APPENDIX 1: DATA CAPTURE SHEET

TRENDS OF DIARRHOEA DISEAS AMONG CHILDREN UNDER FIVE AT THE PMLH (2011-2014)

FOLDER NUMBER	DATE OF ADMISSION	SOCIOECONOMIC STATUS OF CAREGIVER		DEMOGRAPHIC FACTORS OF CHILD			DIAGNOSIS	Outcome Discharge Death
		Educ. level	Occupation	Age	sex	residence		
<u>A</u>	<u>7/12/16</u>	<u>Primary</u>	<u>Trader</u>	<u>38</u>	<u>m</u>	<u>Kotobabi</u>	<u>Acute watery diarrhea with or without dehydration</u>	<u>discharged</u>

