FIVE YEARS' MAGNITUDE OF PNEUMONIA AND ASSOCIATED FACTORS AMONG CHILDREN UNDER FIVE YEARS OF AGE IN DARIMU WOREDA HEALTH CENTERS, ILU ABA BORA ZONE, SOUTH WESTERN ETHIOPIA

MPH RESEARCH PAPER

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A Thesis Submitted to the Department of Public Health,

School of Graduate Studies

Haramaya University

JULY, 2017

Haramaya University, Harar

HARAMAYA UNIVERSITY
COLLEAGUE OF HEALTH AND MEDICAL SCIENCE
SCHOOL OF GRADUATE STUDIES

FIVE YEARS' MAGNITUDE OF PNEUMONIA (FROM JANUARY1, 2012 TO DECEMBER 31, 2016) AND ASSOCIATED FACTORS AMONG CHILDREN UNDER FIVE YEARS OF AGE IN DARIMU WOREDA HEALTH CENTERS, ILU ABA BORA ZONE, SOUTH WESTERN ETHIOPIA

A Thesis Submitted to the Department of Public Health,
School of Graduate Studies
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In Partial Fulfillment of the Requirements for the Degree of
Master in public health Epidemiology

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JULY, 2017

HARAMAYA, ETHIOPIA

APPROVAL SHEET

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SCHOOL OF GRADUATE STUDIES

I hereby certify that I have read and evaluated this Thesis entitled**five years'magnitude of pneumonia (from january1, 2012 to December 31, 2016) and associated factors among children under five years of age in Darimu woreda health centers, Ilu Aba Bora zone, south western Ethiopia**prepared under my guidance by Gutema Ganfure. I recommend that it be submitted as fulfilling the thesis requirement.

Major Advisor	Signature	Date
Co-Advisor	Signature	Date

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Date: **October, 2017**

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ACKNOWLEDGEMENT

I am very grateful to God who always helps me in all conditions I pass. I am indebted to extend my earnest thanks to Haramaya University, school of graduate students for giving chance to prepare this research paper and my advisors Mr Melake Demena and Dr Nega Assefa for helping me by giving a constructive comment and advise for this research preparation. I am very glad to extend my thanks to Haramaya University library for allowing materials and internet access for preparing this research paper.I also acknowledge the directors ofDarimu Woreda health centers for their cooperativeness in providing the necessary IMNCI registrations which are important for the development of this thesis.Lastly but not least, I thanks the data collectors and study participants.

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ACRONYMS AND ABBREVIATIONS

AIDS-Acquired Immune Deficiency Syndromes

AOR- Adjusted Odd Ratio

ARI-Acute Respiratory Tract Infection.

CHERG-Child Health Epidemiology Reference Group

CI-Confidence Interval

COR- Crude Odd Ratio

CSA-Central Statistical Agency

DEC-Data Entry clerk

EDHS-Ethiopian Demographic and Health Survey

EPIDATA-Epidemiological DATA

IMNCI-Integrated Management of Neonatal and Childhood Illness

OR-Odds Ratio

OPD- Out patient diagnosis

PI-Principal Investigator

SPSS-Statistical Package for Social Science

UNICEF-United Nations Children's Fund

UNHCR-United Nation High Commissioner for Refugees

WHO-World Health Organization

ABSTRACT

Background: -Pneumonia is inflammation of the lungs, which makes breathing difficult and limits gaseous exchange. It is mostly caused by infectious agents and can be spread in different ways such as coughing and sneezing. Pneumonia is the number one infectious killer of children under age 5 globally and Time Trend of Pneumonia in under Five Children of Nepal on secondary data analysis showed that the year wise incidence of Pneumonia is having an increasing trend.

Objective: -The objective study was to assess five years' magnitude of pneumonia (from January 1,2012 to December 31, 2016) and associated factors among children under five years of age in Darimu woreda health centers, Ilu Aba Bora Zone, Oromia Region, Western Ethiopia from February 30 to March 30, 2017.

Methods: -Health care facility based Retrospective cross-sectional study was conducted. All under five years old children who had visited under five Outpatient diagnosis of Darimu woreda health centers were source of the study participant. The secondary data was obtained from Integrated Management of Neonatal and Childhood Illness registration books in health centers. The total 5 health centers of the study area were stratified in to two strata one major and four minor health centers. Then in the first stage, two minor health centers were selected by simple random sampling technique and the one major health center was included purposively**.** In the second sampling stage, systematic sampling technique was done to select participants. The data was checked for completeness and then entered into EPI-Data version 3.02 for data editing and cleaning and analyzed by using SPSS version 20 software package. Logistic regression analysis (bivariate and multivariate) was used to assess the association between pneumonia and independent variables.

Result: -Four hundred fifteen (415) records were included in the study. Among those Children who were included in the study, 221(53.3%) children were diagnosed for pneumonia. The minimum clinically diagnosed pneumonia cases of 47.9%, being reported in 2015, and the

maximum of 62.5% were reported in 2013. Place of residence(AOR=3.242; 95%CI=1.330,7.900), diarrhea (AOR=2.553; 95%CI=1.612,4.043), past history of measles(AOR=10.021; 95%CI= 1.239,81.249) and breast feeding status of the children(AOR=1.754; 95%CI=1.085,2.838) were the variables significantly associated with the occurrence of under five pneumonia.

Conclusion and Recommendation: -During the five years, a relatively decreasing of the proportion of pneumonia among under five years of age children was observed. It also pointed out such modifiable risk factors of pneumonia as Place of residence, diarrhea, past history of measles and breast feeding status of the children. The woreda health office, in collaboration with the health facilities in the woreda, should design strategies to help community strengthen their knowledge on the benefit of exclusive breast feeding.

1.INTRODUCTION

1.1 Background

Pneumonia is inflammation of the lungs, which makes breathing difficult and limits gaseous exchange. It is mostly caused by infectious agents and can be spread in different ways such as coughing and sneezing and Pneumonia is the number one infectious killer of children under age 5 globally, killing an estimated 935,000 children each year, that's more than 2500 per day. Pneumonia causes 15% of all deaths in children under age 5 worldwide – 2% of which are newborns. And in developing countries the greatest burden of the disease is among the under-5s is caused by pneumonia(Mitike.G, et al. 2001; Johnson.W.B.R and Abdulkarim.A.A 2013 ; WHO 2014)

The determinants of pneumonia are numerous - educational status of parents, smoking habits of any member of the household, nutritional status, age and sex of the child- and widely vary across the regions of the world. The clinical picture of pneumonia differ depending on the micro organism causing the disease and age of a child. Pneumonia in children with high grade fever and difficulty of breathing is usually caused by bacterial pathogens and pneumonia due to viral causes often come about progressively (WHO 2006).

According to Integrated Community Case Management (iCCM) Survey in Amhara, SNNP, and Tigray Regions,Among 780 sick children in the study, 71% (550) of them were children with ARI. Among the children with ARI symptoms, 64% of those with cough had symptoms of pneumonia (i.e., breathed faster than usual, or with short, rapid breaths, or have difficulty breathing (L10K 2013).Timely diagnosis of pneumonia is an essential step in the prevention process of the diseases. X-ray and laboratory identification of the causative agent are the confirmatory tools to certainly establish the diagnosis of pneumonia. However, these are largely unaffordable in the resource poor settings like Ethiopia. The recommended approach to settle the diagnosis of suspected pneumonia in such regions is, therefore, to rely on the clinical presentation of the disease (WHO 2005).

Integrated Management of Neonatal and Childhood Illness (IMNCI) has been launched by the World Health Organization (WHO) and United Nation's Children Fund (UNICEF) to help health workers classify and treat pneumonia and other most common childhood illness based on certain sensitive and specific signs(WHO 2005). The core of this innovative prevention and curative strategy is to approach the sick child in an integrated fashion, Instead of targeting on single diseases for which s/he has been brought, the child is assessed holistically for possible common childhood problems such as pneumonia, Diarrhea, Malaria ,Malnutrition and others (WHO 2005).

The presence of cough and fast breathing and or difficulty of breathing for specific age clenches the classification of suspected pneumonia in children older than 2 months and yet less than 60 months of age (WHO 2005).Any child older than 2 months of age who presents with one or more of the following danger sign is classified as having suspected sever pneumonia or diseases: chest in drawing, stridor, convulsion, vomiting everything, inability to breast feed/eat/drink, unconsciousness, and lethargy.(WHO 2005)

1.2 Statement of the problem

Pneumonia is a leading cause of death among children worldwide; however, in developing countries the greatest burden of the disease is among the under-5s (Johnson.W.B.R and Abdulkarim.A.A 2013).This children survival gap between the most deprived and better off children is known by looking at the unacceptably high child deaths and morbidities in the poorest settings of the world, including Ethiopia. According to the UNICEF report in 2006, about 156 million new pneumonia cases are estimated to occur each year in the world while its incidence is believed to exceed 150 million new cases (0.29 episodes per year-child) in developing countries just in a year, making the developing nation to host more than 95% of all new pneumonia cases globally(WHO 2006; Rudan.I et al. 2008). In 2011, there were 120 million new pneumonia infections worldwide, 14 million of which were sever enough to require hospitalization. More than 50% of all new pneumonia cases of the under- five childhood are concentrated in the poorest world's regions, Sub-Saharan Africa and South Asia (WHO 2006; Rudan.I et al. 2008; UNICEF 2012).

The most common causes of deaths as identified by physicians' review was pneumonia (28.5%), and It is the major killer of children under the age of five years than any other diseases known to affect children, and, also, more than the death shares of Acquired Immune Deficiency Syndrome (AIDS), Malaria, and Measles combined (WHO 2006; Fantahun.M et al. 2007). Nearly 90 per cent of deaths due to pneumonia and diarrhea occur in sub-Saharan Africa and South Asia and The concentration of deaths due to pneumonia among the poorest children reflects a broader trend of uneven progress in reducing child mortality. Far fewer children are dying today than 20 years ago, Thanks mostly to rapid expansion of basic public health and nutrition interventions, such as immunization, breastfeeding and safe drinking water. But coverage of low-cost curative interventions against pneumonia remains low, particularly among the most vulnerable (UNICEF

2012).Nearly 50% of pneumonia deaths take place in only five densely populated and poorest countries: India, Nigeria, Democratic republic of Congo, Pakistan and Ethiopia. Fifteen percent of all deaths of children less than five years of age is shared by pneumonia(WHO 2014).

According to JSI Research and Training Institute Inc. / The Last Ten Kilo Meters Project (L10K) survey conducted in Ethiopia in 2015,The majority of the health facilities (99% of health posts and 96% of health centers) were providing routine vaccination services at the time of the survey. About 83% of health posts and 35% of health centers were providing the service on monthly basis to reduce pneumonia and other disease of under five years children (L10K 2015). However, Eighteen percent of all the under-five childhood death in Ethiopia is recognized to be due to pneumonia(WHO 2014). A cross-sectional survey conducted in Amhara, SNNP, and Tigray Regions of 60 health posts in 2013, From the total of under five years children, 19% of the children had had ARI symptoms in the preceding two weeks (L10K 2013).

Time Trend of Pneumonia in under Five Children of Nepal on the secondary data analysis of the incidence of Pneumonia (mild + severe) per 1,000 children under five years (new visits) done between 2005 to 2014, showed that the year wise incidence of Pneumonia is having an increasing trend (Sathian.B et al. 2015). More importantly, there were no previous scientific studies to find out the trends of pneumonia among under five years old children in Darimu woreda. InDarimu woreda the recent service report from the health centers shows pneumonia to be one of the ten top diagnosis in children.

This study is, therefore, intended to bridge this information gap by determining the trends of pneumonia among children under five years of age and its associated factors in this district, and to update the previous knowledge on the same problem.

1.3 Significance of the study

The aim of this study tries to find out the need for health care and interventions for child health of the community in the study area. The study also provides better way of selecting specific and effective indicator for wellbeing of the society to the study area. From this study concerned organizations like Darimu woreda health office and other governmental and nongovernmental organizations can utilize for evaluating their program across health of the community in providing service to reduce under five children mortality caused by pneumonia. Through such study the government can determine the need to establish or expand existing surveillance and also the study initiates for subsequent studies in the area as well as in the country.

1.4 Objectives

1.4.1 General objectives of the study:

To assess five years' the magnitude of pneumonia (from January 1, 2012 to December 31, 2016) and associated factors among Children Under Five Years of Age in Darimu woreda health centers, Ilu Aba Bora Zone, Oromia Region, Western Ethiopia from February 30 to March 30, 2017.

1.4.2 The Specific objectives of the study are:

- To assess five years' the magnitude of pneumonia (from January 1, 2012 to December 31, 2016) among children under five years of agein Darimu woreda health centers.

- To assess factors associated to pneumonia among children under five years of ageamong children under five years of agein Darimu woreda health centers.

2.Literature Review

2.1 Pneumonia Morbidity and Mortality burden among under- five children

Pneumonia is among the major killer diseases in under-five children. In developing countries 3 million children die each year due to pneumonia. The main causes of pneumonia are infectious agents such as microorganisms. In some cases, noninfectious agents can also cause pneumonia. For example, aspiration of food, chemicals such as hydrocarbons, and inhalation of smoke can cause pneumonia. According to differentreports, in developing countries, a child dies every seven seconds from Acute Respiratory infections (ARI) usually pneumonia (Mitike.G et al. 2001). Time Trend of Pneumonia in under Five Children of Nepal on The secondary data analysis of the incidence of Pneumonia (mild + severe) per 1,000 children under five years (new visits) done between 2005 to 2014, showed that the year wise incidence of Pneumonia is having an increasing trend (Sathian.B et al. 2015).

In Ethiopia, there are very few studies carried out so far on the trend and prevalence of pneumonia and its risk factors. The latest nationwide research to date is the 2011 Ethiopian Demographic and Health Survey (EDHS), which estimated the national prevalence of pneumonia to be 7%-with the significant variation across regions, the highest and lowest of the two weeks recall based prevalence preceding the survey of the under-five pneumonia was reported in Benishangul- gumuz and Addis Ababa, respectively. The average estimate may hide the probably high prevalence of pneumonia in the rural community. The percentage of children aged less than five years with pneumonia in Amhara regional state reported to reach 6.4%(CSA 2012). A

community based cross sectional study done in Este town in 2014 found that the prevalence was as high as 16%. EDHS report (Abeje.G.F et al. 2014)

According to UNICEF,2012 report Pneumonia and diarrhea are leading killers of the world's youngest children, and the poorest regions and countries are the most affected. Nearly 90 per cent of deaths due to pneumonia and diarrhea occur in sub-Saharan Africa and South Asia. The concentration of deaths due to pneumonia and diarrhea among the poorest children reflects a broader trend of uneven progress in reducing child mortality(UNICEF 2012). Approximately 20% of the 9 million estimated deaths in children aged less than five years in 2007 was ascribed to pneumonia(WHO 2008; WHO 2009). Again, about 19% of all deaths in children aged less than five years in 2008 was attributable to pneumonia (Rudan.I et al. 2008). This figure has reportedly increased to 21% in the 2012 WHO world health statistics report. However, the 2014 estimates of pneumonia mortality by the UNICEF indicates that the disease was responsible for 15% of under five deaths in 2013(UNICEF 2014).

Out of 64.0% of all infectious causes of under- five mortality in 2010, pneumonia still takes the big share of 18.3% world wide. The contribution of pneumonia to the deaths of older children was estimated to reach 14.1% with approximately four percent of childhood pneumonia related death occurred in the first 28 days of life globally (Liu.L et al. 2012). In 2011, about 1.3 million children aged less than five years died of pneumonia globally. The same report showed that the case fatality ratio of pneumonia reached up to 8.9% worldwide (Fischer.C et al. 2013). According to 2012 lancet report, however, the global estimate of childhood pneumonia deaths was 18%,which can be translated to approximately 1.4 million childhood deaths, roughly a 100,000 deaths rise from the previous report of 2011(Liu.L et al. 2012).

Considering the under five children pneumonia mortality burden on continent basis, Southeast Asia bears the highest, estimated to reach 21.8% followed by Africa where pneumonia is responsible for 17% of deaths (Liu.L et al. 2012). According to the 2011 lancet report ,however, the highest burden of pneumonia mortality was observed in Sub-Saharan Africa where 43% of all the under- five childhood pneumonia mortality took place (Fischer.C.Walker et al. 2013).

Likewise, in 2012,the Eastern Mediterranean and Western pacific each bears the child hood pneumonia mortality burden of 19% and 16%,respectively. By contrast, only 10% and 12% of childhood deaths in America and Europe, respectively, are attributable to pneumonia (Liu.L et al. 2012).

India, Pakistan, Nigeria, democratic republic of Congo and Ethiopia are the five highest children pneumonia mortality burden countries in the world. In India, pneumonia killed about 0.397 million children younger than five years which equates to 23.6% of all deaths. In china, pneumonia is the single leading cause of childhood mortality, contributing to 17.4% to the toll of deaths in children less than five years (Liu.L et al. 2012). Seventy-four percent of all under five pneumonia deaths in 2011 was reportedly concentrated in the 15 high burden countries 10 of which are in Africa, including Ethiopia. As the episodes of pneumonia progress to severity, the highest pneumonia mortality tend to occurred in these 15 high burden countries (Fischer.C.Walker et al. 2013).The latest countdown 2014 report presents the country profile of each of the 75 countdown countries where more than 95% of all childhood pneumonia deaths occurred. The vast majority of countdown countries from Africa experienced disproportionately high load of pneumonia cases. In Ruanda, Sierra Leone, Somali, South Sudan and South Africa, 18%,16%,19%,20% and 17% of all under five deaths, in 2012, died of pneumonia, respectively. Conversely, Peru, Nepal, Mozambique, and Morocco, carry pneumonia case load of correspondingly 10%,14%,14%, and 13% (WHO 2014).

Looking at the situations in Ethiopia, pneumonia is the single leading cause of death among children younger than five years in Ethiopia. The 2008 WHO report showed there were 389,000 under five deaths, of which 22% were due to pneumonia(WHO 2009). In 2010,pneumonia was responsible for 21% of all under five deaths in the country, only one percent reduction over the 4 years period(UNICEF 2012). According to the recent 2014 countdown to 2015 report, however, the toll of under-five pneumonia deaths has supposedly plummeted to 18%, which is among the highest even compared to the load in the majority of African countries. Nonetheless, there are only scant source of data on this problem locally. For instance, a case control study in Gilgel Gibe

revealed that 42% of post neonatal and 22.6% of neonatal mortality were attributable to pneumonia (Deribew.A et al. 2007; WHO 2014).

2.2. Determinants of under- five pneumonia

2.2.1. Socio demographic characteristics

Both the incidence of and mortality from pneumonia widely vary across the age of the child where children younger than 2 years of age disproportionately bear about 81% of the overall under- five pneumonia morbidity burden (Fischer.C.Walker et al. 2013). An epidemiological study conducted at Omdurman Pediatrics Hospital, Khartoum, Sudan reports The childhood pneumonia was more frequent among children with low family income 35(36.1%) (X2 = 26.862 - P value = 0.00000147) and place of residence and Educational level had a relation with pneumonia (Abdelsafi.A.G et al. Nov/Dec 2014). However, a case control study in Pakistan found that educational status of parents was not significantly associated with the development of pneumonia (Fatmi.Z and White.F 2002). Comparatively, children born from well to do family are less risky to develop pneumonia than are their counterparts from poor family (Adj. OR 2.51, 95% CI: 1.02-5.73) and Occupational status of parents appeared to have no effect on 02 -59 months old pneumonia (Abeje.G.F et al. 2014).

In a case control study in Pakistan, younger children were found to be at increased risk of pneumonia compared to older children under the age of five years (AOR -2.63 95%CI: -5.14,-0.12) and maternal occupation was significantly associated with pneumonia in under-fives (Fatmi.Z and White.F 2002). There is also evidences on the difference inincidence of pneumonia between boys and girls, with the higher episodes of pneumonia occurred among boys (Fischer.C.Walker et al. 2013). However, this result is in contrary to other finding where gender of the child did not affect the occurrence of child hood pneumonia (Fatmi.Z and White.F 2002). Factor , birth order is among the lists of factors that affects the risk of pneumonia in children (Claudio.F.Lanata et al. 2004).

2.2.2. Environmental factors

Safe water source for both drinking and other uses including hand washing and improved sanitation facility can for the most part prevent pneumonia (UNICEF 2012). A research done on electronic databases (including Africa, China and Latin America) in 2008, on the effect of indoor air pollution is known to accelerate the risk of pneumonia and pneumonia caused deaths and indoor air pollution on under five children found that the risk of pneumonia among children who are exposed to indoor air pollution from solid fuel combustion increased by 80% (Dherani.M et al. 2008).The result of a community based cross sectional study in rural kebeles, of Northwest Ethiopia shows that, Charcoal use for cooking(Adj. OR=7.41, 95% CI: 2.75-19.95), and carrying on the back of a child during the time of cooking (Adj. OR=5.38, 95% CI:2.13-9.65) were statistically significantly associated with pneumonia after controlling for the possible extraneous variables, but animal dung use for cooking has shown no relationship with the incidence of pneumonia (Abeje.G.F et al. 2014). Half of the 2 million premature deaths in low income countries are due to pneumonia caused by indoor air pollution from solid fuel use (UNICEF 2012). Living in the crowded household environment enhances the transmission of pneumonia to the health child by 80% (95% CI 43–125). (Fischer.C.Walker et al. 2013).

2.2.3. Co morbidity

Co-morbidity has been found to elevate the risk of pneumonia. Diarrheal diseases is one of the determinants of under -five pneumonia as established by child health epidemiology reference group (CHERG), an academic review group started on by WHO (Claudio.F.Lanata et al. 2004).

As study conducted on the Women's involvement in household decision-making and strengthening social capital crucial factors for child survival in Ethiopia, Lack of immunization had a strong association with mortality in under-five children [AOR 9.8 (6.0–16.1)]. (Fantahun.M et al. 2007). Case control study in Pakistan supports this finding that lack of immunization (adjusted odds ratio (AOR)= 1.54,95% CI 1.0,2.3), previous history of pneumonia (AOR=1.77,95% CI 1.16,2.7), is revealed as important risk factors for pneumonia. (Fatmi.Z and White.F 2002). The Child Health Epidemiology Reference Group(CHERG) revealed that other co morbid diseases such as HIV/AIDS , Malaria and Malnutrition were identified to be associated

with increased occurrence of pneumonia (Claudio.F.Lanata et al. 2004). Anemia (OR=4.63, P value<0.01) in children is recently studied to be significantly associated with the development of pneumonia (Quyoom.S.Hussain et al. 2014).

2.2.4. Nutritional factors

Exclusive breast feeding during the first six months of life and adequate nutrition to age 5 improves children's natural defenses, protecting them from pneumonia. Not exclusively feeding children younger than six months of age is another factor that put them at higher risk of pneumonia (UNICEF 2012; Fischer.C.Walker et al. 2013; WHO 2014). Children who have in appropriate weaning time were found to be at increased risk of pneumonia infection. Both delayed and early weaning are thought to be the risk factor for malnutrition which itself is strong predictor of pneumonia (Prasad.D.Pore, Chandrashekhar.H.Ghattargi et al. 2010). The same case control study identified the nutritional status of the child to be significantly associated with the development of pneumonia in under- fives. Under nutrition, zinc and vitamin A deficiencies have also been found to be an independent risk factors of pneumonia in children aged less than five years of age (Claudio.F.Lanata et al. 2004; Aggarwal.R et al. 2007; Fischer.C.Walker et al. 2013).A research done on Children below Five Years of Age in Bure Town, West Gojjam Zone, Amhara National Regional State in 2016, indicates acute respiratory tract infection had association with wasting (AOR = 6.003, 95% CI: 2.757–13.074) (Amare.D, Negesse.A et al. 2016). And also Unmatched case control study conducted in Kersa district, Southwest Ethiopia in 2016 indicates wasting (AOR= 2.0; 95% CI: 1.2, 3.5) is showed as determinant of Community Acquired Pneumonia among 2-59 months old children. an important association (Geleta.D et al. 2016).

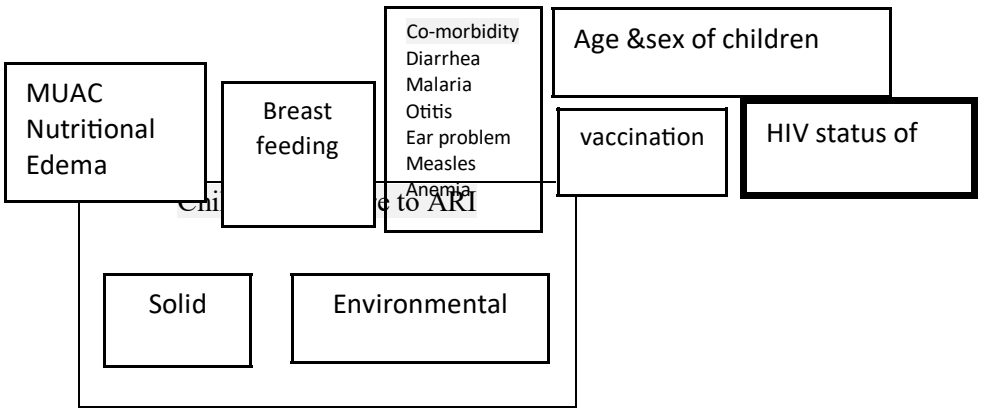
2.2.5. Other factors

According to a study conducted in developing countries in 2004, Local health care system namely maternal and pediatric care, access to health care and low birth weight are found to predict pneumonia in under- fives. Altitude, annual rainfall, number and nature of the seasons and average monthly temperatures are the factors listed by CHERG as factors of under -five pneumonia

(Claudio.F.Lanata et al. 2004). Although the risk of vitamin D in the development of pneumonia remains undecided, Results from the Third National Health and Nutrition Examination Surveyconducted in 2013, has found that low blood level of vitamin D significantly increased the risk of pneumonia among adolescents (Sadeq.A.Quraishi et al. 2013). An Indian hospital based case control study suggested that the deficiency state of vitamin D considerably boosted the probability of childhood pneumonia (Esposito.S and Lelii.M 2015).These findings are, however, no longer supported by the other recent study in children conducted in Canada in 2009 where there found no association between this vitamin A and risk of pneumonia (Khakshou.A et al. 2015). The primary care taker's knowledge of pneumonia plays a considerable role in reducing the burden of the problem through helping the child to seeking appropriate care on timely manner (WHO 2006).The health seeking behavior of primary care taker increases when
they are able to diagnose the ill child as having pneumonia ,which in turn decreases the morbidity and mortality burden of pneumonia (WHO 2006; Ferdous.F et al. 2014).

Morbidity of under-five pneumonia is the greatest impediment to children's health universally though the prevalence varies significantly across various regions, with developing countries bearing the highest burden. The pneumonia studies in developing countries such as Ethiopia, though limited, found the diseases to be the major causes of morbidity and mortality of children under the age of five years. Numerous factors determining the risk of pneumonia in under- fives are reviewed in various literatures across diverse regions of the world. Some risk factors are consistently found to be determinants of pneumonia in all reviewed literatures unlike others, which showed different degree of association with pneumonia across the studies. Certain socio demographic characteristics such as educational status of parents, residence, occupation, age and sex, environmental factors such as types of toilet, indoor air pollution, source of water for drinking and washing and nutritional factors such as weaning time, and also some co morbid illness ,namely diarrhea and Measles, which are prioritized by the Child Health Epidemiology Reference Group (CHERG), are linked to each other to determine the occurrence of under-five pneumonia morbidity .

Conceptual framework



Maternal situation

- Place of residence
- HIV serostatus
- Educational level
- Income
- Occupation
- Religion
- Ethnic group

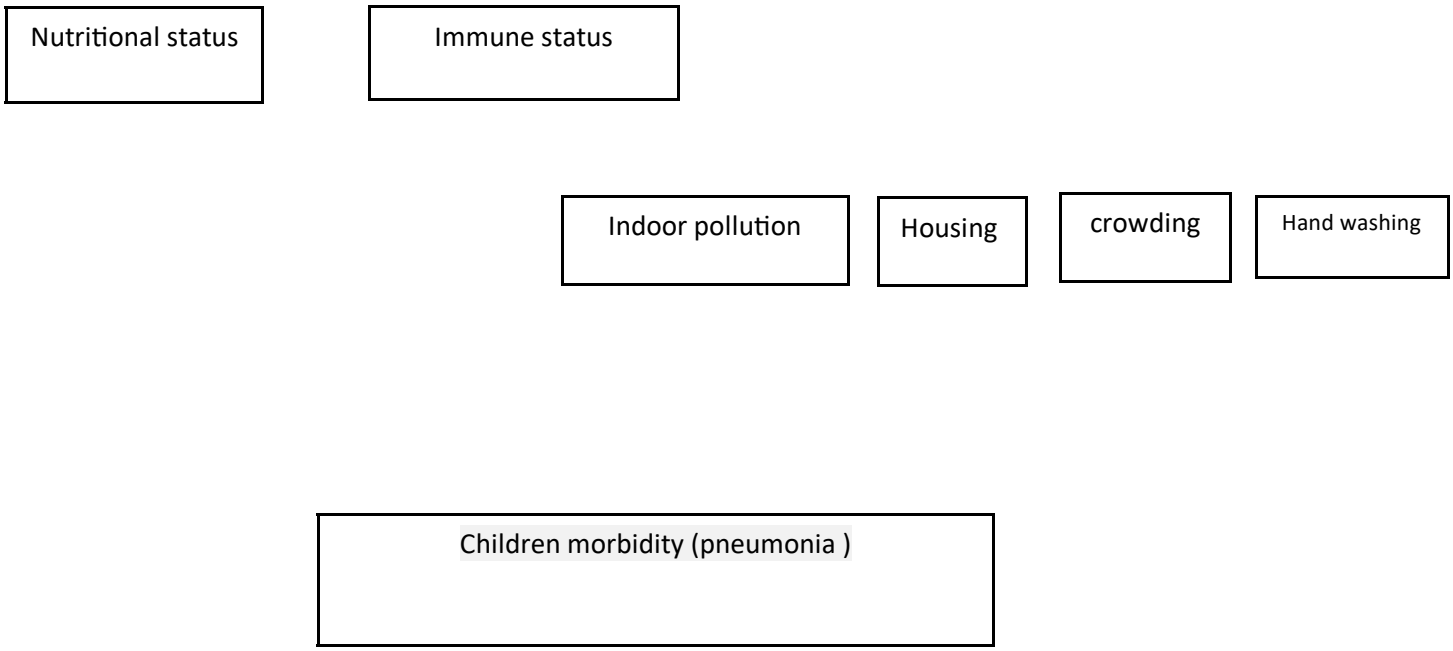


Figure 1: Conceptual frame work on causal relationship of under five years old pneumonia development

3.MATERIALS AND METHODS

3.1 Study Area/Setting and period

Darimu woreda is one of the 14 woredas found in Ilu Aba Bora zone, Oromia region and the study site is located about 664 kilometers from Ethiopia's capital city, Addis Ababa in south western Ethiopia. The capital of Ilu Aba Bora Mattu town is located about 600 kilometers from Addis Ababa along the south western main road that connects Addis Ababa and Gambella and the study area is located about 64 kilometers North of Mettu town. One urban and Forty five rural kebeles are under the jurisdiction of the district administration. The main livelihood of the woreda is agriculture in the rural area and trade in the urban setting. Coffee and maize are among the major agricultural products. Darimu woreda has 153,00 population size (2008 census projection) and There are now about 28,489 children under the age of five years in the district.

According to the Oromia regional health bureau reports, the health care delivery system of the woreda has one district hospital (start giving service in mid-2014), 5 health centers (one major and four minor), 46 health posts and more than 10 private clinics (lower and medium) which are routinely delivering different health care programs to community.Pneumonia is reported as one of the largest cause of outpatient visit in Darimu woreda (district). The recent health services report from the health centers shows pneumonia is one of the ten top diagnosis in children.The study was conducted from February 30 to March 30, in the selected health centers.

3.2 Study design:

Health facility based retrospective Cross-sectional study was conducted

3.3 Source population

All children under five years oldwho visited Darimu woreda health centers from January 1, 2012to December 31, 2016

3.4 Study population

All children under five years of age who visited the randomly selected health centers from January 1, 2012to December 31, 2016 were included in the study.

3.5 Inclusion and exclusion criteria

3.5.1 Inclusion criteria

All children under five years oldwho visited the under-five OPD of all health centers of Darimu Woreda from January 1, 2012 to December 31, 2016.

3.5.2 Exclusion criteria

Children whose recorded information were incomplete/not legible and children who were referred to hospitals for farther diagnosis and management during the study period were excluded.

3.6 Sample size determination

A single population proportion formula [$n= Z^2_{\alpha/2} P (1-P)/\omega^2$] was used to estimate the minimum required sample size. The following assumptions were made: 95% confidence level, margin of error 5% ($\omega = 0.05$) and expecting that 43.4% (p) of the total children who had a symptom of ARI (as reported by 2012, Ethiopian demographic health survey)(CSA 2012). Computing with the above formula gives a total sample size of 377. Including 10% non-response rate, the final sample size calculated to be 415.

Alternatively, the two population proportion formula was used to calculate the required sample size of children under five years of age considering wasting and history breast feeding as the two major determinant factors of pneumonia in this age group according to Unmatched case control study conducted in Kersa district, Southwest Ethiopia (Geleta.D, 2016). At 80% power, the sample size was calculated as follows:

Major variables	Confidence interval	P1	P2	AOR	Ratio(unexposed: exposed)	Sample size (+10% NR)

Wasting	95%	59.3%	74.5	2	1:1	361
Breast feeding	95%	32.2%	61.5%	3.3	1:1	117

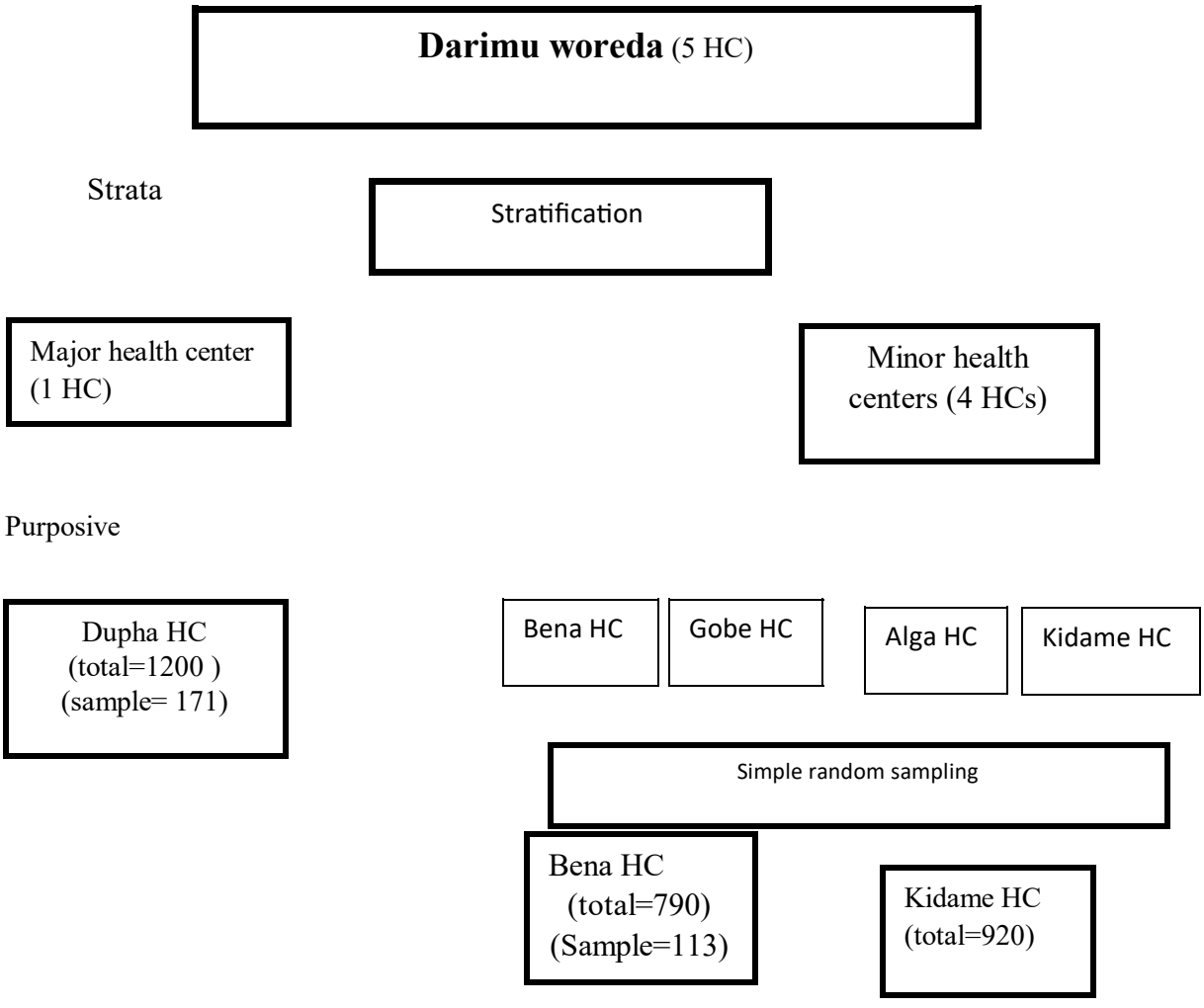
Where,

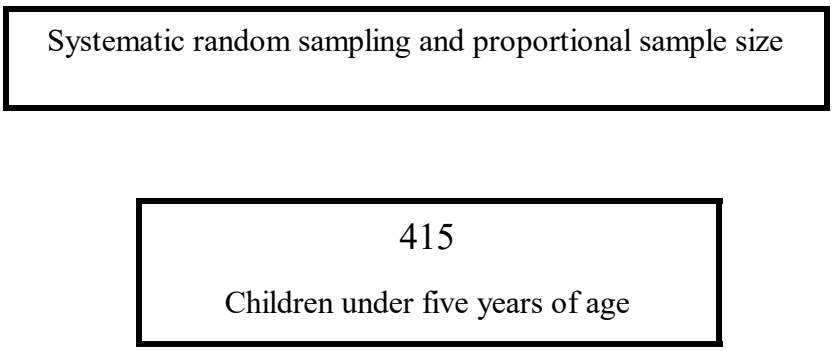
P1-the percentage of under-five pneumonia in unexposed (normal and exclusive breast feeding) P2-the percentage of under-five pneumonia in exposed (wasting and non-exclusive breast feeding). Since the sample size for each of these variables is calculated to be smaller than the size calculated for the single proportion formula, the 415 children under five years of age remained the appropriate sample size for this study.

3.7 Sampling procedures/Technique

Stratified sampling procedure was used to include one major and four minor health centers, Since the type of health center is known to affect the availability of the data.

Out of the total 5 health centers of the study area were stratified in to two (1 major and 4 minor) strata. The major health center was selected purposively and then two health centers were selected by simple random sampling technique from four minor health centers. In the second stage the number of children selected from each health center was determined based on proportion to the total number of children in each health center. Then using systematic random sampling technique every k^{th} (every 7^{th}) child was selected from each health center adding up to 415 children (final sample size).


Darimu woreda (5 HC)
Strata
Stratification
Major health center (1 HC)
Minor health centers (4 HCs)
Purposive
Dupha HC (total=1200) (sample= 171)
Bena HC
Gobe HC
Alga HC
Kidame HC
Simple random sampling
Bena HC (total=790) (Sample=113)
Kidame HC (total=920)



Note:- HC- Health center

Fig.2: Schematic presentation of the sampling procedure of children under-five years of age from Darimu woreda health centers, Ilu Aba Bora zone.

3.8 Study variables

3.8.1 Dependent variable

Pneumonia among children under five years of age

3.8.2 Independent variable

- Age of child
- Sex of child
- Place of residence
- Educational level of mothers
- Religion
- Ethnic group
- Occupation of mothers
- Under nutrition
- Breast feeding
- Immunization status of children
- Vitamin A
- Diarrhea
- History of measles
- Anemia

3.9 Operational definition

Under nutrition- usually thought of as a deficiency primarily of calories and measured by MUAC a quick and simple way to check loss of muscle and fat and child whose MUAC was < 12 cm classified as under nutrition and also measured by nutritional edema.

The mid upper arm circumference (MUAC)- The most feasible way to determine wasting or acute malnutrition and measured by centimeter and if the child MUAC was less than 12 cm classified as under nutrition and above and equal to 12 cm normal regarding the nutrition status of the children.

Immunization status- the status of child exposed to immunization to produce immunity and a child could take all vaccine was classified to fully immunized (complete), who not complete but on appointment as uptodate and who discontinue as defaulted.

Vitamin A- A treatment or immunization given for children after a six months of age to all children and given every six months and a child who was on appointment classified as uptodete and who did not know about vitamin A classified as not uptodate.

Diarrhea- a child whose stools contain more water than normal/loose or watery stool

Pneumonia- Inflammation of the lungs, which makes breathing difficult and limits gaseous exchange.

Woreda – administrative division of Ethiopia. subdivided in to a number of kebeles, which are the smallest units of local government in Ethiopia.

3.10. Data collection method

Structured data collection checklist/tools was adopted from IMNCI registration book. The checklist was used to address the trends of pneumonia and associated with pneumonia morbidity in under five year children in health centers.

Data was obtained from registration books in the health centers during the calendar years from 2012 to 2016. The registration books include the date of diagnosis, age of the children, vaccine

status, nutrition status, place of residence and other associated factors and the outcome of the diagnosis were collected. The data were collected from registration book by 3 data collectors (Heath officer and BSc nurse) who have experience on under five OPD and were recruited from different health centers.

3.11. Data quality control

Three days training was given to data collectors for four days prior to the starting of the data collection on contents of data collection format by health center director and principal investigator. The data collection checklist was pretested with two month record out of the indicated period (January, 2012 to the end of December 2016) under the study to check the consistency and completeness of the checklist. Daily very close supervision was undertaken during data collection process and checked for its consistency and completeness by supervisors and principal investigators.

3.12. Data processing and analysis

The compiled data was handed over the unsophisticated data entry/quality checking supervisors on the same day of each work, and entered to computer

The data was checked for completeness and then entered into EPI-Data version 3.02 for data editing and cleaning and analyzed by using SPSS version 20 software package. Descriptive such as proportions, percentages, and mean (SD) of pneumonia (95%Confidence interval) of the time spans was estimated.

Logistic regression analysis (bivariate and multivariate) was used to assess the association between pneumonia and independent variables like place of residence, vaccine, nutrition, age of the children, and other factors using OR and 95% CI; adjusted OR for explanatory variables was also determined. The significance level was considered at $P< 0.05$. explanatory variables with (P-value <0.03) was entered into the final simple regression model based on the likelihood ratio. In addition, this model was used to assess the trends of pneumonia in health centers. Finally, the finding was presented by using tables and graphs as appropriate.

3.13. Ethical considerations*:*

Ethical clearance was obtained from Haramaya University, college of health science and ethics clearance committee. All processes were started after safe and sound written permission obtained from the post graduate office of Haramaya University. A permission letter obtained from school of graduate studies was submitted to Darimu woreda health office. A signed written consent was obtained from the heads of woreda health office for collecting data from the health centers. Confidentiality of the data was kept through the data collection and the entire study period. Only authorized person was get to assess to raw data collected from the health facilities.

3.14. Dissemination of research findings*:*

Final copy of this study finding was submitted to Haramaya University, school of graduate studies, Oromia National Regional Bureau and Darimu woreda health office, and to those who have a stake in under five year interventions and NGO. Efforts was made to present the findings of the study in different seminars, workshops and conferences. Publication on the scientific journals was also be considered.

4. RESULT

4.1.Socio demographic characteristics of the respondents

The study population consisted of children in the age group of 0 to 59 months from heterogeneous groups in terms of place of residence, education and occupationof mothers. Four hundred fifteen (415) recordswere included in the study.Among the study subjects 226(54.5%) were males and the rest 189(45.5%) were females. Majority of study participants 347(83.6%) were rural dwellers. The largest proportion of mothers 188 (43%) were elementary school complete. One hundred and one (24.3%) of motherswho did not attend forma education but can read and write. About 71(17.2%) of mothers did not attend formal education and cannot read and write.Fifty five(13.25%) of the mothers attend high school and above. Majority of mothers

256(61.7%) wereMuslim and the rest 159(38.3%) were protestant and orthodox Christian. Amongmothers of the children almost all, 376(90.6%) were Oromo and 39(9.4%)were Amhara and Tigre. The largest proportion of mothers were housewivesand 67(16.1%) being others which includes merchant and government employee. The highest proportion of children in the study population were in the age group of 0-11 months 168(40.5%) and children in the age group of 12-23 months comprises the smallest percentages 118(28.4%) with the mean age of the child determined to be 17.91± **sd**14.16months.(Table 1).

Table 1: socio-demographic characteristics of children under five years of age and their mothers from January 1,2012 to December 31,2016 in Darimu woreda, Ilu Aba Bora zone

Variables	Frequency	Percentage
Age		
0-11	168	40.5
12-23	118	28.4
24-59	129	31.1
Sex		
Male	226	54.5
Female	189	45.5

Place of residence		
Urban	68	16.4
Rural	347	83.6
Maternal level of education		
no formal education	71	17.2
read and write	101	24.3
Primary school	188	45.3
Secondary school and above	55	13.3
Religion		
Muslim	256	61.7
Others (Orthodox, Protestant)	159	38.3
Ethnicity		
Oromo	376	90.6
Others (Amhara, Tigray)	39	9.4
Occupation		
House wife	348	83.9
Others (Merchant and Government employee)	67	16.1

4.2. Danger signs of pneumonia of the study participants

Among the study participants80(19.3%) were present with danger signs of pneumonia. Among those who had history of danger sign 65(81.25%) were present with vomiting everything and the others were present with inability to drink/breast feed 9(11.25%) and history of convulsion 6(7.5%) (figure 3). Majority of them 57(71.3%) were treated by antibiotic and improved from their problem.

Figure 3:Danger signs of pneumonia among children under five years of age from January 1,2012 to December 31,2016 in Darimu woreda health centers, IluAba Bora zone.

4.3. Immunization status and vitamin A supplement of the children

Majority of the study participant 231 (55.7%) were fully vaccinated, and only 18(4.3%) children not started immunization (Figure 4). From the study participant 244(58.8%) children were on vitamin A supplement.

Figure 4: Immunization status of children under five years of age from January 1,2012 to December 31,2016 in Darimu woreda health centers, IluAba Bora zone.

4.4pneumonia and sociodemographic factors of children under five years of age in Darimu Woreda health centers.

Among 415 children who were included in the study, 221(53.3%) were clinically diagnosed for pneumonia. The case was reported in all age groups of children under five years of age. But higher 95(22.9%) cases were observed in age group0-11 months and followed by 24-59 months age group 77(18.6%) (figure 5).Regarding sex of the children, the proportion of pneumonia cases was almost similar for both males 113(27.2%) and females108(26%) (figure 6).

Figure 5: Five Years age Distribution of pneumonia cases among under five years of age from January 01, 2012 to December 31, 2016 in Darimu woreda health centers, IluAba Bora zone.

Figure 6: Five Years Distribution of Pneumonia in Children Under Five Years of Age by Sex from January 01, 2012 to December 31, 2016in Darimu woreda health centers, IluAba Bora zone.

4.5 pneumonia and comorbidity among children under five years of age by year in Darimu Woreda health centers.

From the comorbidity factors of pneumonia, children who had history of diarrhea165(39.8%)were affected by pneumonia. The highest of pneumonia/diarrhea comorbidity cases of 42.5% were reported in 2013, and the lowest of 36.6 were reported in 2016 (figure 7). One hundred and fifty one (36.4%) of cases of pneumonia were among children who were breast feed exclusively.The highest 40(44%) were reported in 2016 and the lowest 22(24.4) cases were reported in 2012.

figure 7: Five Years Distribution of pneumonia and diarrhea comorbidity among children under five years of age by year from January 1, 2012 to December 31, 2016 in Darimu woreda health centers, Ilu Aba Bora

4.6Five years' magnitude of pneumonia among under five years of age in Darimu Woreda health centers.

Among 415 children, 221 (53.5%) were clinically diagnosed for pneumonia. The lowest clinically diagnosed pneumonia cases of 34(47.9%), were reported in 2015, and the highest of 50(62.5%) were reported in 2013. Pneumonia cases increased from 49(54.4%) in 2012 to 50(62.5%) in 2013 and continuously decreasing proportion of pneumonia from50(62.5%) in 2013 to 44(53%) in 2014 and to 34(47.9%) in 2015. However, pneumonia cases increased from 34(47.9%) in 2015 to 44(48.40%) in 2016 (figure 8)

Figure 8:Five years' magnitude of pneumonia among under five years of age from January 01, 2012 to December 31, 2016in Darimu Woreda health centers, IluAba Bora zone

4.7Bivariate analysis of factors associated with pneumonia in children under five years of age

1. Socio-Demographic characteristics (factors)

Among sociodemographic variables under this category, Age,place of residence and maternal educational levelwere found to be significantly associated with children under five years of age pneumonia at bivariate analysis. Children whose age were 12-23 months were about 46.3% (COR=0.537; 95%CI=0.323, 0.894) less likely affected by pneumonia when compared with those whose age were 24-59 months. Childrenwho live in rural were about four times(COR= 3.593; 95%= 2.030, 6.360) more likely affected than urban dwellers. And also, children whose mothers did not attend formal education but can read and write were about three times(COR=3.033, 95%CI=1.504, 6.120) more likely to be affected, those whose mothers attend elementary school were four times(COR= 4.017; 95%CI=2.092, 7.712) more likely affected by pneumonia when compared with those whose mothers attend high school and above. And however, variables which show p- value < 0.03 at binary logistic regression were taken to multiple logistic model to control confounding. (Table 2)

Table 2:Bivariate analysis of Socio-demographic characteristics and their relation with under five years of age children pneumonia from January 1, 2012 to December 31, 2016in Darimu woreda health centers, IluAba Bora zone.

Variables	Pneumonia (%)		COR (95%)	P value
	Yes	No		
Age				
0-11 months	95(55.6%)	76(44.4%)	0.877(0.553, 1.389)	0.575
12-23 months	49(43.4%)	64(56.6%)	0.537(0.323, 0.894)	0.017*
24-59 months	77(58.8%)	54(41.2%)	1	
Sex				
Female	108(57.1%)	81(42.9%)	1.333(0.904,1.966)	0.147
Male	113(50.0%)	113(50.0%)	1	
Residence				
Rural	202(58.2%)	145(41.8%)	3.593(2.030, 6.360)	<0.0001*
Urban	19(27.9%)	49(72.1%)	1	
Maternal educational level				
No formal education(can't read and write)	32(45.1%)	39(54.9%)	2.0(0.948, 4.219)	0.069
No formal education but read and write	56(55.4%)	45(44.6%)	3.033(1.504, 6.120)	0.002*
Elementary school	117(62.2%)	71(37.8%)	4.017(2.092, 7.712)	<0.0001*
High school and above	16(29.1%)	39(70.9%)	1	
Religion				
Muslims	142(55.5%)	114(44.5%)	1.261(0.848, 1.876)	0.251
Others (Orthodox and Protestant)	79(49.7%)	80(50.3%)	1	
Ethnicity				
Oromo	204(54.3%)	172(45.7%)	1.535 (0.790,2.983)	0.206
Others (Amhara, Tigre)	17(43.6%)	22(56.4%)	1	
Occupation				
House wife	192(55.2%)	156(44.8%)	1.613 (0.952,2.733)	0.076
Others (Marchant and Govn't employee)	29(43.3%)	38(56.7%)	1	

*Variables which show significant association at bivariate logistic regression at P- value <0.03

2. Past co-morbidities, Immunization status of children and nutrition related factors

The study showed that Diarrhea, past history of measles and breast feeding showed a significant association with under five pneumonia at bivariate analysis. Children who had diarrhea were about two times (COR= 2.157; 95%CI=1.423,3.270) more likely affected by pneumonia than those who did not had diarrhea. Children who were presented with past history of measles were about ten times (COR=10.11; 95%CI=1.293, 79.036) more likely affected by pneumonia than those who were not presented with past history of measles. Children who were not exclusively breast feed were about two times (COR=1.628; 95%CI=1.047, 2.532) morelikely affected by pneumonia than those who werebreast feed exclusively. None of the immunization status of the study participants including vitamin A supplement did not illustrated a statistically significant association with pneumonia in children under five years of age.However, variables which show p- value < 0.03 at binary logistic regression were taken to multiple logistic model to control confounding. (table 3)

Table 3: Bivariate analysis of co-morbidities, immunization status and nutrition related factors and their relation with under five years of age children pneumonia from January 1, 2012 to December 31, 2016in Darimu woreda health centers, IluAba Bora zone

Variables	Pneumonia (%)		COR (95%CI)	P value
	Yes	No		
Diarrhea				
Yes	165(59.6%)	112(40.4%)	2.157(1.423,3.270)	<0.0001*
No	56(40.6%)	82(59.4%)	1	
Measles				
Yes	11(91.7%)	1(8.3%)	10.11(1.293, 79.036)	0.027*
No	210(52.1%)	193(47.9%)	1	
Anemia				
Yes	3(30%)	7(70%)	0.368(0.094, 1.442)	0.151
No	218(53.8%)	187(46.2%)	1	
Under nutrition				
Yes	12(38.7%)	19(61.3%)	0.529(0.250, 1.120)	0.096
No	209(54.4)	175(45.6%)	1	
Breast feeding				
Non-exclusive	70(62%)	43(38%)	1.628(1.047,2.532)	0.03*
Exclusive	151(50%)	151(50%)	1	
Immunization				
Complete	119(51.5%)	112(48.5%)	1	
Up to date	61(55%)	50(45%)	1.148(0.729, 1.809)	0.551
Defaulted	31(56.4%)	24(43.6%)	1.216(0.672, 2.198)	0.518
Not started	10(55.6%)	8(44.4%)	1.176(0.448, 3.087)	0.741
Vitamin A				
Up to date	130(53.3%)	114(46.7%)	1	0.99
Not up to date	91(53.2%)	80(46.8%)	1.003(0.678,1.483)	

*Variables which show significant association at bivariate logistic regression at P- value <0.03

4.8Multivariate analysis of factors associated with pneumonia in children under five years of age.

The study showed that the age of the children did not illustrate any association with under five pneumonia. Children who were live in rural were about three times (AOR=3.242; 95%CI=1.330,7.900; p-value=0.010) more likely affected by pneumonia than urban dwellers. Maternal educational level not showed any association with under five pneumonia in this finding.However, children who had diarrhea wereabout three times(AOR=2.553; 95%CI=1.612,4.043; p-value= <0.0001)more likely affected than those who did not have diarrhea.AndChildren who had past history of measles were 10 times (AOR=10.021; 95%CI= 1.236, 81.249; P-value= 0.031) more likely to have pneumonia. Similarly, children who had been breast feed exclusively have reduced likelihood of pneumonia (AOR=1.754; 95%CI=1.085,2.838; p-value=0.022).(table 4)

Table 4: Multivariate analysis of factors that determine the occurrence of under five years of age children pneumonia,from January 1, 2012 to December 31, 2016 in Darimu woreda health centers, IluAba Bora zone.

Variables	Pneumonia (%)		COR	AOR(95%CI)	p-va
	Yes	No			
Age					
0-11 months	95(55.6%)	76(44.4%)	0.877 (0.553, 1.389)	0.958 (0.582, 1.549)	0. 8
12-23 months	49(43.4%)	64(56.6%)	0.537* (0.323, 0.894)	0 .634(0. 365, 1.099)	0. 1
24-59 months	77(58.8%)	54(41.2%)	1	1	
Residence					
Rural	202(58.2%)	145(41.8%)	3.593* (2.030, 6.360)	3.242(1.330,7.900)	0.01
Urban	19(27.9%)	49(72.1%)	1	1	
Maternal educational level					
No formal education	32(45.1%)	39(54.9%)	2.0 (0.948, 4.219)	0.578 (0.194, 1.724)	0.32
Read and write	56(55.4%)	45(44.6%)	3.033* (1.504, 6.120)	1.160 (0.406, 3.314)	0.78
Elementary school	117(62.2%)	71(37.8%)	4.017* (2.092, 7.712)	1.334 (0.504, 3.535)	0.56
High school and above	16(29.1%)	39(70.9%)	1	1	
Diarrhea					
Yes	165(59.6%)	112(40.4%)	2.157* (1.423,3.270)	2.553(1.612,4.043)	< 0.
No	56(40.6%)	82(59.4%)	1	1	
History of measles					
Yes	11(91.7%)	1(8.3%)	10.11* (1.293,	10.021(1.236, 81.249)	0.03
No	210(52.1%)	193(47.9%)	79.036)	1	
			1		
Breast feeding					
Non-exclusive	70(62%)	43(38%)	1.628* (1.047, 2.532)	1.754(1.085,2.838)	0.02
Exclusive	151(50%)	151(50%)	1	1	

*Variables which show significant association at bivariate logistic regression at P- value <0.05

**Variables which show significant association during the multiple logistic regression at P <0.05

5. DISCUSSION

5.1.Magnitude of pneumonia among children under five years of age

This study has identified a relatively fluctuating magnitude of pneumonia among children under five years of ageduring the five years study periodand pointed out certain modifiable risk factors. The number of pneumonia cases in 2012 was smaller than that of the 2013. The lowest pneumonia case was recorded in the year 2015 and an increasing in the year 2016. This indicates decreasing proportion that was not similar to the trend of pneumonia in under five years of age of Nepal on the secondary data analysis of the incidence of pneumonia that showed an increasing trend(Sathian.B et al. 2015). This difference may be due to difference in methodology and skill of the under five OPD health workers.

5.2. Factors associated with pneumonia among children under five years of age

In this study there was no difference in the occurrence of pneumonia with the age of the children. This finding is not similar with the report from lancet 2013 which revealed higher occurrence of pneumonia in children younger than 2 years of age (Fischer.C.Walker et al. 2013). Similarly a case control study from Pakistan showed that pneumonia tend to occur more frequently in younger children; the prevalence decrease as the child gets older(Fatmi.Z and White.F 2002). This difference may be due to the difference in the methodology of the studyand skill of the under five OPD health workers.

Also, any significant difference in the occurrence of pneumonia with the sex of the child was not seen. This finding is similar with the finding from a case control study in Pakistan (Fatmi.Z and White.F 2002). However this is not supported by the report from Lancet 2013 which showed higher occurrence of pneumonia in boys than in girls(Fischer.C.Walker et al. 2013). The difference in the methodology of the study could be the reason for this discrepancy.

In this study, the occurrence pneumonia was affected by the residence.This finding is comparable with An epidemiological study conducted at Omdurman Pediatrics Hospital, Khartoum, Sudan reports place of residence had a relation with pneumonia (Abdelsafi.A.G et al. Nov/Dec 2014).

However this finding is not similar with the findings from the cross sectional survey in Este town where pneumonia prevalence was not different between urban and rural dwellers (Abeje.G.F et al. 2014). The occurrence of pneumonia in children under five years of agewas not affected by the educational level and occupation of mothers**.** This finding is consistent withthe findings from a case control study in Pakistanreported that maternal educational level had no a statistically significant difference with pneumonia, which is similar to the finding in this study. Similarly this finding was supported by the report from the cross-sectional survey in Etse town where educational level and occupation of the mothers did not illustrate significant association with pneumonia in children (Abeje.G.F et al. 2014). A case control study conducted in Pakistan, however, reported thatmaternal occupation had been found to be significantly associated with pneumonia (Fatmi.Z and White.F 2002)which is in contrary to the finding in this study.

In this study the occurrence of pneumonia had no association with undernutrition and past history of anemia. This finding is not similar the report of child health epidemiology reference group (CHERG) established that malnutrition were identified to be associated with increased occurrence of pneumonia (Claudio.F.Lanata et al. 2004). Also, a case control study conducted in India reported past history of anemia in children to be significantly associated with the development of pneumonia (Quyoom.S.Hussain et al. 2014). Diarrheal disease had association with the occurrence of under five years of age pneumonia in this finding which was similar with the report of child health epidemiology reference group (CHERG) established that diarrheal disease is one of the determinants of under five years of age pneumonia (Claudio.F.Lanata et al. 2004).

Also, a significantassociation in the occurrence of pneumonia and immunization was not observedin this study. This finding is not in line with the study conducted on crucial factors for child survival in Ethiopia reported that lack of immunization had a strong association with under five pneumonia (Fantahun.M et al. 2007). Similarly, a case control study in Pakistan does not supportthis finding that lack of immunization is revealed as important risk factor for pneumonia(Fatmi.Z and White.F 2002). This difference might be due to difference in methodology and immunizing the children.

Breast feeding the child exclusively during the first 6 months of child's life was associated with pneumonia in children. This is consistent with findings from a systematic review and meta analysis done in USA,2013, 2011 UNICEF report and the integrated action plan for prevention and control of pneumonia and diarrhea of 2013 of the WHO and UNICEF where exclusive breast feeding was one of the factors that could determine the incidence and prevalence of and mortality from pneumonia in children(UNICEF 2012; Fischer.C.Walker et al. 2013; WHO 2014).

6. STRENGTHS AND LIMITATIONS OF THE STUDY

Strength

- The secondary data, in this study may reflect the actual five years' magnitude of pneumonia among children under five years of agein the study area.
- Ascertainment of pneumonia was based on objective assessments by under-five OPD experience of health personnel and trained data collectors.

Limitation

- This study selectively addressed certain factors of under-five pneumonia while various factors are found to cause the disease.
- Also, the WHO's IMNCI is not confirmatory gold standard diagnostic tool and might be health workers had skill difference to surely settle pneumonia diagnosis.
- And also, the study did not measure the environmental factors that may be associated to under under-five pneumonia, since the study used secondary data and the environmental factors not registered on the IMNCI registration book.

7. CONCLUSION

During the five years, a relatively decreasingof the proportion of pneumonia among children under five years of agewas observed. It also pointed out such modifiable risk factors of under five years of age pneumonia as place of residence, diarrhea, past history measles and breast feeding.

8. RECOMMENDATION

Based on the findings in this study the followings were recommended.

- The woreda health office, in collaboration with the health facilities in the woreda, should design strategies to help community strengthen their knowledge on the benefit of exclusive breast feeding to reduce pneumonia.
- The woreda health office, in collaboration with the health facilities in the woreda should create awareness among the community about the advantages of vaccines (immunization) to help prevent measles, diarrhea and pneumonia diseases in children to reduce under five years of age pneumonia.
- The woreda health office, in collaboration with the health facilities in the woreda, should communicate messages to the community to early address to health facilities if their children had any type of sign and symptoms of pneumonia
- The woreda health office, in collaboration with the health facilities in the woreda should create awareness among the rural dwellers about the advantages of vaccines (immunization) and exclusive breast feedingto reduce under five years of age pneumonia.
- Further large scale research should be carried out in this study area that could resolve the limitation of this study.

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APPENDICES

Appendix A.

Information sheet and consent form for Darimu woreda health centers head.

My name is_____I am working a data collector for the study being conducted in this health center by Gutema Ganfure who is studying for his Masters Degree at Haramaya University, college of health and medical science. I kindly request you to lend me your attention to explain you about the study and your institution being selected as the study setting.

Title of the study

Five years' magnitude of pneumonia (January 1, 2012 to December 31, 2016) and its associated factors among children under five years of age in Darimu Woreda health centers, Ilu Aba Bora zone, south western Ethiopia.

Purpose/Aim of the study

This research is one of the criteria in MPH work it will benefit the Darimu Woreda Health centers to identify the magnitude of pneumonia over five years (2012-2016). Thus this study is beneficial for the planners to alert the children morbidity and enhance intervention activities.

Objectives

To assess the five years' magnitude of pneumoniaandassociated factorsamong children under five years of age in Darimu woreda health office, Ilu Aba Bora Zone, Oromia Region, south Western Ethiopia from February 30 to March 30, 2017.

Procedure and duration

Today, I will be to review data from IMNCI registration book to determine magnitude of pneumonia from 2012-2016. However, the data is from registration book it will be kept confidential and the MRN of the client is written on the checklist only that information needed for conducting this research will be taken. It will take fifteen days, so your attention to give me the necessary information has a great contribution for the success my work.

Risk and benefit of the study.

Reviewing IMNCI registration book has very minimal risk, but only taking time for the health facility director to provide the necessary pneumonia and information. There is no direct payment for providing us the necessary information except this research indirectly providing the health facility the strength and weakness of them to plan for future action.

Confidentiality

The information that reviewed from IMNCI registration book will be kept confidential. There is no information that indicates the individual that is taken from registration book. The result of the study will be generally explained; the questionnaires (checklist) of the study will be coded and kept confidential.

Rights

Participating in this study will be fully voluntary. The health facility director has the right to declare to allow the IMNCI registration or not. If you decide to allow, you have the right to stop/interrupt the study at any time and this will not label you for any loss of benefits.

Contact address

If you have any questions or inquires at any time about the study or procedures, please contact me on gutemaganfure@gmail.com or mobile no.0917055287 and also you can contact ethical committee (IHRERC) on phone no 0254660708 or po. Box 235, Harar

Declaration of informed voluntary consent.

I have understood, the purpose of this study is to collect information regarding under five children morbidity. I have read all the above information and I am clearly understand with all the aspects of the information that is satisfactory. So, I consent voluntarily to give you the necessary registration you need from _____ health center. Also I have read that I have full right to stop to give you the registration you need.

Name and Signature of the director_____Date_____/_____/_____

Name and Signature of the data collector _____Date_____/_____/_____

Appendix B:
Data collection Tools/check list

Haramaya University

College of Health Science

School of Graduate Studies

This is data collection format to determine the magnitude of pneumoniaand associated factors over five years (from January 1, 2012 to December 31, 2016) in Darimu Woreda health centers Ilu Aba Bora Zone, south Western Ethiopia in 2017.

Name of data collector:-_____Date_____/_____/_____

Qualification_____

Data collectors agreement

I certify that, I have got the necessary information and I can fill this questionnaire in accordance with the training that is given to me and instruction written on the questionnaires. I have participated voluntarily and I have a duty to fill the questionnaire. If I have stopped the data collection at any time I will lose perduim and I will be punished according to the standard of the civil servant.

Signed_____Date_____/_____/_____

Instruction:-Information regarding to magnitude of pneumonia and its associated factors will be completed for each year from January 1, 2012 to December 31, 2016

Check list

Check list identification data

001Check listidentification number

002 residential address: woreda_____ kebele_____

003 Name of data collector_____

004 Date of data collection_____/_____/2017

Day / month/ year

005 Result code (1=completed, 2=partially completed 3= other specify)

*Checked by: facilitator's name*_____ *signature*_____*date*_____

Instruction: - write the number which contain the correct information of the patient from the IMNCI registration book from choices and short answers on the provided space

Name and type of health center _____ MRN_____ Date of registered __/__/20__

No	Variable	Alternative choices	Coding	Skip to question
SD	Socio demographic information			
SD	Children information			
SD101	Age of children	In week/month _____		
SD102	Sex	Male ……	1	
		female……	2	
SD103	Weight	In gm/kg……		
SD104	Place of residence	Urban……	1	
		Rural……..	2	
SD105	Educational level of mothers	no formal education ……	1	
		read and write…….	2	
		elementary school…….	3	
		High school…….	4	
		higher institution……..	5	
SD106	Religion of mothers	orthodox Christian……..	1	
		protestant Christian…….	2	
		Muslim ……	3	
		other (specify)_____	4	
SD107	Ethnic group	Oromo……	1	
		Amhara……..	2	
		Tigre…….	3	
		other (specify)_____	4	

SD108	Annual income	_____		
Sd109	Occupation of mothers	House wife…… Merchant……. Government employee…… Others (specify)_____	1 2 3 4	

GS General Sign and symptom of the children

GS101	General danger sign	Yes……. No…….	1 2	
GS102	Types of general sign	unable drink/breast feed…… vomiting every thing……. history of convulsion …….. convulsion know……. others(specify) _____ have no general danger sign…….	1 2 3 4 5 6	
GS103	History of cough	Yes…… No……	1 2	
GS104	Respiratory rate __bpm	fast breathing…… chest indrowing……. Stridor…….	1 2 3	
GS105	Diarrhea	Yes……. No……..	1 2	
GS106	Type of diarrhea	bloody diarrhea…….. watery diarrhea…….	1 2	
GS107	Fever	Yes…… No……..	1 2	
GS108	Malaria risk	High……. Low…….	1 2	

		No……..	3	
GS109	Laboratory investigation BF/RDT	Positive……. Negative…….	1 2	
GS110	History of measles	Yes……. No……..	1 2	
GS111	Sign and symptom of measles	red eye…… runny nosey…….. generalized skin rash ……	1 2 3	
GS112	Ear problem	Yes…….. No……..	1 2	
GS113	Sign and symptom of ear problem	ear pain…… ear discharge…… tender swelling……..	1 2 3	
GS114	History of anemia	yes …….. no……	1 2	
GS115	Sign and symptom of anemia	Severe pallor …… Pallor……. no pallor……	1 2 3	

CM Check Malnutrition

CM101	Edema	Yes…… No…….	1 2	
CM102	MUAC	<11 cm…….. 11-12cm……. >= 12 cm……	1 2 3	
CM103	Breast feeding	Exclusive …….. Non-exclusive ……..	1 2	

HI HIV seroststus

HI101	Mothers HIV seroststus	Positive…… Negative…… unknown ……	1 2 3	
HI102	Children HIV serostatus	Positive…… Negative…… Unknown……..	1 2 3	

HT History of Treatment of the children

HT101	Immunization	Complete……. up-to-date…… defaulted …….. not started……..	1 2 3 4	
HT102	Vitamin A	up-to-date…….. N o t up-to-date……	1 2	
HT103	Feeding problem	Yes……. No…… not applicable……..	1 2 3	

CL Classification

CL101	Pneumonia	yes …… no……..	1 2	
CL102	Type of Diarrhea	severe dehydration……. Dehydration……. no dehydration……..	1 2 3	
CL103	Otitis	Yes……. No……	1 2	
CL104	Malnutrition	Yes……. No…….	1 2	

MT Medicine treatment

MT101	Drug	Anti biotic……..	1	
		Anti helminthic…….	2	
		Anti protozoa…….	3	

FU Follow up

FU101	Follow up	improved ……	1	
		no seam……..	2	
		worsened…….	3	

CURRICULUM VITAE

Personal Information

Name: Gutema Ganfure Kitila

Mother's Name:Dadhitu Regasa

Place of birth: Adileka Tulu Chali Kebele, Jima Geneti Woreda, Horro Guduru Wallaggaa Zone, Oromia region, Western Ethiopia.

Date of birth: June 08,1986 G.C.

Sex: Male

Marital Status: married

Nationality: Ethiopian

Ethnicity: Oromo

Religion:Christian, Jehovah witness.

Contact Address:Tel:-+251-917055287

Email:- gutemaganfure@gmail.com

Country of residence:Ethiopia

Town: Mettu

Educational Back Ground

Primary School: -Hareto primary school

Secondary School: -Hareto preparatory and High School

Higher Education: -Bachelor Degree in Laboratory from Jimma University 2011G.C.

Profession Experience: -Five Years' Experience

Organization Government: -kidame Health Center, Darimu Woreda, Ilu Aba Bora Zone.

Position: - Laboratory.