COLLEGE OF MEDICINE AND HEALTH SCIENCE
DEPARTMENT OF PUBLIC HEALTH

PREVALENCE OF PNEUMONIA AND ASSOCIATED FACTORS AMONG UNDER FIVE CHILDREN ATTENDING PEDIATRICS OPD IN BUTA JIRA HEALTH CENTER, 2023. A CROSS SECTIONAL STUDY

PREPARED BY:

1. **ABENEZER BIRUK 0060/12**
2. **ABUSHU BAHIRU 0092/12**
3. **AREBU ABDA 0201/12**

A THESIS IS SUBMITTED TO DEPARTEMENT OF PUBLIC HEALTH, COLLEGE OF MEDICINE AND HEALTH SCIENCES, WOLKITE UNIVERSITY.

AUGUST 2023

WOLKITE, ETHIOPIA

PREVALENCE OF PNEUMONIA AND ASSOCIATED FACTORS AMONG UNDER FIVE CHILDREN ATTENDING PEDIATRICS OPD IN BUTA JIRA HEALTH CENTER, 2023.

BY:

1. **ABENEZER BIRUK 0060/12**
2. **ABUSHU BAHIRU 0092/12**
3. **AREBU ABDA 0201/12**

ADVISORS:

1. **GIRMA ALEMAYEHU**
2. **ANTENEH KASSA**

A THESIS IS SUBMITTED TO DEPARTEMENT OF PUBLIC HEALTH, COLLEGE OF MEDICINE AND HEALTH SCIENCES, WOLKITE UNIVERSITY.

AUGUST 2023

ACKNOWLEDGMENT

We would like to express our gratitude to the Butajira Health center pediatrics OPD and Wolkite University for providing us this opportunity to prepare this thesis. We also want to show appreciation for under graduate nursing student for their assistance in the provision of baseline information which helps us to obtain more information about the problem. Finally we would like to give our deepest gratitude and sincere appreciation for our instructors Girma Alemayehu and Anteneh Kassa for their invaluable and unreserved help in teaching us research method and giving direction to prepare this thesis.

Table of contents

Contents

List of Table

List of Figures

Abbreviations and Acronyms

ALRI	Acute Lower Respiratory Infection
ARTI	Acute Respiratory Tract Infection
CAP	Community –acquired pneumonia
CSA	Central Statistical Agency
EDHS	Ethiopian Demography and Health Survey
HIV	Human Immunodeficiency Virus
WHO	World Health Organization
OPD	Out Patient Department
RSV	Respiratory Syncytial Virus
UNICEF	United Nations Children's Fund
URTI	Upper Respiratory Tract Infection
MUAC	Mid Upper Arm Circumference

ABSTRACT

Background: Acute respiratory infection is among the leading causes of child morbidity and mortality in Ethiopia and throughout the world. The main aim of the this study will be to determine the prevalence and factors associated with pneumonia among children 2-59 months old in Buta jira Health center in pediatrics OPD.

Objective: To assess the prevalence of pneumonia and associated factors among under five years age children in Butajira health center, Gurage zone, SNNPR, , Ethiopia.

Methods: Institutional based cross-sectional study design will be conducted on 252 participants and systematic random sampling technique will be applied to select participant. Data will be collected by interview method using structured questionnaire. The collected data will be check for completeness, code and enter into statically package for the social sciences (SPSS) version 27 for analysis .To control data quality data collectors and a supervisor will be trained for one days. All variables used in the bivariate analysis and variables with P-values less than 0.25 candidates for multivariate analysis to control confounding variable and to determine predictors of pneumonia. Crude odds ratio and adjusted odds ratio were computed with a 95% confidence interval (CI) and p-value <0.05 was considered to declare statistically significant association. The questioner will be included potential risk factor for pneumonia which will be categorized into socio-demographic factory, child related factors and environmental factor. Our data will be described by using descriptive statistics.

Result: The prevalence of pneumonia among under five children was 77%. Use of charcoal as a fuel source (P= 0.011, AOR=0.316 CI= (0.129, 0.771)), children who unvaccinated (P= 0.013, AOR= 0.206 (95% CI) = (0.059, 0.718)), Children who have diarrhea (P=0.012, AOR=0.365 CI= (0.166, 0.805)), child those start additional food at six month (P= 0.009, AOR= 0.181 CI= (0.05, 0.655,)),children those MUAC of between 12cm and 12.9cm P= 0.001, AOR= 0.188 CI= (0.0770, 0.459)), household that has no ventilation system (P= 0.009, AOR= 3.057 (95% CI) = (1.314, 7.111)), household that are near the factories (P= 0.027, AOR= 4.633(95% CI) = (1.192, 18.002)), children from unclean residence (P= 0.042, AOR=2.246CI= (0.903, 5.586)) and household that haven't Refrigerator (P= 0.003, AOR= 0.289CI= (0.129, 0.648)) were the potential risk factor of under five pneumonia.

Conclusion and Recommendation: This studies show that the prevalence of under-five pneumonia was high. Therefore, by make intervention on potential determinates such as: by Ventilate and improved housing conditions, give health education on environmental and personal hygiene , promoting health education on the importance of immunization status, improve child nutritional status, and early control of diarrhea we can reduce under-five pneumonia.

Keywords: prevalence of pneumonia, associated factors, under five pneumonia, Butajira.

Chapter one: Introduction

1.1Background

The medical term for the inflammation of the parenchyma lung components known as the alveoli and bronchioles is pneumonia. The most common classifications for pneumonia are aspiration pneumonia, nosocomial pneumonia (acquired while hospitalized), and ventilator-associated pneumonia[1]. Examining the symptoms and signs of a child's pneumonia can also help evaluate its severity. Infectious pneumonia is frequently characterized by a productive cough, a fever with shivering chills, shortness of breath, a sharp or stabbing chest discomfort during deep breaths, and an increased rate of breathing [1].

Pneumonia typically results from a virus or bacterial infection. Up to 45% of pediatric pneumonia cases and 15% of adult cases can be attributed to viral and bacterial causes. Bacteria are the ones that cause community-acquired pneumonia the most frequently [2, 3].

The leading cause of bacterial pneumonia in children under the age of five is streptococcus pneumonia, followed by haemophilus influenza type b (Hib)[2].S. pneumonia is the most common cause of pneumonia mortality worldwide and was responsible for more deaths in 2016 than all other causes put together [2].Around two million children under the age of five die from pneumonia each year[3]. India, Nigeria, Pakistan, the Democratic Republic of the Congo, and Ethiopia had the greatest rate of pneumonia deaths among children under the age of five, accounting for 49% of all pneumonia deaths worldwide [4]. Virus or bacterial infection is the usual cause of pneumonia. Virus and bacterial causes of pneumonia can account for up to 45% of cases in children and 15% of cases in adults. Bacteria are the most common cause of community-acquired pneumonia (CAP), with Streptococcus pneumonia isolated in nearly 50% of cases [3].

Viruses such as rhinoviruses, coronaviruses, influenza viruses, respiratory Syncytial viruses (RSV), adenoviruses, and parainfluenza are frequently the cause of pneumonia. Although fungal pneumonia is rare, those with compromised immune systems or other health issues are more likely to develop it. Numerous parasites can also harm the lungs. A group of diffuse lung disorders includes idiopathic interstitial pneumonia or noninfectious pneumonia [2, 4].

Pneumonia can be brought on by a variety of infection-causing organisms, including viruses, bacteria, and fungi. Streptococcus and Syncytial virus, respectively, were the most frequent causative agents of bacterial and viral pneumonia in children [2]. Pneumonia has been connected to malnutrition, low birth weight, nonexclusive breastfeeding, parental smoking in the home, vitamin A deficiency, and prior illnesses like symptomatic HIV infections and measles.

According to the WHO, pneumonia affects 156 million children under the age of five every year, with up to 20 million cases being severe enough to necessitate hospital admission. This age group accounts for 18% of all deaths and is primarily responsible for 1.2 million annual deaths. Pneumonia is the leading cause of death for children in these societies [5], and respiratory tract infections are not only more common but also more severe there, accounting for more than 2 million deaths annually.

According to reports, only two places Southeast Asia and Africa, which each have 35 and 61 million new infections each year are responsible for more than 60% of this pneumonia incidence. In children under the age of five, pneumonia is thought to occur 33 times per 10,000 people annually in the industrialized world [5].

1.2. Statement of the problem

Globally In worldwide, pneumonia is the main cause of death in children under age of five. The World Health Organization (WHO) estimates that pneumonia killed almost 900,000 children in 2019, making up about 16% of the 5.6 million fatalities among children under the age of five. This translates to the death of more than 2,500 children each day, or more than 100 each hour. Around the world, pneumonia kills almost 1 million children under the age of five, more than HIV/AIDS, diarrhea, and malaria all together. Pneumonia, known as "the forgotten child killer," claims two children under five per minute [6].

Pneumonia caused 15% of the estimated 5.9 million deaths of children under the age of five in 2015, according to the WHO 2016 study. However, according to 2012, the global estimate of pediatric pneumonia mortality was 18%, which translates to around 1.4 million child fatalities, an increase of almost 100,000 deaths from the last report from 2011[5].

According to research, developing countries experience 0.29 episodes per child per year, while wealthy nations experience 0.05 episodes per child per year of the under-five age group. This tells us that 156 million new episodes are produced annually, 151 million of which are produced in the developing world. A million children under the age of five die from pneumonia each year, according to estimates. From this, the developing world accounts for 90–95 percent of mortality. There are more cases in Bangladesh, Indonesia, and Nigeria (6 million each), but the majority of cases are in India (43 million), China (21 million), and Pakistan (10 million). 7–13% of cases in the community are severe enough to be life-threatening and necessitate hospitalization. It continues to be a serious public health issue, especially in low- and middle-income nations [7].

Around fifty percent of all pneumonia-related fatalities in children under five worldwide occur in the African region, which has the largest burden of child mortality overall. Comparatively speaking, less than 2% of these fatalities occur in the European Region and less than 3% in the Americas Region. More than 90% of all pneumonia-related deaths in children under the age of five occur in 40 different nations. The prevalence and severity of pediatric pneumonia were highest in Southeast Asia and Africa, which together made up 30% and 39% of all severe cases worldwide. Two-thirds of all episodes and severe cases of pediatric pneumonia occurred in 15 nations in these two regions [7]. In Africa, pneumonia significantly affects children's health. The morbidity and death caused by pediatric pneumonia are a considerable burden on the continent. According to the Global Burden of Disease Study, pneumonia killed more than 600,000 children under the age of five in Africa in 2019. The greater incidence is a result of a number of factors, including poverty, malnutrition, poor access to healthcare, and high co-infection rates[8].

Pneumonia is the primary cause of disease-related death among children under five in Ethiopia. According to estimates, pneumonia affects 3,370,000 children in Ethiopia every year and accounts for 18% of all causes of death, killing more than 40,000 children under the age of five each year. These fatalities can be easily avoided with low-cost measures like vaccinations, a healthy diet, exclusive breastfeeding, the right supplemental feeding, and hand cleaning [9]. a research conducted in the Wondo Genet district states, Sidama zone, Ethiopia, the prevalence of pneumonia among under-five children visit health center was 33.5% [10].

Due to low coverage and affordability of effective preventative measures like PCV and RSV immunization, poor access to care, and a lack of appropriate management options, childhood pneumonia is a common and severe disease in Ethiopian children. Compared to children in high-income nations,

children in our countries also have increased exposure to pneumonia. The stark disparity between the present unacceptably high and large pneumonia outbreaks is a result of ill-conceived prevention policies in the world's poorest nations, such Ethiopia[6].

Therefore, it's crucial to consider a variety of tactics for lowering pneumonia-related morbidity and death. These include preventive measures including regular immunizations, vitamin A and zinc supplements, environmental factor control, breastfeeding promotion, excellent nutrition, safe drinking water, and decent sanitation. However, pneumonia continues to be the leading cause of death in children. These fatalities can be readily avoided and treated with quick, inexpensive fixes. So, in order to achieve Sustainable Development Goal (SDG) 3 (24), it is essential to close the gaps in current under-five pneumonia prevention strategies.

Pneumonia is a common illness in children under five in Ethiopia. One of the main causes of illness and mortality in the nation is pneumonia. The prevalence of acute respiratory infection, which includes pneumonia, among children under five in Ethiopia was estimated to be at 8.6% according to the Ethiopian Demographic and Health Survey carried out in 2016. Around 15% of under-five mortality in the nation was caused by pneumonia[11].

Pneumonia and the risk factor it entails may have a variety of effects on Ethiopian government objectives, notably those pertaining to children's health, welfare, and sustainable development. As a major objective for governments in reaching sustainable development goals, lowering child death rates can be hampered by the high frequency of pneumonia. The efficient management of pneumonia cases can be impacted by poor access to healthcare facilities, inadequate diagnostic equipment, a lack of medical supplies, and a paucity of qualified healthcare personnel. Increased medical expenses, decreased caregiver productivity, and potential long-term effects like stunted growth and development in affected children are all possible outcomes of the illness. These elements may obstruct the government's pursuit of sustainable development and general economic advancement. The frequency of pneumonia can disproportionately harm vulnerable groups, escalating already-existing health disparities. Socioeconomic differences in pneumonia prevalence can also be attributed to things like poverty and poor access to healthcare. In order to provide equal access to healthcare and further social development goals, pneumonia must be adequately addressed [12]. Ethiopia's pervasive problem has already claimed the lives of thousands of youngsters; therefore, a long-term solution is required to put an end to the issue. Despite ongoing efforts to stop the issue, pneumonia continues to be a leading cause of pediatric mortality, necessitating the development of creative solutions that can only be discovered via thorough research. For the purpose of organizing child health care services, data on the prevalence of pneumonia and its associated risk factors are crucial yet lacking in our nations. The purpose of this study was to evaluate the incidence of pneumonia and its contributing factors in children under the age of five at Butajira Health Center.

1.3. Significance of the study

Health managers can find gaps in the provision of healthcare and take action to remedy those gaps by understanding the pediatric pneumonia problem in the health center and community. The data was used to assist the health manager in formulating plans and preparing the hospital to receive the supplies required to treat children with pneumonia. It also lessens the problem by preventing the organism that produces the alignment.

Studying the prevalence of pneumonia and associated factors among under five will help the community to understand the extent and impact of the disease within their population .It also raise awareness among community about the importance of pneumonia prevention, early recognition of symptoms, and timely seeking of healthcare. It empowers individuals, parents, caregivers, and community leaders to take proactive measures to prevent pneumonia, promote good health practices, and seek appropriate treatment when needed . Prevalence studies provide health professionals with an understanding of the burden of pneumonia in their specific population. This knowledge enables them to improve the diagnosis and management of pneumonia cases among children under five years old. It helps in early recognition of symptoms, appropriate referral, and evidence-based treatment implementation. : Prevalence studies inform health managers about the burden of pneumonia, allowing them to allocate resources effectively. They can plan for adequate staffing, medical supplies, diagnostic tools, and infrastructure to address the specific needs of pneumonia management. Prevalence studies provide policymakers with robust evidence on the significance of pneumonia as a public health concern. This data helps policymakers develop evidence-based policies, interventions, and strategies to address the burden of pneumonia among children under five. It supports the prioritization of resources and guides decision-making processes.

Chapter two: Literature Review

2.1. Global Incidence and Prevalence under-five pneumonia

The most common cause of death worldwide is pneumonia. It accounts for up to 28-34% of all deaths in children under the age of five. Acute lower respiratory infections (ALRIs) impact 120–156 million individuals annually and 1.4 million of those cases are fatal. Pneumonia claims the lives of about 1 million kids under the age of five every year. 15% of pediatric mortality as a result, with 90–95% of these deaths occurring in developing nations. Two-thirds of pediatric pneumonia episodes occur in just 15 countries, with South Asia and Sub-Saharan Africa bearing the brunt of the burden with more than half of all pediatric pneumonia cases globally [7].

The estimated prevalence of clinical pneumonia reveals to us with 0.36 episodes per child-year, South-East Asia has the highest rate, followed by Africa (0.33 episodes), the Eastern Mediterranean (0.28 episodes), and European Regions (0.06 episodes). The Western Pacific, the Americas, and the European Regions have the lowest rates (0.22, 0.10, and 0.06 episodes per child-year, respectively). More than 90% of all pediatric pneumonia-related deaths occur in 40 distinct countries [7, 13].

Ethiopia, India, Pakistan, Nigeria, and the Democratic Republic of the Congo are five nations with the highest rates of pediatric pneumonia mortality. About 0.397 million children under the age of five died in India from pneumonia, accounting for 23.6% of all fatalities. In China Pneumonia is the number one cause of pediatric mortality accounting for 17.4% of all fatalities in children under the age of five. In 2012, pneumonia in Rwanda, Sierra Leone, Somalia, South Sudan, and South Africa, respectively. Peru, Nepal, Mozambique, and Morocco by 18%, 16%, 19%, 20%, and 17%caused death in children under five, on the other hand, have pneumonia caseloads that are, respectively, 10%, 14%, and 13% [14]

Ethiopia has a high frequency of pediatric pneumonia, and of those children, 30% really have ARI symptoms when they visit a medical facility for treatment of their pneumonia, according to EDHS data from 2016[15] . In Ethiopia, pneumonia is the main cause of death for kids under five. According to WHO statistics, pneumonia was responsible for 22% of the 389,000-child mortality under five.

33.5% of children under the age of five in Ethiopia's Wondo Genet district, Sidama region, had pneumonia, according to an institutionally based cross-sectional survey. Children between the ages of 2 and 12 months, breastfeeding for less than a year, the absence of a separate kitchen, and a window in the kitchen have all been connected to pneumonia[16] . Using data from a cross-sectional survey carried out in Este Town, Northwest Ethiopia, found that 16.1% of children under five had pneumonia overall during the previous two weeks[17].

2.2. Associated Factors to under –five pneumonia

2.2.1. Socio Demographic Characteristics

In developing countries young people are 3–6 times more likely to develop pneumonia than other young people. The mortality rate for pneumonia is higher in underdeveloped countries because of the epidemic. Children's pneumonia mortality is strongly correlated with poverty-related factors, including malnutrition, unsafe water and sanitation problems, indoor air pollution, limited access to health care, and mothers' ignorance of proper infant care, which exacerbates the problem.

2.2.2. Maternal education

This is among the most crucial and significant factors in determining the child's health. The mother's education influences the health of the children. Mothers have a critical role in patient care, supporting early diagnosis, promoting health, and preventing disease. Low maternal educational level was one of the biggest risk factors for pneumonia in infants under the age of five, according to a comparable case-control research carried out at the University of Ghana's Komfo Anokye Teaching Hospital [18].

2.3. Delays in seeking health care

The primary barriers preventing individuals from receiving care include a lack of resources, distance, and the perception that their illness wasn't serious. Residence and knowledge were discovered to be the two most significant factors of health care seeking behaviors from health facilities. North shoa zone of Ethiopia's Derra region cross-sectional study Studies have shown that a mother's decision to seek medical attention for her child's diseases is influenced by a variety of variables, including socioeconomic status, the mother's knowledge and attitudes of the genesis and severity of the illness, and their traditional beliefs.

2.4. Immunization/vaccination

Programs for childhood immunization and the prevention of pneumonia mortality in children are particularly cost-effective, according to a recent review of intervention packages [19].The incidence of pneumonia reduced by 27.3% and 46.4%, respectively, between 2009 and 2012, according to a cross-sectional study carried out in Uruguay's northwest, while a comparison between 2001-2004 and 2009-2012 revealed a significant difference of 20.4% for pneumonia incidence. pneumonia-related hospitalizations that are combined. The incidence was significantly lower in children between the ages of 6 and 35 months.

2.5. Lack of Breast Feeding

Without breastfeeding, children have a 60% chance of developing ARI.A thorough review of the literature and meta-analysis revealed that children of all ages were more likely to develop pneumonia-related morbidity and mortality when poor breastfeeding was present. In particular, mortality from pneumonia was higher in non-breastfed infants and young children aged 6-23 months compared to exclusively breastfed infants and in non-breastfed neonates aged 0-5 months [20]. According to an institution-based case control research carried out in the Achefer District, Northwest Ethiopia, children who did not have the opportunity to breastfeed were 83 times more likely to develop cases than those who were breastfed exclusively.

2.6 Environmental Risk Factors

Indoor air pollution

Children who were exposed to indoor air pollution from solid fuel combustion had an 80% increased chance of developing pneumonia. In a similar vein, a WHO study shows a substantial correlation between indoor air pollution and pediatric pneumonia-related death[21]. After adjusting for potential confounders like socioeconomic status, parental education, breastfeeding, malnutrition, and cigarette smoke exposure, a systematic review of indoor air pollution and pneumonia risk among young children (5 years) in developing countries discovered a significant association with pneumonia morbidity and mortality.

Inappropriate sanitation and overcrowded

Inappropriate sanitation, overcrowded living conditions, lack of clean water and irregular hand washing, they contribute to child pneumonia. Studies suggest that in impoverished communities, regular hand washing can reduce the incidence of child pneumonia by 16% (95%CI 11%-21%) [22].

Tobacco smoke and maternal prenatal smoking

Passive cigarette smoke exposure is prevalent in the Western Pacific region (70.5%) and is responsible for 28.7% of pediatric pneumonia cases and 44,000 hospitalizations. 81% of toddlers hospitalized for pneumonia had been exposed to home cigarette smoke, according to a Ho Chi Minh City research[23].

2.7 Preexisting medical and Co-morbid conditions

Malnutrition: Inadequate nutrition, which is defined as wasting, stunting, and particular nutritional deficiencies, is linked to about half of all child fatalities.

Children who are underweight have compromised immune systems, which make them more vulnerable to illnesses like pneumonia. The body's capacity to fend against illnesses and recover from infections might be compromised by poor diet. As a result, having severe acute malnutrition can increase pneumonia mortality by 15 times[13]. In comparison to other children, children whose weight is less than 70% of what is considered acceptable for their age have an elevated 8-fold chance of dying from pneumonia [3].

Insufficient nutrition

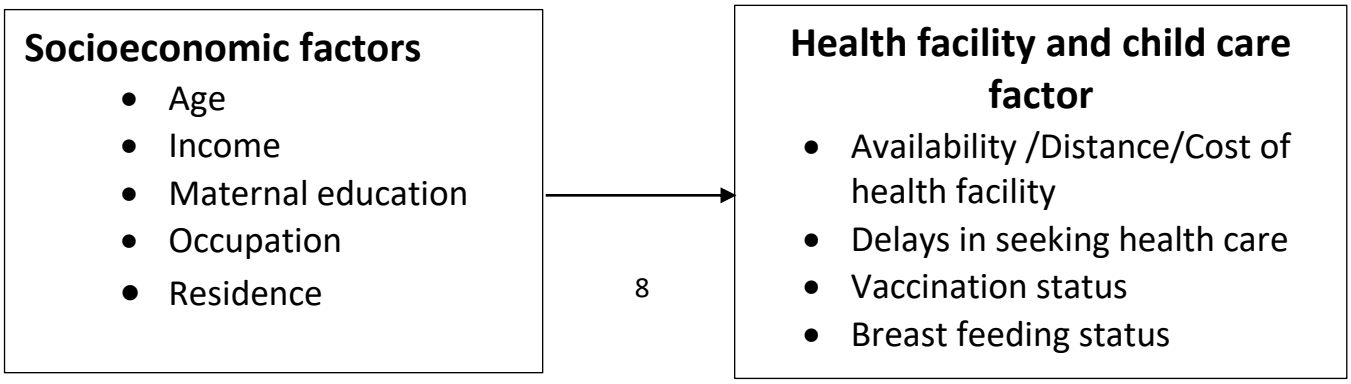
Among the 200 Iranian children who were hospitalized to the Children's Medical Center with radiologic rickets, 43% also had bronchopneumonia. Therefore, a lack of vitamin D may be a significant predictor of pneumonia in children under the age of five in underdeveloped nations.[24] Vitamin A is crucial for the growth and development of tissues, particularly respiratory epithelial cells and lung tissue. A lack of vitamin A 11 has been associated with inflammation and infection in children and the severity of the infection [25].Zinc deficiency to be associated with increased risk of infection, particularly pneumonia.

Co-morbid conditions

Prematurity, low birth weight, chronic disease and HIV/ AIDS have been recognized as independent risk factors for pneumonia-related mortality in children. Children with co-morbid conditions such as prematurity, malnutrition, congenital heart disease or HIV-infection often require prolonged periods of hospitalization.[22]

2.6. Conceptual framework

Under-five pneumonia is a dependent variable, and socio-demographic characteristics like educational attainment, family size, income, place of residence, and occupation are connected to under-five pneumonia. Under-five pneumonia is predicated by environmental variables such indoor air pollution, inadequate ventilation, exposure to cigarette smoke from crowded circumstances, and exposure to unfavorable environmental conditions.



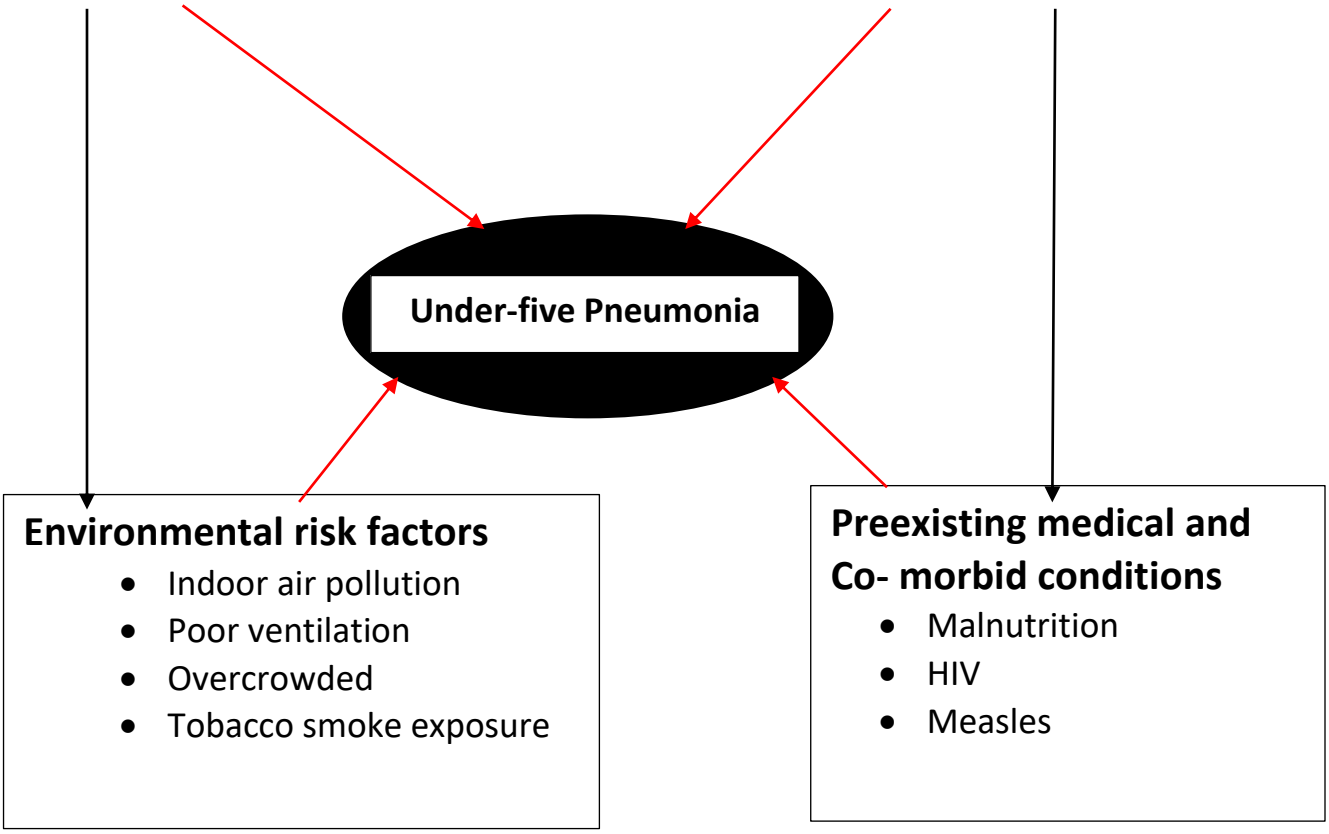


Figure-1 Conceptual frame work on associated factors to pneumonia among under -five children developed from deferent literature review (5, 9, 10, 13, 15, 18, and 25).

Chapter three: Objectives

3.1. General objectives

To assess the prevalence of pneumonia and associated factors among under five years age children in Butajira health center, Gurage zone, SNNPR, , Ethiopia from March to April 2023s.

3.2. Specific objectives

1. To determine the prevalence of pneumonia among under five years children in Butajira health center.
2. To identify factors associated with pneumonia among under five year's age children in Buta jira health center.

Chapter four: Methods

4.1. Study area and period

The study was conducted in the SNNPR, which is situated to the south of Ethiopia's capital, Addis Ababa. The zone is divided into 11 Woreda, and 2 Administration. Butajira, is 131.2 km from Addis Ababa, the country's capital. According to the Central Statistical Agency of Ethiopia (CSA) census from 2007, the Zone is expected to have 1.9 million residents overall in 2016. For the quantitative part based Butajira city has a total population of 56,018, of whom 27,468 are men and 28,570 women among the total population of Butajira 8744 which male and female under five year's old children. There are currently 3975 health posts, 731 health centers, and 79 public hospitals operating in the zone. From January to March 2023, the study was carried out at Buta Jira Health center.

4.2. Study design

An institution based cross-sectional study was carried out from January to March 2023.

4.3. Population

4.3. 1. Source population

The source population was all children under the age of five that visit Buta Jira Health center.

4.3.2. Study population

Children aged 2-59 months and their mothers or carers who visited Buta Jira Health center during the data collection period.

4.4. Eligibility criteria

4.4.1. Inclusion criteria

Child who Visit to Buta Jira Health center by moms, who are the children's primary carers, and children aged 2 to 59 months.

4.4.2. Exclusion criteria

Severely sick child who need immediate life treating intervention exclude from the study.

4.5. Sample size determination

The study utilized the single population proportion formula technique to determine the study sample size.

$$n=\left[\frac{(Z\alpha/2)^2 * P(1-P)}{d^2}\right]$$ where n is the desired sample size,

P is the population of under-five pneumonia children, which is 28.1% (27), has taken from previously published study from jimma town.

Zα/2 is the critical value at the 95% confidence interval level of certainty (1.96), and d is the margin of error between the sample and population (5%).

$$n=\left[\frac{(1.96)^2 * 0.28(1-0.28)}{(0.05)^2}\right] = \frac{0.776}{0.0025} = 310.4 \approx 310$$

Where source population (N) = 874, which was a monthly plan on the proportion of under-five children visiting the outpatient department in Buta jira health center. Because the source population was less than 10,000, we can use the correction formula to get the actual sample size of the study population.

nf= $\frac{n}{1+n/N}$
nf = final sample size,
n = first calculated sample size,
N = source population.

$\frac{310}{1+310/874}$=228.8≈ 229 by adding 10% of the nonresponse rate, the total sample size of this study was 229+22.9≈ 252

Sampling technique

Participants were selected using systematic random sampling technique, by calculating the Interval. Outpatient department (OPD) registration book was used as sampling frame and K is 3 (k=N/n). Therefore, the sample selected every 3rd interval. But the first child was randomly selected.

4.6. Data collection procedures and Instrument

Checklists and structured questionnaires were used to collect data. Three trained undergrad public health students will collect the data. Every day, they were control and oversee the gathering process. A standardized interviewer-administered questionnaire was used to gather information on the prevalence and risk factors of pneumonia in children under the age of five who are visiting Buta Jira Health center.

4.7. Study variables

4.7.1. Dependent variables

Under five children pneumonia

4.7.2. Independent variables

Socio demographic characteristics: Age, sex, occupations of the parents, Mother and father's educational backgrounds, family size, marital status, and geography all come into play.

Environmental factors: if a separate kitchen exists or not, the ventilation situation in the home, and whether there are any smokers there.

Nutritional factors and co-morbidities: the child's status regarding breastfeeding, immunizations, and HIV testing, both the history of diarrhoea and the measle.

4.8. Operational definition

Children under five: Infants younger than two months will not be included in this study since the diagnosis of pneumonia is not made until the age of two months in children younger than 59 months.

Co morbidity: Diseases associated with another disease, other disease (S) associated with pneumonia in this case [26].

Immunization status [27].

- **Fully immunized:** child will be completed the whole vaccine.
- **Partially immunized**: not fully vaccinated.

- **Not immunized**: the child not vaccinated at all.

Respiratory rate: The number of child's respiration in a full minute [26].

Co morbidity: diseases associated with another disease [26].

Solid fuels: These include such fuel as wood, crop waste, animal dung and charcoal.

Sever pneumonia: pneumonia with at least one of the following [27].

- Central cyanosis
- Inability to breastfeed or drink or vomiting everything.
- Convulsions, lethargy, or unconsciousness
- Grunting (in young infants)
- Lower chest wall in drawing

Severe acute malnutrition: A child with one of the following [27].

- Weight for height (W/H) <70%
- Middle Upper Arm Circumference (MUAC) <11.5 cm (for 6 months-5 years)
- Bilateral pitting edema
- Visible severe wasting.

4.9. Data processing and analysis

The data was coded, entered, and cleaned using Epi-Data version 4.4.2.1. Then, the data was exported to SPSS software 27 version analysis was carried out. Tables and graphs were used to present the results. To identify significant associations, bivariable and multivariable logistic regression analysis was used. A p-value of 0.05 and a 95% confidence interval (CI) will be considered significant.

4.10. Data quality control

The validity, reliability, and internal consistency of the instrument were confirmed by a pretest on 5% of the sample before the research is conducted after two days of training for the data collectors on the questioners. Following the collection of the pretest data, each individual questionnaire response was examined for any potential instrument-related issues, such as challenging questions that don't align with respondent psychology, easily understandable or difficult questions to answer and corrective action was taken.

4.11. Ethical consideration

Data collectors and a supervisor are instructed to explain the study's goals and purposes to participants so that they voluntarily agree to participate in the study. The study's participants were assured that their refusal to participate will not subject them to any sort of punishment and that they are free to leave the study whenever they choose. Before collecting data, a letter of permission was requested from department of public health, college of medicine and Health Science, Wolkite University.

4.12. Dissemination plan

The department of public health at Wolkite University College of Health Sciences will get the study's findings. The results shall be provided to Buta Jira Health center and the SNNP zone health office in any suitable hard or digital copies. Additionally, articles will be presented at scientific conferences in addition to being submitted for publication in respectable peer-reviewed scientific journals.

CHAPTER FIVE

RESULTS

Socio demographic characteristics of the respondents

The study's estimated sample size was 252, and all of the respondents took part in the survey. The study received 100% of the responses. Out of 252 kids, 120 (47.6%) were boys and 132 (52.4%) were girls. The children were 23.5+16 months old on average, and 153 (60.7%) of them lived in cities.

Table 1 Socio-demographic characteristics of under -five children at Butajira Health center in gurage Zone, SNNPR, Ethiopia, august, 2023.

Variables	Category	Frequency (252)	Percent
Sex	Male	120	47.6
	Female	132	52.4
Age of the child	2-12 months	34	13.5
	13-36 months	190	75.4
	37-59 months	28	11.1
Residence of the child	Urban	153	60.7
	Rural	99	39.3
Ethnicity of the patient	Gurage	213	84.5
	Oromo	25	9.9
	Amhara	14	5.6
	Other (Sidama, Tigray)	0	0
Religion of the patient	Orthodox	109	43.3
	Muslim	125	49.6
	Protestant	18	7.1
	Other (catholic…)	0	0

Environmental characteristics of the respondents

136 households (54.0%) used charcoal as their primary source of cooking fuel, while 71 households (28.2%) used wood. A total of 188 (74.6%) participant households had a separate kitchen, while 46 (18.3%) participant families cooked in a room corner.

Table 2 Environmental characteristics of under -five children at Butajira health center in gurage Zone, SNNPR, Ethiopia, august, 2023.

Variables	Category	Frequency	Percent
Type of fuel source	Kerosene	0	0
	Charcoal	136	54
	Electricity	45	17.9
	Wood	71	28.2
Type of kitchen	Separate	188	74.6
	Corner of the room	46	18.3
	Veranda	18	7.1
	Other	0	0
Kitchen that have chimney	Yes	172	68.3
	No	80	31.7
Number of room in the house	1 room	19	7.5
	≥ 2 room	233	92.5
Kind of toilet facility	Pit latrine	239	94.8
	Open field	13	5.2
	Other (ventilated improve pit latrine	0	0
Window in the house	Yes	227	90.1
	No	25	9.9
Cigarette smoking in the house	Yes	66	26.2
	No	186	73.8
ventilation system in the house	Yes	144	57.1
	No	108	42.9

Child care characteristics of respondents

From a total of 252 children who participated, 56 (22.2%) had received all recommended vaccinations, 125 (49.5) had received some vaccinations, and 71 (28.1%) had not.

Table 3. Child care characteristics of under -five children at Butajira heath center in gurage Zone, SNNPR, Ethiopia, august, 2023.

Variables	Category	Frequency	Percent
Vaccination status	Fully vaccinated	56	22.2
	Partially vaccinated	125	49.6
	Not vaccinated	71	28.2
Breast feeding start	Within an hour	143	56.7
	After an hour	109	43.3
Duration of breast feed	<2 year	213	84.5
	>2 year	39	15.5
Bottle feeding use	Yes	225	89.3
	No	27	10.7
Additional food start	<6 months	120	47.6
	At 6 months	105	41.7
	After 6 months	27	10.7

Preexisting medical or Co-morbid conditions characteristics of respondent's

Among the 252 children who participated, 58 (23%) had mild acute malnutrition, while 184 (73%) had no malnutrition at all. Acute respiratory tract infection was the most prevalent medical condition among children who participated in the study, followed by AGE 123 (48.8%) and 191 (75.8%).

Table- 4 Preexisting medical or Co-morbid conditions characteristics of under -five children at Butajira health center in gurage Zone, SNNPR, Ethiopia, august, 2019.

Variables	Category		Frequency	Percent
MUAC	≤ 11cm		37	14.7
	12-12.9cm		54	21.4
	≥ 13cm		161	63.9
Malnutrition	No malnutrition		184	73
	Moderate malnutrition		58	23
	Severe malnutrition		10	4
History of past medical disease	AGE	Yes	123	48.8
		No	129	51.2
	ARTI	Yes	191	75.8
		No	61	24.2
	Malaria	Yes	5	2
		No	247	98
	Measles'	Yes	47	18.7
		No	205	81.3
	Chronic diseases like CHD, Asthma	Yes	15	6
		No	237	94

5.5 Prevalence of Pneumonia and Signs and symptoms of pneumonia

71 (28.1%) of the 252 children who took part in the trial and were surveyed had a history of coughing. At the time of the survey, 62 (24.6%) children had quick breathing, while 47 (18.7%)

children had trouble breathing. Twenty (7.9%) of the 252 children overall had fever, and one (0.4%) had a sketch of the chest wall. During the survey, 14 people (5.6%) made crackles, stridor, or wheezing noises. The overall prevalence of under-five children's pneumonia during the study was 194 (77%).

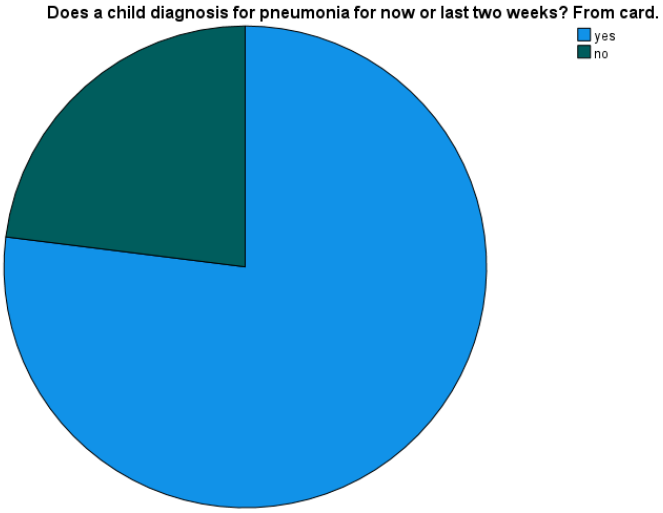


Figure -2 Prevalence of pneumonia among under -five children at Butajira in gurage zone, SNNPR, Ethiopia, august, 2023.

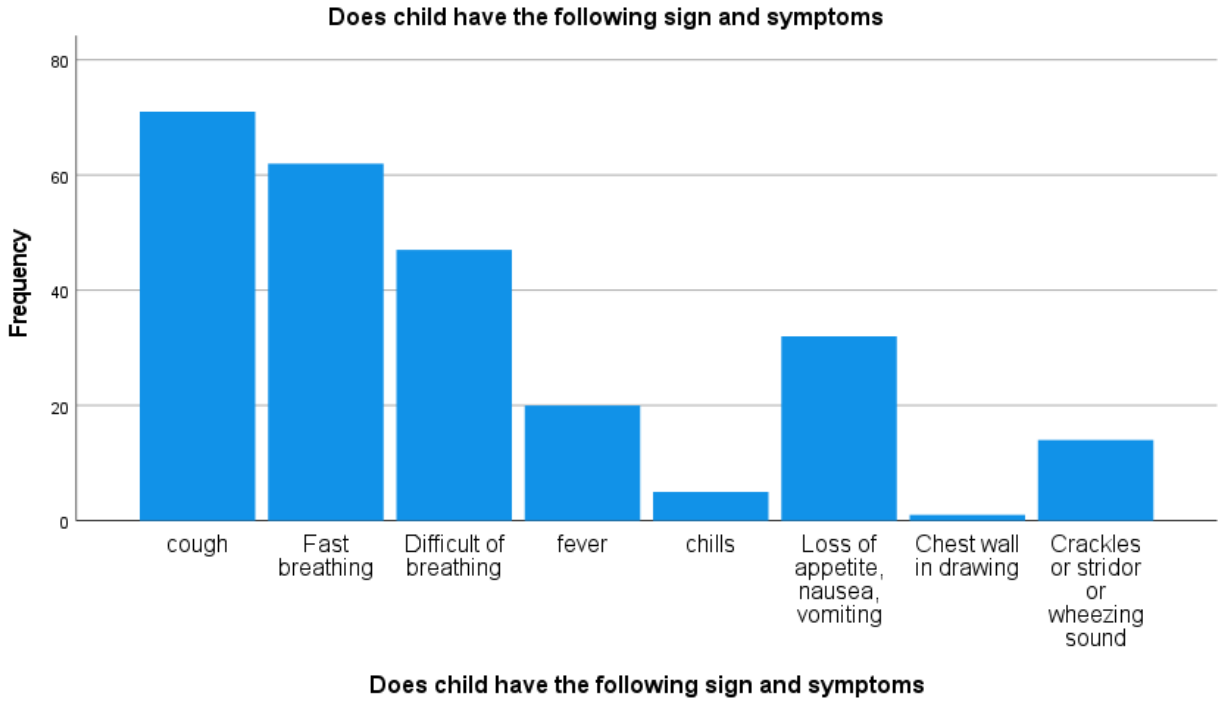


Figure- 3 Signs and symptoms of pneumonia among under -five children at Butajira health center in Gurage zone, SNNPR, Ethiopia, August 2023.

Multivariate logistic regression

All study variables were tested by binary logistic regression analysis and variable those had less than 0.2 P- values were candidate for the multivariate logistic regression to control confounding variable and to determine potential predictors of under-five pneumonia.

This result showed that children from those household used charcoal as fuel source increase the risk of childhood pneumonia by 0.316 times (P= 0.011, AOR=0.316 CI= (0.129,0.771)) when compare to children from household those not used charcoal as fuel source.

This finding indicates that children who unvaccinated were 0.206 times (P= 0.013, AOR= 0.206 (95% CI) = (0.059, 0.718)) more likely to develop pneumonia as compared to children who fully vaccinated. Also, Children who have diarrhea were 0.365 times (P=0.012, AOR=0.365 CI= (0.166,0.805)) more likely to develop pneumonia when compared to children who doesn't have diarrhea.

According to this result child those start additional food at six months were 0.181 times (P= 0.009, AOR= 0.181 CI= (0.05, 0.655,)) more likely to develop pneumonia as compared to children those start additional feeding after six months. Also, MUAC of between 12cm and 12.9cm increase the risk of child to develop pneumonia by 0.188 times (P= 0.001, AOR= 0.188 CI= (0.0770, 0.459)) when compared to MUAC of above 13cm.

This finding suggests that household that has no ventilation system were 3.057 times (P= 0.009, AOR= 3.057 (95% CI) = (1.314, 7.111)) increase the risk of child to develop pneumonia than those household that has ventilation system. Also, this finding indicates that household that are near the factories were 4.633 times (P= 0.027, AOR= 4.633(95% CI) = (1.192, 18.002)) more likely to increase the risk of child to develop pneumonia as compared to household that are not near to the factories.

This result showed that children from unclean residence were 2.246 times (P= 0.042, AOR=2.246CI= (0.903, 5.586)) more likely to develop pneumonia than those clean residence. According to this result household that haven't Refrigerator been 0.289 times (P= 0.003, AOR= 0.289CI= (0.129, 0.648)) more likely to increase the chance of child to develop pneumonia as compared to household that have Refrigerator. Also, family member that consume alcohol increase the risk of child to develop pneumonia by 0.308 times (P= 0.014, AOR= 0.308 CI= (0.121, 0.787)) when compared to child that are not from alcoholic family member.

Table- 5 Multivariate logistic regression analysis factors associated to pneumonia among under -five children at Butajira health center in gurage Zone, SNNPR, Ethiopia, August, 2023.

Variable	category	Pneumonia		COR	p-value	AAOR(95%CI
		Yes	No			
Type of fuel used in home	Charcoal	114	22	2.994	0.011	0.316(0.129,0.771)
	Electricity	35	10	2.022	0.766	0.848(0.288,2.499)
	wood	45	26			
Immunization status	Fully vaccinated	8	48			
	Partially vaccinated	96	29	0.552	0.049	0.325(0.106,0.993)

	Not immunized	50	21	0.397	0.013	0.206(0.059,0.718)
History of diarrhea	yes	85	38	0.410	0.012	0.365(0.166,0.805)
	No	109	20			
At what age additional started	< 6 months	103	17	2.121	0.349	0.532(0.142,1.993)
	At 6 months	71	34	0.731	0.009	0.181(0.05,0.655)
	After 6 months	20	7			
MUAC	<11.9cm	32	5	1.290	0.179	0.418(0.117,1.493)
	12cm-12.9cm	28	26	0.217	0.001	0.188(0.077,0.459)
	>13cm	134	27			
Ventilation system	Yes	103	41			
	No	91	17	2.131	0.009	3.057(1.314,7.111)
Factories near home	Yes	32	3	3.621	0.027	4.633(1.192,18.002)
	No	162	55			
Is you residential clean	Yes	136	48			
	No	58	10	2.047	0.042	2.246(0.903,5.586)
Refrigerator in home	Yes	110	21			
	No	84	37	0.433	0.003	0.289(0.129,0.648)
Does any of your family consume alcohol?	Yes	106	45	0.348	0.014	0.308(0.121,0.787)
	No	88	13			

CHAPTER SIX

6 .1 DISCUSSION

In Ethiopia and other underdeveloped nations, pneumonia is a major cause of morbidity and mortality in children under the age of five. Planning child health care services, proper management, and prevention strategies all depend on understanding the prevalence and associated risk factors of under-five pneumonia.

In this study the prevalence of pneumonia was 77%. Which is higher than the study conducted in Wondo Genet district (33.3%) ,public hospital of Jimma zone (28.1%) and Este town (16.1%), Nigeria (27.7%), slums of Dibrugarh town (16.34%) (27, 28, 29, 30, 31). These differences might be due to difference in study setting and seasonal variation. Institutional basis of the study may also affect the prevalence.

This result demonstrates that children whose homes utilize charcoal as a fuel source have 0.316-fold increased chance of developing childhood pneumonia. This is consistent with a cross-sectional survey done in Nepal, which indicated a strong correlation between ALRI and using traditional cooking fuel [28]. According to a UNICEF report, cooking with solid fuels including charcoal, animal dung, and crop waste doubles children's risk of developing pneumonia [29].

This study found that household that has no ventilation system were triples the likelihood that the child will develop pneumonia. This is because both targeted and non-targeted host defenses of the respiratory tract against infections may be negatively impacted by high levels of indoor air pollution associated with fuel consumption. Severe pneumonia cases can be decreased by improved indoor air quality [30].

According to these results, kids who weren't fully immunized had a 0.206-fold higher risk of developing pneumonia than kids who were fully immunized (P= 0.013, AOR= 0.206 (95% CI) = (0.059, 0.655)). It is congruent with a study conducted in two slums in Dibrugarh, India, which shows that children who have received all recommended vaccinations had fewer cases of pneumonia as they get older[31]. This is because vaccinations help prevent pneumonia in children in two different ways. First, immunizations aid in shielding kids from infections like Haemophilus influenza type b (Hib), which can cause pneumonia on their own. Second, vaccinations may prevent illnesses like measles and pertussis, which can develop into pneumonia.

Among factors associated with under five pneumonias at multivariate analysis, children from households who had MUAC of between 12cm and 12.9cm were 0.188 times more likely to develop pneumonia than children who had MUAC > 13cm. This result not supported by the study conducted in Jimma (31). This discrepancy may be due to socio economical difference and also weather condition variation. Other additional reason could be under nutrition weakens a children over all immune system and undernourished children have weakened respiratory muscles, which inhibits them from adequately clearing secretions found in their respiratory tract. [10]

According to this finding, Children who have diarrhea had 0.365 fold increased risk of developing pneumonia (P=0.012, AOR= 0.356(95% CI) =(0.166, 0.805)). This result not supported by the study conducted in Jimma (31).

This study found that children were 0.181 times (P= 0.009, AOR= 0.181 CI= (0.05, 0.655,)) more likely to get pneumonia if they were starting additional food at six months when compared with child that start additional food after six months. Also, this finding indicates that household that are near the factories were 4.633 times (P= 0.027, AOR= 4.633(95% CI) = (1.192, 18.002)) more likely to increase the risk of child to develop pneumonia as compared to household that are not near to the factories. This result showed that children from unclean residence were 2.246 times (P= 0.042, AOR=2.246CI= (0.903, 5.586)) more likely to develop pneumonia than those clean residence. According to this result household that haven't Refrigerator been 0.289 times (P= 0.003, AOR= 0.289CI= (0.129, 0.648)) more likely to increase the chance of child to develop pneumonia as compared to household that have Refrigerator. Also, family member that consume alcohol increase the risk of child to develop pneumonia by 0.308 times (P= 0.014, AOR= 0.308 CI= (0.121, 0.787)) when compared to child that are not from alcoholic family member.

6.2 Strength and limitation of the study

Strength of the study

- The study includes a wide range of the subject matter.
- Since 100% of respondents responded, we may believe that the target population accurately reflects the degree of accuracy.

Limitation of the study

- Since the study is cross-sectional, cause and effect relationships between the dependent and independent variables are not demonstrated.
- The information was provided voluntarily, and the mother's behaviour was not noticed.
- The respondents' prejudice in their responses could affect the study.

CHAPTER SEVEN

7 CONCLUSIONS AND RECOMMENDATION

7.1 Conclusions

According to this study, 77 percent of children under the age of five had pneumonia. It had a high. The study found risk factors for pneumonia in children under five, including.

- Under-five pneumonia may be predicted by environmental factors such as using charcoal as a fuel source, absence of ventilation in the house, presence of factories near the house, unclean residence, absence Refrigerator in the home.
- Under-five pneumonia may also be predicted by factors related to health care and childcare, such as vaccination status, and additional feeding at first six months of life.
- Under-five pneumonia may be predicted from prior medical or co-morbid problems by factors such malnutrition, a history of child diarrhea, and family member that consume alcohol.

7. 2 Recommendation

For each Butajira health center in gurage zone, Community of Butajira and health care provider.

- The use of charcoal as a fuel source should be discouraged in favour of more economical, smoke-free alternatives.
- Improved housing circumstances, having ventilation system or windows in the house should all be encouraged.
- Encourage and provide health information on immunizations.
- All children receiving medical attention should have their nutritional status evaluated, and nutritional counseling is advised for all children visiting medical institutions.
- Encourage early diagnosis and treatment of diarrhea in children.
- Promoting health education to clean their compounds and their house.
- As much as possible the factories should be away from the community.

For ministry of health, SNNPR regional health bureau, non-governmental organizations and Gurage zone health bureau

- By promoting accessible and inexpensive immunization, providing health education about immunization, and organizing the community around immunization, we can increase the immunization rate.
- Encourage all children visiting medical facilities to have their nutritional status evaluated and receive nutritional counseling.

References

1. Raghavendran, K., J.M. Mylotte, and F.A. Scannapieco, *Nursing home-associated pneumonia, hospital-acquired pneumonia and ventilator-associated pneumonia: the contribution of dental biofilms and periodontal inflammation.* Periodontology 2000, 2007. **44**: p. 164.
2. Kaijalainen, T., et al., *Invasive infections caused by Neisseria meningitidis, Haemophilus influenzae and Streptococcus pneumoniae among children in St Petersburg, Russia.* Clinical microbiology and infection, 2008. **14**(5): p. 507-510.
3. Black, R.E., S.S. Morris, and J. Bryce, *Where and why are 10 million children dying every year?* The lancet, 2003. **361**(9376): p. 2226-2234.
4. McAllister, D.A., et al., *Global, regional, and national estimates of pneumonia morbidity and mortality in children younger than 5 years between 2000 and 2015: a systematic analysis.* The Lancet Global Health, 2019. **7**(1): p. e47-e57.
5. Berkley, J.A., et al., *Bacteremia among children admitted to a rural hospital in Kenya.* New England Journal of Medicine, 2005. **352**(1): p. 39-47.
6. Townes, E., *Troubling in My Soul: Womanist Perspectives on Evil and Suffering*. 2015: Orbis Books.
7. Rudan, I., et al., *Epidemiology and etiology of childhood pneumonia.* Bulletin of the world health organization, 2008. **86**: p. 408-416B.
8. Tavares, A.M., et al., *HIV and tuberculosis co-infection among migrants in Europe: A systematic review on the prevalence, incidence and mortality.* PloS one, 2017. **12**(9): p. e0185526.
9. Keusch, G.T., et al., *Diarrheal diseases.* Disease control priorities in developing countries, 2006. **2**: p. 371-388.
10. Lema, K., et al., *Prevalence and associated factors of pneumonia among under-five children at public hospitals in Jimma zone, South West of Ethiopia, 2018.* J Pulmonol Clin Res 2018; 2 (1): 25-31 J Pulmonol Clin Res 2018 Volume 2 Issue, 2018. **1**.
11. Pandey, M.R., et al., *Reduction in total under-five mortality in western Nepal through community-based antimicrobial treatment of pneumonia.* The Lancet, 1991. **338**(8773): p. 993-997.
12. Organization, W.H., *Health in 2015: from MDGs, millennium development goals to SDGs, sustainable development goals.* 2015.
13. Chandra, R.K. and P.M. Newberne, *Nutrition, immunity, and infection: mechanisms of interactions*. 2012: Springer Science & Business Media.
14. Abdisadiq, A.A., *Prevalence and risk factors of severe pneumonia among children aged below 5 years at Jinja Referral Hospital.* 2018.
15. Tesfaye, S.H., B.T. Seboka, and D. Sisay, *Spatial patterns and spatially-varying factors associated with childhood acute respiratory infection: data from Ethiopian demographic and health surveys (2005, 2011, and 2016).* BMC Infectious Diseases, 2023. **23**(1): p. 293.
16. Abuka, T., *Prevalence of pneumonia and factors associated among children 2–59 months old in Wondo Genet district, Sidama zone, SNNPR, Ethiopia.* Curr Pediatr Res, 2017. **21**(1): p. 19-25.
17. Fekadu, G.A., M.W. Terefe, and G.A. Alemie, *Prevalence of pneumonia among under-five children in Este Town and the surrounding rural Kebeles, Northwest Ethiopia: a community based cross sectional study.* Science Journal of Public Health, 2014. **2**(3): p. 150-5.
18. Aitpillah, P., *The effect of HIV/AIDS on the treatment outcome of severe acute malnutrition in children under 5 years at the Komfo Anokye Teaching Hospital, Kumasi, Ghana*. 2015.
19. Horton, S. and C. Levin, *Cost-effectiveness of interventions for reproductive, maternal, neonatal, and child health.* 2016.

20. Victora, C.G., et al., *Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect.* The lancet, 2016. **387**(10017): p. 475-490.
21. Wu, Z., et al., *Indoor environment in relation to recurrent childhood pneumonia in Southern China.* Building and Environment, 2020. **172**: p. 106727.
22. Nguyen, T., et al., *Risk factors for child pneumonia-focus on the Western Pacific Region.* Paediatric respiratory reviews, 2017. **21**: p. 95-101.
23. Elhissi, J.H., *Faculty of Pharmacy Department of Clinical Nutrition Deanship of Postgraduate Studies and Research*. 2020, Al-Azhar University.
24. Ramezani, M., S.Z. Aemmi, and Z. Emami Moghadam, *Factors affecting the rate of pediatric pneumonia in developing countries: a review and literature study.* International Journal of Pediatrics, 2015. **3**(6.2): p. 1173-1181.
25. Weir, E.K., et al., *Does vitamin D deficiency increase the severity of COVID-19?* Clinical Medicine, 2020. **20**(4): p. e107.
26. Carskadon, M.A., et al., *Respiration during sleep in children.* Western Journal of Medicine, 1978. **128**(6): p. 477.
27. Russo, G., et al., *Vaccine coverage and determinants of incomplete vaccination in children aged 12–23 months in Dschang, West Region, Cameroon: a cross-sectional survey during a polio outbreak.* BMC public health, 2015. **15**(1): p. 1-11.
28. Sanbata, H., A. Asfaw, and A. Kumie, *Association of biomass fuel use with acute respiratory infections among under-five children in a slum urban of Addis Ababa, Ethiopia.* BMC public health, 2014. **14**(1): p. 1-8.
29. Organization, W.H., *Burning opportunity: clean household energy for health, sustainable development, and wellbeing of women and children.* 2016.
30. Naz, L. and U. Ghimire, *Assessing the prevalence trend of childhood pneumonia associated with indoor air pollution in Pakistan.* Environmental Science and Pollution Research, 2020. **27**(35): p. 44540-44551.
31. Nirmolia, N., et al., *Prevalence and risk factors of pneumonia in under five children living in slums of Dibrugarh town.* Clinical Epidemiology and Global Health, 2018. **6**(1): p. 1-4.

Annexes

Annex-1: Parents/caregiver's permission from(English version)

Parent/Caregiver permission form for participants age <5 years old

I'm _____. Hello. You are being interviewed so that I can gather information for the study "Prevalence of Pneumonia and Associated Factors among Under-Five Children Attending in Buta Jira health center." The information on this form is intended to help you make a decision about whether to provide consent to take part in this study looking into your child's problem.

Dear Parent/Caregiver:

This study's objective is to determine the prevalence of pneumonia and its contributing factors among young children visiting the pediatrics OPD at Buta Jira Health center. You'll be required to participate in a quick interview. You should plan to participate in this research study for 15 to 20 minutes. Your comments or information on your child's issue will be kept private and anonymous. Your child will not be at risk from the trial. You won't receive any financial rewards for taking part in the study. The key advantage is that your child's issue will be detected, and possible management measures can be adopted in response to the outcome. Additionally, the findings of this study will serve as a guideline for future research that can be conducted in our nation.

However, I sincerely hope that you are allowed to take part in this study because the information you provide is crucial for understanding the issue with your child.

Are you now able to take part in the study?

☐ I'm allowed to participate in the interview (go on)

☐ I'm not allowed to participate in interviews (thanks, end)

Annex II: English version questionnaire

Socio-demographic characteristics

Sex:	1. Male

	2. female
Residence:	1. Urban 2. Rural
Age:	
Ethnicity:	1. Gurage 2. Oromo 3. Amhara 4. Others
Religion:	1. Orthodox 2. Muslim 3. Protestant 4. Others
Household	
Does the house have windows:	1. yes 2. No
Refrigerator:	1. Yes 2. No
Toilet facility:	1. Pit latrine 2. open field 3. others
Type of fuel used in home:	1. Kerosene 2. Charcoal 3. Electric City 4. Wood
Rate the general illumination/ventilation of the room	1. good 2. fair 3. bad
Do any of the other members of your family have a	1. Yes 2. No

cigarette smoking habit?	
Do any of your family consume alcohol?	1. Yes 2. No
What kind of meals do you typically eat?	1. Raw 2.cooked food
Is your residential area clean?	1. Yes 2. No
. Are there any factories near your house?	1. Yes 2. No
Environmental Health	
Number of rooms: ____	
Type of kitchen?	1. Separate 2. Corner of room 3.Veranda 4. Other
Does the kitchen have chimney?	1. Yes 2. No
Cleanness of the compound/house	1. Good 2. Fair 3.poor
Water Supply	
1. What is your source of drinking water?	1. Pipe water 2. Well water 3. Spring water
If their source is well or spring, do you make water treatment at household level?	1. Yes 2. No
If yes to Q2, what do you usually do to make it safer to drink?	1. Boiling 2. Add bleach/chemicals 3. Strain it through a cloth
What type of container do you	

use to store your drinking water?	1. Jerrican 2. Pot 3.Tanker
Do you wash the container and cover it? (Observe its cleanliness)	1. Yes 2. No
Child Care Practice	
1. What type of feeding do you use in the first 6 month for the baby?	1. Exclusive breast feeding 2. Mixed breast feeding
2. For how long did breast feed your baby?	1. < 2years 2 .> 2 years
3. At what age do you start additional food for your baby?	1. at < 6 months 2. At 6 months 3. After 6 months
4. Do you use bottle for feeding your baby?	1. Yes 2. No
Immunization	
Is the infant vaccinated accordingly (if yes check EPI card)?	1. Fully immunized 2. Partially immunized 3. Not immunized
If not immunized, what is the main reason?	
	1. Fear of side effect 2. Lack of access 3.Lack of knowledge
Does a child diagnosis for pneumonia for now or last two weeks? From card.	1. Yes 2. No
Does child have the following sign and symptoms	1. Cough 2. Fast breathing 3. Difficult breathing 4. Fever 5. Chills 6. Loss of appetite nausea , vomiting 7. Malaise /lethargy 8. Chest wall I drawing 9. Crackles or stridor or wheezing sound

Does child have Cough or difficult breathing plus at least one of the following?	1. Moderate to severe respiratory distress 2. Central cyanosis or Hypoxemia (oxygen saturation<90 %) 3. Inability to breastfeed or draink, or vomiting everything 4. Convulsions, lethargy or unconsciousness or Capillary refill ≥2 second
MUAC of the patient	1. <11.9cm 2. 12cm-12.9cm 3. >13cm
Have your child ever had Measles in months?	1. Yes 2. No
History of child ARTI in last two weeks	1. Yes 2. No
History of Malaria	1. Yes 2. No
History of Chronic diseases like CHD, Asthma	1. Yes 2. No
Have your child ever had diarrhea?	1. Yes 2. No
what is the current nutritional status of the patient	1. not malnutrition 2. moderate malnutrition 3. severe malnutrition