ISSN: 2469-5769

Ali et al. Int J Pediatr Res 2022, 8:096
DOI: 10.23937/2469-5769/1510096
Volume 8 | Issue 1
Open Access

International Journal of Pediatric Research

RESEARCH ARTICLE

Determinants of Community-Acquired Pneumonia among under-Five Children in Tehulederie District, Northeast Ethiopia

Getahun Ali[1], Alemayehu Shimeka[2] and Ayalew Kassaw[1,3]*

[1]*Gambella Health Office, Gambella, Ethiopia*

[2]*Department of Epidemiology, College of Health Science, Gondar University, Ethiopia*

[3]*Department of Nursing and Midwifery, Gambella College of Health Science, Southern Ethiopia*

***Corresponding author:** *Ayalew Kassaw, Gambella Health Office, Gambella, Ethiopia; Department of Nursing and Midwifery, Gambella College of Health Science, Southern Ethiopia*

Abstract

Background: Pneumonia is the leading cause of mortality and morbidity in under-five children which accounting two million under-five deaths each year globally. Half of these deaths occur in Sub-Saharan Africa. Regardless of this fact, efforts to identify determinants of pneumonia have been limited in the study area. The aim of this study was to identify determinants of community-acquired pneumonia among 2-59 months of age children in Tehulederie district, Northeast Ethiopia.

Methods: An institution-based 1:2 unmatched case-control study was conducted in Tehulederie district from August to September 2017 on 132 cases and 264 control of children aged 2 to 59 months were included in the sample. Cases were children with pneumonia, while controls were non-pneumonia children. Data were entered, coded, and cleaned using Epi-info software version 7 and analyzed using SPSS version 20. The binary logistic regression model was used to test associations between each independent factor with the outcome variable. Variables with $P < 0.05$ were considered significantly associated with community-acquired pneumonia.

Results: Children who lived in the urban (AOR = 2.67, 95% CI: 1.5, 4.7), children who are lived in house without windows (AOR = 4.7, 95% CI: 2.7, 8), children who are lived in house in non-separated animal house (AOR = 3.57 95%CI = 1.7, 7.2), children carried on the back of caregivers during cooking (AOR = 4.7, 95% CI: 2.7, 8), crowded family size (AOR = 2, 95% CI: 1.05, 3.37), and children who had history of diarrhea in the past two weeks prior to data collection (AOR = 3.06, 95% CI: 1.68, 5.86), were found to be determinants of community-acquired pneumonia.

Conclusion: Children who lived in the urban, children who are lived in house without windows, children who are lived in house in non-separated animal house, children carried on the back of caregivers during cooking, crowded family size and children who had history of diarrhea in the past two weeks prior to data collection showed a significant association with community-acquired pneumonia.

Keywords

Pneumonia, Determinant, Case-control study, Child age of 2-59 months

Abbreviations

AHR: Adjusted Hazard Ratio; CAP: Community Acquired Pneumonia; CHR: Crude Hazard Ratio; CI: Confidence Interval; FMOH: Ethiopian Federal Ministry of Health; ARI: Acute Respiratory Tract Infection: HIV: Human Immunodeficiency Virus, IMNCI: Integrated Management of Neonatal and Childhood Illness; UN: United Nation; WHO: World Health Organization

Introduction

Community-acquired childhood pneumonia (CAP) is an acute infection of the lower respiratory tract that starts outside or is identified within 48 hours after admission to the hospital in a child who has not resided in long-term care for 14 days or more before admission [1].

The main cardinal sign and symptom of CAP in children whose age were 2-59 months are fast

Citation: Ali G, Shimeka A, Kassaw A (2022) Determinants of Community-Acquired Pneumonia among under-Five Children in Tehulederie District, Northeast Ethiopia. Int J Pediatr Res 8:096. doi.org/10.23937/2469-5769/1510096

Accepted: May 28, 2022: **Published:** May 30, 2022

breathing. According to World Health Organization (WHO), fast breathing has defined as a respiratory rate of > 60/min for infants less than 2 months age; > 50/min for infants of 2-12 months age, and > 40/min for children more than 12-59 months age. Pneumonia is caused by several infectious causes, including viruses, bacteria, and fungi. The commonest bacterial cause is Streptococcus pneumonia [1,2].

Globally, CAP is one of the leading causes of morbidity and mortality among under-five children [3]. The incidence rate of CAP in under-five children is 0.29 episodes per child-year, accounting for 151.8 million cases annually in developing countries. Fifteen countries contribute 74% of the world's annual pneumonia cases including Ethiopia [4].

There are approximately 120 million cases of pneumonia a year, with Southeast Asia and Africa having the highest incidence. Nearly half of all pneumonia mortality is concentrated in 10 high-burden countries. It accounts for 935,000 under-five deaths annually, representing 15% of all under-five annual worldwide mortality. More than 70% of these deaths occur in just 15 countries in Asia and Sub-Saharan Africa. Many of these countries face significant challenges in the provision of effective health care, diagnosis, and treatment [5].

Globally, pneumonia is the biggest single cause of death in children, accounting for 15% of over 6 million deaths in children aged, five years in 2013. Half of these deaths occur in sub-Saharan Africa, and the Gambia, like other countries in this region, suffers a high toll from pneumonia [6]. Pneumonia disease can affect any age group, at most risk are adults aged ≥ 65 years, and infants and young children, who do not have a fully developed immune system. The incidence and severity of childhood pneumonia were highest in Africa and Southeast Asia, which accounted for 30% and 39% respectively of the global burden of severe cases [7].

Pneumonia disease remains the leading cause of childhood mortality and the most common reason for adult hospitalization in low and middle-income countries, despite advances in preventative and management strategies [8]. Acute respiratory infections (ARI) are one of the leading causes of childhood morbidity and mortality in developing countries, accounting for approximately a third of the 15 million deaths that occur annually among under-5-year-olds [9]. Pneumonia causes about two million under-five deaths each year, accounting for nearly one in five child deaths globally. WHO estimates the annual number of ARI-related death in this age group was 2.1 million, accounting for 20% of all childhood death [10].

Pneumonia disease is common in poor communities. Since Mali is one of the poorest countries in the world, with an under-five year mortality rate of 123 per 1,000 live births in 2013 according to the UN Inter-agency Group for Child Mortality Estimation. It has been estimated that among its 14.9 million inhabitants, each year more than 900,000 pneumonia episodes occur in children under 5 years of age, leading to almost 8,000 deaths annually [11].

In Ethiopia, pneumonia is a leading single disease killing under-five children. It is estimated that 3,370,000 children encountered pneumonia annually which contributes to 20% of all causes of death killing over 40.000 under-five children every year, these death are easily preventable and treatable through simple and cost-effective interventions [11]. Similarly, pneumonia is the third most prevalent, 20%, acute respiratory tract infection for 2-59 months children in urban settings of the Amhara region [12].

Pneumonia death is strongly associated with poverty-related factors like under-nutrition, lack of safe water and sanitation, indoor air pollution, and inadequate access to health care. Almost half of the pneumonia deaths were associated with air pollution. The impact of indoor air pollution kills more children globally than outdoor air pollution [13,14].

Even if a high number of prevention strategies are performed in the district pneumonia disease remains a public health problem. Controlling the continuing threat of pneumonia is one of the major health priorities of the FMoH of Ethiopia for which this study aimed to contribute its part. Regardless of this fact, efforts to identify determinants of pneumonia have been limited in the study area. This study were more focus on many determinants in addition to pneumonia prevention advice and different aspects of health extension programs that present better evidence for the policymakers and stakeholders, which in turn, may help in designing and implementing appropriate interventions at different levels to minimize pneumonia case and for the betterment of childhood health in general.

Methods and Materials

Study area, design, and setting

The study was conducted in the tehulederie districts in the Amhara Regional State of Ethiopia. Tehulederie is found in the northeast direction of Addis Ababa (capital city of the country) at a distance of 429 km through the highway of Mekele town. The district is divided into twenty-six kebeles (seven urban and nineteen rural kebeles), which are the smallest administrative units of FDRE, and has five health centers and 19 rural health posts in its administration. The district has five governmental health centers.

The livelihood of the majority of the resident is dependent on agriculture and animal rearing. According to 2016/17 the district finance and development office projection, the total population of the district

is estimated to be 141,236 of which 72,030 (51%) are male and 63,984 (49%) female. There are a total of 19,129 children under the age of under five years in the district [15].

Study design

An institution-based unmatched case-control study was conducted from August 25 to September 25, 2017.

Sample size determination

The sample size was calculated using the Epi info Statcalc program and the minimum number of cases and controls required by taking assumptions of a 95% confidence level, 80% power, and 5.5% to controls exposed of family child caring practice giving OR of 2.98 [12]. Family child caring practice was selected because it was the exposure variable that gave the highest sample size of cases and controls among the other variables from previous studies. We used two controls for each case (132 cases and 264 controls).

Sampling technique

The study area was first stratified into urban and rural health centers. Then by using a simple random sampling technique (lottery method) we had selected two health centers from the rural health centers and include the only urban health center. For proportional sample size allocation for health centers, we also observed client flow of the previous three consecutive months before the data collection period. We used a simple random sampling technique and gave to the high burden of cases and enumeration method to select controls and cases. To represent control in the community we obtained the total number of under-five children from each randomly selected health center were consecutively recruited by the concurrent controls selection technique.

Data collection instrument and quality controls

Data were collected using a structured and pre-tested questionnaire. Three health workers who are working in the IMNCI clinic in each randomly selected health center and two supervisors from the district health office were recruited before data collection. The training was given to data collectors and supervisors before the study. Mothers/primary caregivers of children aged 2-59 months who are on-site during data collection were eligible to participate in the study. Face-to-face interviews and document review was done to collect data. Questionnaires were administered after explaining the purpose of the study and the criteria used to select each respondent. Anthropometric measurement was used to measure nutritional status and a Timer to count the fast breathing of the -child. The collected data were checked for inconsistencies, coding errors, completeness, accuracy, clarity, and missing values.

Data processing and analysis

Data collected from the questionnaire was entered, coded, and cleaned using Epi-info software version 7

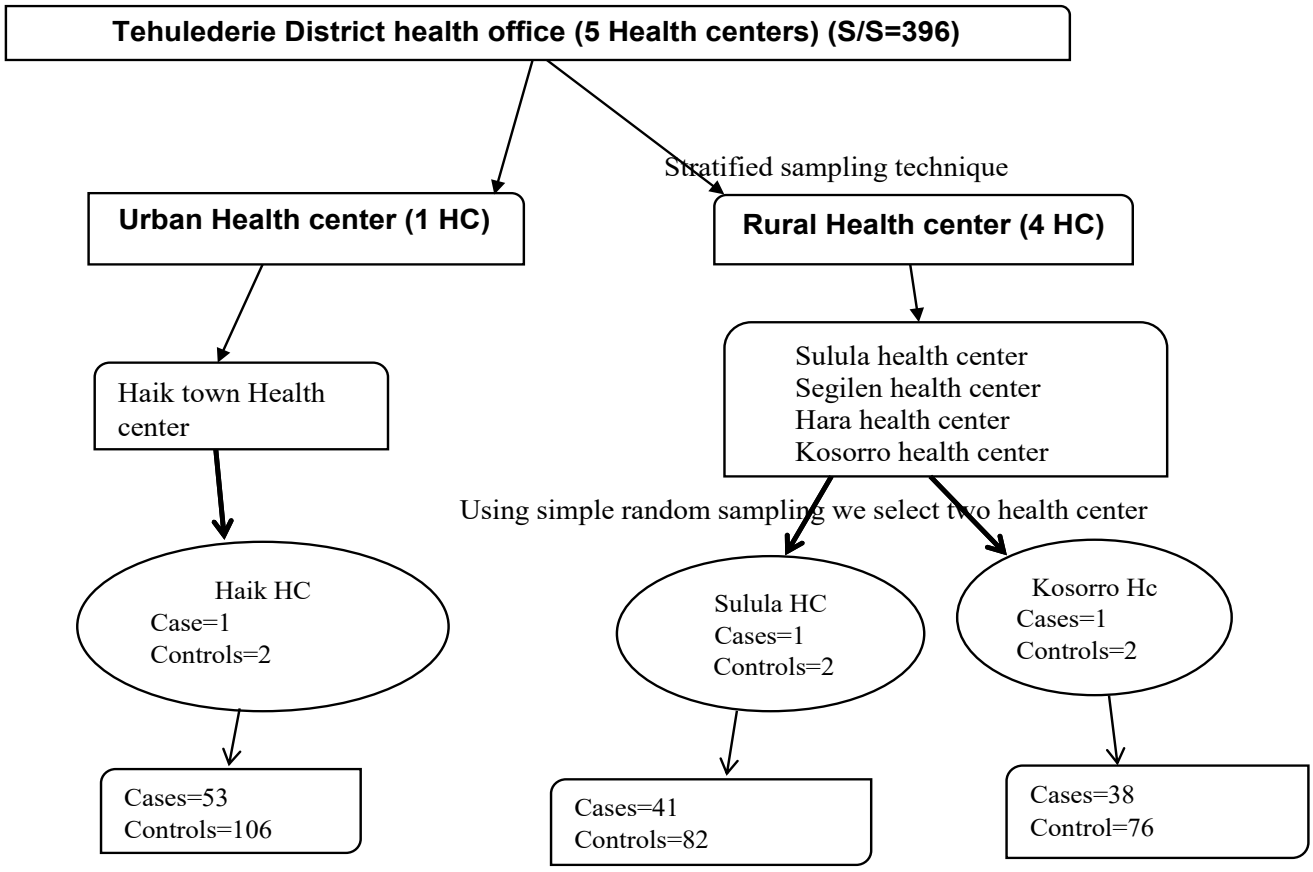

Figure 1: Shows schematic presentation of a sampling frame of the study.

and Exported to SPSS version 20 for further analysis. Frequency distribution, percentage, mean and standard deviation are used in the data description. Double entry was performed to assure the quality of the data. Tables and figures were used to present the data. Adjusted odds ratio (AOR) with its 95% confidence interval (CI) and P-Value less than 0.05 was used to report statistical significance. Binary logistic regression was used to test associations between each independent factor with the outcome variable. Variables that showed significance during bi-variable analysis at P-value < 0.2 were set as a candidate and simultaneously included in multivariable logistic regression with a backward stepwise method. Finally, the variables with statistically significant associations at a p-value of < 0.05 with the outcome variable were expressed as potential determinants of community-acquired pneumonia. Hosmer's and Leme show goodness of fit test was used to evaluate model fitness (P-value > 0.05).

Ethical statement and consent

The institutional review board (IRB) of the University of Gondar approved the study protocol Ref. No: HSC/984/16/12. A formal letter was submitted to the south Wollo zonal health department and Tehulederie district health office requesting permission for the data collection. Written informed consent was obtained from mothers/caregivers before data collection. Data security and participants' confidentiality were maintained at all levels of data management.

Result

Socio-demography characteristics of the respondent

132 cases and 264 controls of children aged 2-59 months participated in the study, making the response rate 100% and 100% for cases and controls, respectively. The majority (87.12%) of cases and 84.46% of control of the mothers/caregivers were Muslim religious followers. Seventy-five (56.81%) of the case and 155 (58.71%) of the controls were male. The mean age of the children was 21.3 months (SD ± 15.49) and 24.7 months (SD ± 16.05) for cases and controls, respectively. The mean age of mothers was 30.2 years (SD ± 6.9) and 29.8 years (SD ± 6.8) for cases and controls, respectively. Educational status of fathers, 54 (40.91%) of cases and 70 (26.51%) of control were not able to read and write. On the hand the educational status of mothers 49 (37.12%) cases and 74 (28.03%) of control were not able to read and write. In the majority of cases, 89 (67.43%) and 197 (74.64%) of controls were live in rural kebeles (Table 1).

Table 1: Socio-demographic characteristics of children's age from 2 months to 5 years in Tehuledere district, (N = 396).

Variable	Case N (%)	Control N (%)
Usual place of residence		
Urban	43 (32.57)	67 (25.37)
Rural	89 (67.43)	197 (74.64)
Age of the child		
2-11	46 (34.85)	63 (23.86)
12-27	44 (33.33)	99 (37.50)
28-60	42 (31.82)	102 (38.64)
Sex of the child		
Male	75 (56.81)	155 (58.71)
Female	57 (41.19)	109 (41.29)
Age of the mother		
< 18	3 (1.51)	2 (0.76)
19-25	38 (28.79)	75 (28.41)
26-34	61 (20.45)	140 (53.03)
35-44	27 (20.45)	39 (14.77)
> 45	3 (2.27)	8 (3.03)
Educational status of mothers		
Not able to read and write	49 (37.12)	74 (28.03)
Able to read and write	23 (17.42)	74 (28.03)
Primary (1-8)	20 (15.15)	48 (18.18)

Secondary (9-12)	33 (25)	41 (15.53)
Higher education	7 (5.30)	27 (10.23)
Occupational status of Mothers		
Farmers	37 (28.03)	52 (19.70)
Student	10 (7.58)	14 (5.30)
Gov't employee	6 (4.55)	25 (9.47)
House wife	70 (53.03)	156 (59.09)
Merchant	7 (5.03)	13 (4.92)
Other specify	2 (1.52)	4 (1.52)
Fathers Educational status		
Not able to read and write	54 (40.91)	70 (26.51)
Able to read and write	29 (21.97)	53 (20.07)
Primary (1-8)	17 (12.88)	46 (17.42)
Secondary (9-12)	16 (12.12)	48 (18.18)
Higher education	16 (12.12)	47 (17.80)

Table 2: Vaccination and Disease risk factor characteristics of children's age from 2 to 59 months in Tehuledere district, (N = 396).

Variable	Case N (%)	Control N (%)
Child with history of cough in the last two weeks		
Yes	87 (65.91)	100 (37.88)
No	45 (34.09)	164 (62.12)
Childs history of diarrhea in the last two weeks		
Yes	67 (50.75)	93 (35.23)
No	65 (49.25)	171 (64.77)
Pentavalent vaccine status of the child		
Not vaccinated	0	2 (0.76)
Up to dated	27 (20.45)	25 (9.47)
Completed	105 (79.55)	237 (89.77)
Measles vaccination status the child		
Up to date	34 (25.75)	71 (26.89)
Completed	98 (74.25)	192 (73.11)

Nutrition and comorbidity related factors

Regarding the nutritional status of the children, 20 (15.15%) of cases and 22 (40.4%) controls were stunted. 8.3% of cases and 6.82% controls were underweight. 9.09% of cases and 4.55% of controls were wasted. The majority of cases (84.85%) and controls (81.44%) were exclusively breastfed for six months. 70.2% of cases and 77.5% of controls started complementary feeding at six months.

Vaccination and disease risk factor characteristics of the respondent

Of the 87 (65.91%) of cases and 100 (37.88%) of controls had a history of cough in the last two weeks. 67 (50.5%) of cases and 93 (35.23%) of controls had a history of diarrhea. Regarding the vaccination status of children, the majority of cases 105 (79.55%) and controls 237 (89.77%) received at least one full dose of pneumococcal conjugate vaccine (Table 2).

Housing, environmental and related characteristics of the respondents

Nearly equal proportion of the cases 125 (94.69%) and controls 252 (95.45%) lived in a house with a roof made of corrugated iron sheet. The majority of cases 118 (89.39%) and controls 205 (77.65%) lived in a house made of wood and mud. Majority of cases 95 (71.96%) and controls 196 (74.24%) lived in a house owned by the mothers/caregivers. About 88 (66.67%) cases and 27.28% of controls were carried on back during cooking which exposes them to high indoor pollution. 81.82% of cases and 84.85% of controls of the study participant live in house hold having separated kitchen. The vast majority of cases 112 (84.84%) and 242 (91.6) of controls use pipe water for both drinking and washing purpose and Eighteen (13.6%) cases and 22 (8.3) controls houses use protected well for the same purpose. Fuel wood and animal dung were the most common source of cooking fuel as answered by mothers/caregivers they were using

both. The highest number of cases 108 (89.39) and 205 (77.65%) of controls mothers/care givers were cooking their food in the separated kitchen (Table 3).

Factors associated with community-acquired pneumonia

The independent predictors of being a risk factor for pneumonia were assessed. Binary logistic regression analyses were used to identify the independent determinants of community-acquired pneumonia. Firstly, socio-demographic, vaccination, and disease risk factor characteristics of the respondents, and housing, environmental and related characteristics of the respondents were analyzed against the outcome variable that is being a risk factor using the bi-variable analysis. Variables with a P-value of < = 0.2 were fitted into the final model of the binary logistic regression (multivariable analysis). Accordingly, child's age, Place of residence, Material used to construct house floor, child place during cooking, Family size, previous history of cough, frequency of carrying's more than 5 times, History of diarrhea, which had a < 0.05 significance level were entered into the final model to control confounding (Table 4).

Discussion

Community-acquired pneumonia in children under five years of age is a primary leading cause of morbidity and mortality worldwide but high burdens were seen especially in developing countries like Ethiopia. Knowing the determinant factors is important to create proper management and prevention strategy for community-acquired pneumonia. The result of these findings identifies those easily preventable determinant factors.

In this study, the occurrence of community-acquired pneumonia was not affected by socio-demographic except, place of residence but this result is different from other study done in Este town and the surrounding

Table 3: Housing, environmental and related characteristics of children's age from 2-59 months to in Tehuledere district, (N = 396).

Variable	Case N (%)	Control N (%)
Main material used to construct the house roof		
Thatched roof	7 (5.30)	12 (4.35)
Corrugated iron roof	125 (94.70)	252 (95.45)
Main material used to construct the house wall		
Wood/sand/mud	118 (89.39)	205 (77.65)
Cement/Bricks	14 (10.61)	59 (22.35)
Have separated kitchen		
Yes	108 (81.82)	224 (84.85)
No	2418.18	40 (15.15)
Kitchen with Chimney		
Yes	36 (27.27)	143 (54.16)
No	96 (72.73)	121 (45.84)
Family Size		
Crowded	46 (34.85)	47 (17.80)
Not crowded	86 (65.15)	217 (82.20)
HH status under Health Extension program		
Model	35 (26)	10 (3.79)
On training	83 (62.88)	145 (54.92)
Not on training	14 (10.62)	19 (7.20)
Types of cooking fuel		
Animal dung	59 (44.70)	72 (27.27)
Wood	125 (94.70)	241 (91.29)
Charcoal	23 (17.42)	76 (28.79)
Electricity	8 (6.06)	28 (10.61)
Petroleum fuel	7 (5.30)	16 (6.06)
Source of drinking and washing water		
Tap (pipe)	112 (84.8)	242 (91.66)
Protected well	18 (13.6)	22 (8.3)
Protected spring	9 (6.82)	8 (3.03)

Table 4: Bi-variable and multivariable analysis for possible risk factors of children's age from 2-59 months in Tehuledere district, (N = 396).

Variables	Pneumonia status		COR (95%CI)	AOR (95%CI)	P-Value
	Case (%)	Control (%)			
Age of the child					
2-11	46 (34.65)	63 (23.86)	1.77 (1.05, 2.99)*	1.56 (0.59, 2.76)	0.152
12-27	44 (33.33)	99 (37.58)	1.07 (0.65, 1.78)	1.25 (0.56, 2.77)	0.57
28-60	42 (31.82)	102 (38.64)	1	1	
Place of residence					
Urban	43 (32.57)	67 (25.)	1.45 (0.91, 2.31)*	2.67 (1.5, 4.7)**	0.001
Rural	89 (67.43)	197 (74.64)	1	1	
Child place during cooking					
On the back or near the caregiver	88 (66.66)	72 (27.27)	5.33 (3.39, 8.38)*	4.7 (2.7, 8)**	0.00
Outside of the cooking house	44 (33.34)	192 (72.73)	1	1	
Frequency of child carries on the back					
< 2 times	43 (32.58)	185 (70.07)	1	1	
3-5 times	68 (51.51)	68 (25.75)	4.39 (2.73, 7.08)*	2.64 (1.5, 4.6)*	0.00
> 5 times	21 (15.91)	11 (4.16)	7.87 (3.5, 17.68)*	5.11 (2.10, 13)*	0.00
Family size					
Crowded	46 (34.85)	47 (17.80)	2.47 (1.53, 3.97)*	1.9 (1.05, 3.37)**	0.032
Not crowded	86 (65.15)	217 (82.20)	1	1	
Household status under Health extension Package					
Model HH	35 (26)	10 (3.79)	1	1	
On Package training	83 (62.88)	145 (54.92)	1.73 (1.07, 2.79)*	1.35 (0.74, 2.44)	0.31
Not in the Package	14 (10.61)	19 (7.20)	1.17 (1.17, 5.52)*	1.32 (0.48, 3.58)	0.58
The main house without a window					
Yes	76 (57.57)	220 (83.33)	1	1	0.00
No	56 (42.43)	44 (16.67)	3.7 (2.3, 5.9)*	2.42 (1.4, 4.2)**	0.02
Having a no separated animal house					
Yes	65 (49.24)	203 (76.89)	1	1	
No	67 (57.76)	67 (23.11)	3.5 (1.9, 62)*	3.57 (1.7, 7.2)**	0.00
Child's history of diarrhea in the last two weeks					
Yes	67 (50.75)	93 (35.23)	3.65 (2.27, 5.86)*	3.16 (1.85, 5.52)**	0.00
No	65 (49.25)	171 (64.77)	1	1	

*Variables that show significant association during the Binary logistic regression at P < 0.05; **Variables that show significant association during the multiple logistic regression at P < 0.05

rural kebele, Northwest Ethiopia [16].

Place of residence was the primary variable that show a positive risk factor for community-acquired pneumonia. Children who lived in the urban area were two times more likely to develop community-acquired pneumonia (AOR= 2.67, 95% CI: 1.5, 4.7). The possible reason for this result is urban areas are more exposed to environmental pollution as a result of swage and household dry and liquid wastes and high population density in living style. This result is similar to a study done in urban and rural areas of Puducherry, India [10].

Children who are lived in a house without windows in the main house were indicated the risk by four times more likely to develop community-acquired pneumonia (AOR = 4.7, 95%CI = 2.7, 8). The reason for this result is due to the proper ventilation of the house. This study was consistent with other previous studies in Este town and surrounding kebeles [16].

Children who are lived in a house in non-separated animal house from the main house were shown as three times more likely to develop pneumonia (AOR = 3.57, 95%CI = 1.7, 7.2). This is happen because the wet area is a result of animal excreta and makes it more suffocated as a result of excreta. This result is supported by another previous study in Este town and surrounding kebeles which indicates children who lived in a non-separate animal house were more likely to have community-

acquired pneumonia than a child who lived in the separated house [16].

Children carried on the back of mothers or caregivers during cooking were associated with an increased risk of community-acquired pneumonia by four times more likely to develop community-acquired pneumonia that is (AOR = 4.7, 95% CI: 2.7, 8). This is because children who are in the kitchen during cooking especially on the back of the mother or caregiver expose to indoor air pollution as a result of different cooking fuels that lead to respiratory tract infection. This result is supported by the study done in Este town, Ethiopia, and Greater Banjul and Upper River Regions, the Gambia [6,16].

An increase in the frequency of children carried on the back of the mother's or caregiver's back three to five times per day is two times more likely to cause community-acquired pneumonia (AOR = 2.6, 95% CI: 1.5, 4.6) and also those carry more than five times per day regardless of the time stay on the back were five times more likely to develop community-acquired pneumonia (AOR = 5.11, 95% CI: 2.10, 13). It is not advisable to carry children on the back to keep the child from another risk instead it is better to sleep on the bed or hold by arm but the community as a whole carries their child, especially in a rural area. These happen because the child's chest isn't able to relax and the child's lungs also aren't able to inhale and exhale properly. In addition, the high burden of temperature from the mother's body makes the child suffocated. Such variables are not found in the previous literature so they need further study.

Crowded family size was another factor identified to affect occurrences of community-acquired pneumonia indicating that children who lived in families with more than five members had two times more likely to develop community-acquired pneumonia (AOR = 2, 95%CI 1.05, 3.37). Crowding refers to overcrowding as a situation in which more people are living within a single house as compared to space so that movement is restricted, privacy limited, hygiene is poor and disturbed sleep. This result is supported by a similar study done in Kersa district southwest, Ethiopia, western Kenya, and Fortaleza, Brazil showed a similar result [17,18]. Children who had a history of diarrhea in the past two weeks prior to data collection were 3.14 (AOR = 3.06, 95%CI: 1.68, 5.86) times more chance of developing community-acquired pneumonia compared to those who were not ill due to diarrhea prior to collection. The probable explanation for this result might be that diarrheal disease can cause immune to suppress that easily lead to community-acquired pneumonia as a risk factor in children under the age of five [18,19].

Limitations of the study

Diagnosis of pneumonia was based on clinical WHO IMNCI classification guidelines, which could introduce misclassification bias. The second main limitations were due to the nature of the data collection: interview was conducted in the facility that might lead to interviewer bias.

Conclusion

Our finding identified that determinant factors of community-acquired pneumonia in under children such as; place of residence, carrying the child on the back of mothers/caregiver during cooking, child history of diarrhea in the last two weeks, crowded family size, frequency of child carry on the back find as risk factors of CAP and living in a house without window and non-separated house for an animal in/from the main house find as another risk factor. All public health centers should promote early prevention and treatments of Diarrhea in the Health facility and at household level. They need to create awareness about the power of separate kitchens in the reduction of CAP in children. It is important for clinicians and public health officials to consider the constraints and knowledge gaps that hinder the implementation of primary pneumonia prevention strategies.

Acknowledgment

Primarily, my heartfelt gratitude goes to our advisor; Alemayehu Shimeka (MPH, Asst. Prof.) for his unreserved effort to advise me to have a clear vision in writing this thesis report. Secondly, I would like to extend my sincere gratitude to the department of epidemiology and biostatistics, institute of public health, University of Gondar, for providing this opportunity. Finally, my thanks go to all South Wollo zonal health department and Tehulederie district health office staff for their support in facilitating internet services for searching relevant literature and other material supports to develop this thesis report.

Funding

The authors received no specific funding for this work.

Competing Interests

The authors declare that there are no competing interests

Author Contributions

Conceptualization: Getahun Ali, Ayalew Kasaw; Data curation: Getahun Ali, Ayalew Kasaw; Formal analysis: Getahun Ali, Ayalew Kasaw; Funding acquisition: Getahun Ali, Alemayehu Shimeka, and Ayalew Kasaw; Investigation: Getahun Ali, Alemayehu Shimeka, Ayalew Kasaw; Methodology: Getahun Ali, Alemayehu Shimeka, Ayalew Kasaw; Project administration: Getahun Ali, Ayalew Kasaw; Resources: Getahun Ali, Alemayehu Shimeka, Ayalew Kasaw; Software: Getahun Ali, Alemayehu Shimeka, Ayalew Kasaw; Supervision: Getahun Ali, Ayalew Kasaw; Validation: Getahun Ali,

Alemayehu Shimeka, Ayalew Kasaw; Visualization: Getahun Ali, Alemayehu Shimeka, Ayalew Kasaw; Writing - original draft: Getahun Ali, Alemayehu Shimeka, Ayalew Kasaw; Writing - review & editing: Getahun Ali, Alemayehu Shimeka, Ayalew Kasaw.

References

1. Porth C, Matfin G (2009) Pathophysiology: Concepts of altered health states. Wolters Kluwer Health Lippincott Williams & Wilkins, New York, 676-680.
2. WHO (2014) Revised WHO classification and treatment of childhood pneumonia at health facilities.
3. Geleta D, Tessema F, Ewnetu H (2016) Determinants of community-acquired pneumonia among children in Kersa District, Southwest Ethiopia: Facility Based Case Control Study. J Pediatr Neonatal Care 5: 00179.
4. Chen J, Hu P, Zhou T, Zheng T, Zhou L, et al. (2016) Epidemiology and clinical characteristics of acute respiratory tract infections among hospitalized infants and young children in Chengdu, West China, 2009-2014. BMC Pediatr 18: 216.
5. Fischer Walker CL, Rudan I, Liu L, Nair H, Theodoratou E, et al. (2013) Global burden of childhood pneumonia and diarrhoea. Lancet 381: 1405-1416.
6. Howie SRC, Schellenberg J, Chimah O, Ideh RC, Ebruke BE, et al. (2016) Childhood pneumonia and crowding, bed-sharing and nutrition: A case-control study from the Gambia. Int J Tuberc Lung Dis 20: 1405-1415.
7. Vinogradova Y, Hippisley-Cox J, Coupland C (2009) Identification of new risk factors for pneumonia: Population-based case-control study. Br J Gen Pract 59: e329-e338.
8. Zar HJ, Madhi SA, Aston SJ, Gordon SB (2013) Pneumonia in low and middle-income countries: Progress and challenges. Thorax 68: 1052-1056.
9. Fonseca W,' Kirkwood BR, Victora CG, Fuchs SR, Flores JA, et al. (1996) Risk factors for childhood pneumonia among the urban poor in Fortaleza, Brazil: A case--control study. Bull World Health Organ 74: 199-208.
10. Ganesh Kumar S, Majumdar A, Kumar V, Nanda Naik B, Selvaraj K, et al. (2016) Prevalence of acute respiratory infection among under-five children in urban and rural areas of Puducherry, India J Nat Sci Biol Med 6: 3-6.
11. Rudan I, Boschi-Pinto C, Biloglav Z, Mulhollandd K, Campbell H (2008) Epidemiology and etiology of childhood pneumonia. Bull World Health Organ 86: 408-416.
12. Dadi AF, Kebede Y, Birhanu Z (2014) Determinants of pneumonia in children aged two months to five years in Urban Areas of Oromia Zone, Amhara Region, Ethiopia. Open Access Library Journal 1: e1044.
13. Alemayehu S, Kidane K, Kahsay T, Kassa M (2019) Risk factors of acute respiratory infections among under-five children attending public hospitals in southern Tigray, Ethiopia 2016/2017. BMC Pediatr 19: 380.
14. Razanajatovo NH, Guillebaud J, Harimanana A, Rajatonirina S, Ratsima EH, et al. (2018) Epidemiology of severe acute respiratory infections from hospital-based surveillance in Madagascar, November 2010 to July 2013. PLoS One 13: e0205124.
15. Gebrestadik S (2015) Prevalence and association factors of pneumonia, in children 2-59.
16. Abeje Fekadu G, Wubshet Terefe M, Asres Alemie G (2014) 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 2: 150-155.
17. Swati Kambli (2014) Knowledge of bronchopneumonia among caretakers of Infants. Int J Sci Res 3.
18. Onyango D, Kikuvi G, Amukoye E, Omolo J (2012) Risk factors of severe pneumonia among children aged 2-59 months in western Kenya: A case control study. Pan Afr Med J 13: 45.
19. Simoes EAF, Cherian T, Chow J, Shahid Salles SA, Laxminarayan R, et al. (2006) Acute respiratory infections in children. In: Jamison DT, Breman JG, Measham AR, Disease control priorities in developing countries. (2nd edn), Oxford University Press, New York, 483.