Prevalence of Community Acquired Pneumonia among Children 2 to 59 Months Old and its Associated Factors in Munesa District, Arsi Zone, Oromia Region, Ethiopia

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ABSTRACT

Background: Pneumonia is one of leading cause of death among under five children in the world. Half of death from pneumonia occurs in sub-Saharan Africa. According to estimate of WHO in 2016 pneumonia accounts for 16.4% of under-five mortality in Ethiopia.

Objective: To assess prevalence of community acquired pneumonia in children 2 to 59 months old and its associated factors in Munesa district, Arsi zone, Oromia Region, Ethiopia.

Methods: Community based cross sectional study was conducted in Munesa district from July 16 to October 30, 2018. A total of 344 households with under-five children were selected by multistage sampling technique. Data were collected and entered in to Epi data version 3.1, then exported to SPSS version 21 for analysis. Binary logistic regression analysis was used to test associations between the predictor factors and the dependent variable. Variables with p-value<0.25 during bivariate analysis were included to multivariate logistic regression model to control confounder. Finally, variables with p-value<0.05 were expressed as potential determinants of community acquired pneumonia.

Results: This study revealed that prevalence of community acquired pneumonia to be 17.7%. The potential factors identified in this study were being male AOR=2.777, 95%CI: (1.262, 6.109), caring of child on mothers back during food cooking AOR=11.758, 95% CI: (4.596, 30.081), history of acute respiratory tract infection AOR=4.256, 95% CI: (1.562, 11.593) and children who were living in the house that have three or more window AOR=0.044; 95% CI: (0.003, 0.625).

Conclusion: It is identified prevalence of community acquired pneumonia and the potential factors were being male, caring of child on mothers back during food cooking, history of acute respiratory tract infection and children who were living in the house that have three or more window.

Keywords: Community acquired pneumonia; Upper respiratory tract infection; Munesa

ABBREVIATIONS

AIDS: Acquired Immune Deficiency Syndrome; AOR: Adjusted Odds Ratio; AURTI: Acute Upper Respiratory Tract Infection; CAP: Community Acquired Pneumonia; CHERG: Child Health Epidemiology Reference Group; CI: Confidence Interval; COR: Crude Odds Ratio; CSA: Central Statistical Agency; DHB: District Health Bureau; EBF: Exclusive Breast Feeding; EDHS: Ethiopian Demographic and Health Survey; HC: Health Center; HH: House Hold; HIV: Human Immune deficiency Virus; IMNCI: Integrated Management of Neonatal and Childhood Illness.

INTRODUCTION

Pneumonia is an acute infection of lung [1]. Pneumonia is one of leading cause of death among under five children, which results in death of 2,500 children per day. Pneumonia accounts 16% of under-five mortality. Majority of victims were children less than two years [2].

Pneumonia occurs as result different infection causing microorganisms like viruses, bacteria and fungi. Commonest causative agents were Streptococcus and syncytial virus for bacterial and viral pneumonia respectively in children [1].

Factors identified to contribute for pneumonia includes malnutrition, low birth weight, nonexclusive breastfeeding, homes with parental smoking, vitamin A deficiency, zinc deficiency, mother's in experience as a caregiver, preexisting illnesses, such as symptomatic HIV infections and measles, rainfall, high altitude, indoor air pollution caused by cooking and heating with biomass fuels, living in crowded homes, keeping cattle inside the main house, and age of child and widely vary across the regions of the world [1,3-5].

The manifestation of both bacterial and viral pneumonia are almost similar. However, the symptoms are many in viral pneumonia. Wheezing is more common in viral infections. Very severely ill infants may be unable to feed or drink and may also experience unconsciousness, hypothermia and convulsions [1].

The presence of cough and/or difficult breathing and fast breathing and/or chest in drawing for specific age helps for classification of suspected pneumonia in Child age 2 to 59 month [6]. Any children between 2 to 59 months of age who presents with one or more of the following danger sign is classified as having suspected sever pneumonia: Not able to drink, persistent vomiting, convulsions, lethargic or unconscious, stridor in a calm child or severe malnutrition [6-8].

Statements of the problem

Pneumonia is commonest cause of morbidity in under five children, with the developing nations accounts for highest mortality from pneumonia [1]. According to the Bulletin of the WHO in 2008, every year about 156 million cases of under five pneumonia occurs worldwide from which about 95% of under five pneumonia occurs in developing nations [3].

Pneumonia is the leading infectious mortality among under five, kills nearly a million children in 2015 [9]. Out of those deaths about 99% occurs in developing countries [10]. In 2015 Sub Saharan Africa accounts for half (more than 490,000) of pneumonia deaths among children under five worldwide [11]. According to WHO report in 2016, pneumonia was responsible for 16.4% of all under five deaths in the Ethiopia [12].

The majority of studies on pneumonia take place in developed nation, with only negligible volume of surveys being conducted in developing countries, including Ethiopia. Some variables that are found to be predictor of pneumonia in one study may not necessarily be a risk factor of pneumonia in another study supporting the argument that possible determinants of under five pneumonia vary across the geographical location.

More importantly, there were no previous scientific studies to find out the prevalence and determinant of pneumonia among 2 to 59 months old children in study area even though the service report from the health center and hospital show under five pneumonia was one of the top ten diseases in children.

This study is intended to bridge this information gap by determining the prevalence of pneumonia among 2 to 59 months old children and its associated factors in this district, and to update the previous knowledge on the same problem.

OBJECTIVES OF STUDY

General objective

To assess prevalence of Community Acquired Pneumonia in children 2 to 59 months old and its associated factors in Munesa district, Arsi Zone, Oromia Region, Ethiopia 2018.

Specific objectives

To determine prevalence of community acquired pneumonia in Munesa.

To identify associated factors of community acquired pneumonia in Munesa.

MATERIALS AND METHODS

Study design and period

A community based cross sectional quantitative study design was used. The study was conducted from July 16 to October 30, 2018.

Study area

The study was conducted in Munesa district located 62 km to North West of Assela, the capital city of Arsi Zone and 237 km to South west of Addis Ababa, the capital of the Ethiopia. According to district Health Office report the population of the district in 2010 is about 215,684. There are 1 primary Hospital, 7 Health Centers, 32 Health Posts and 16 Private clinics in the district. Related to health professional the district has 13 Medical Doctors, 20 Health Officer, 102 clinical nurse, 20 Laboratory technicians and 25 Pharmacist.

SOURCE AND STUDY POPULATION

Source population

All 2 to 59 months old children in the Munesa districts.

Study population

The study population was children age group of 2 to 59 months in the selected kebeles.

Exclusion criteria

Children and mothers or caretakers who were severely ill, under five children who have cough because of recent history of

aspiration of a liquid or of a foreign body and confirmed diagnosis of tuberculosis were excluded from the study.

Sample size and sampling procedures

Sample size determination: Prevalence of pneumonia among under five children in Este town and the surrounding rural kebeles, Northwest Ethiopia was 16.1%(5), level of confidence 95%, and margin of error 5%, the sample size was calculated as follows:

$$n = \frac{Z^2_{\alpha/2} p * q}{d^2}$$

Where, n: is the minimum sample size required

P: is an estimate of the prevalence of pneumonia

Z: is the standard normal variable at (1: α)% confidence level and α is mostly 0.05 i.e. with 95% CI (z=1.96)

D: is the margin of error to be tolerated (%)

n=((1.96)2*0.161(0.84))/(0.05)2=208

Adding the potential none response rate of 10% and multiplying the result by a design factor of 1.5, the final sample size of 344 households having children 2 to 59 months of age was included.

Sampling procedure

Stratified, multistage sampling technique was employed to include study participants in to the research. The study area was first stratified in to urban and rural kebeles since residence is known to affect the prevalence of under five childhood pneumonia [13].

The total 37 kebeles of the study area was stratified in to two strata, urban and rural, each containing 5 and 32 kebeles, respectively. Then in the first stage, six rural kebeles and one urban kebeles were selected proportionally based on the number of kebeles in each stratum through lottery method.

In the second sampling stage, systematic sampling technique was used to take households from each of the selected seven kebeles, by taking into account the number of households in each of the sampled kebeles, until the calculated sample size in the respective kebeles was reached to achieve the sample size of 344 households in total.

The first household was selected randomly through lottery method and the direction to move to the subsequent household was guided by the direction of the tip of the pen.

Immediately the next household selected whenever children in the age group of 2 to 59 months was not found in the 34th household. Every time more than one child aged 2 to 59 months was found per household, the data collectors employed simple random sampling technique to take just a child for the study.

Variables of the study

Dependent variables: Community Acquired Pneumonia in under five children.

Independent variables

Socio demographic characteristics includes:

Age, Sex, Occupation of mother and father, Educational status of mother and father, family size, marital status of mother and residence

Environmental factors

Source of water for drinking

Presence of toilet

Fuel used for cooking

Place of food preparation

Place of the child during Cooking

Presence of separated kitchen or not

Ventilation status of the house and kitchen

Presence of cigarette smoker in the house

Nutritional factors and comorbidities

Breast feeding status of the child

Vaccination status of the child

History of diarrhea, measles, AURTI

Vitamin A supplementation

Data quality assurance

Both data collectors and a supervisor were trained for two days on the techniques of data collection and face to face interview skills. The training also covered the importance of disclosing the possible benefits and purpose of the study to the study participants before the start of data collection.

Mechanisms of maintaining the confidentiality of the participants throughout the whole process of data collection and the study were discussed and ascertained during the two days long training. A supervisor was trained on how to check the completeness and consistencies of questionnaires filled by the data collectors to ensure the quality of the data, and also, the researcher visited data collectors once a day to check whether they collect the data appropriately.

Both the data Collectors and a supervisor trained on the WHO's Integrated Management of Child hood and Neonatal Illness (IMNCI) classification of pneumonia [8,14] to enable them classify pneumonia cases appropriately.

Data processing and analysis

The data were coded and entered in to Epi data version 3.1 and then exported to SPSS version 21 for further clean the data and check for missing/ errors values and for analysis. All variables

were used in the bivariate logistic regression and a variable with p: value ≤ 0.25 was further considered for multivariate logistic regression to control confounding variables. Crude odds ratio and adjusted odds ratio (AOR) was analyzed with a 95% confidence interval (CI) and p: value<0.05 was considered to declare statistically significant association.

Dissemination of results

The study was presented at the end in the Arsi University, College of Health Science, and School of Public Health. The result of the study was disseminated to the relevant organization that can make use of findings, including the regional health bureaus, Districts of health offices, health institution, community leaders and relevant nongovernment organization. Also, manuscript(s) will get submitted for publication in peer reviewed scientific journal.

RESULTS

The study population consisted of children in the age group of 2 to 59 months from heterogeneous groups in terms of place of residence, education and occupation. Three hundred forty four (344) mothers /primary care takers and children's pair were included in the study with a response rate of 100%.

Majority of study participants were rural residents. The mean age of mothers was 29.1 ± 6.40 years and about 108 (31.6%) of mothers were between the age group of 25 to 29 years. Concerning educational status, more than one third of mothers 124(36%) and 59 (17.2%) of their husbands were illiterate. Almost all of mothers were married and house wife.

Of all the under five children included in the survey, 179(52%) were male and 165(48%) were females. The highest proportion of children in the survey 145(42.2%) were in the age group of 24 to 59 months and 25.6% children in the age group of 12 to 23 months and the mean age of the children 21 ± 14.63 months (Table 1).

Table 1: Socio: demographic characteristics of children aged 2 to 59 months old parents, Munesa district, Arsi Zone, Oromia Region, Ethiopia, 2018 (n=344 mothers and children's pair).

Variable	Frequency	%
Residence		
Urban	30	8.7
Rural	314	91.3
Educational status of mothers		
Cannot read and write	124	36
Read and write	37	10.8
Primary (1 to 8)	115	33.4
Secondary (9 to 12)	47	13.7
High level	21	6.1
Educational status of fathers		
Cannot read and write	59	17.2
Read and write	37	10.7
Primary (1 to 8)	126	36.6
Secondary (9 to 12)	80	23.3
High level	42	12.2
Mothers occupation		
House wife	271	78.8
Farmer	20	5.8
Daily laborer	8	2.3
Civil servant	19	5.5
Merchant	26	7.6
Fathers occupation		
Farmer	239	69.5
Daily laborer	42	12.2
Civil servant	41	11.9
Merchant	22	6.4
Age of the child		
2 to 11 months	111	32.2
12 to 23 months	88	25.6
24 to 59 months	145	42.2
Sex of the child		
Male	179	52
Female	165	48

Regarding place of food preparation of respondents 262(76.2%) was cooking their food in the kitchen and 247(94.2%) of kitchen were separate from main houses.

The largest percentages of living room 330(96.0%) had at least one window, and more than half 159(62.1%) of kitchens in the surveyed household had been observed to have no windows at all.

About 160(46.5%) children were carried on back or beside mother during cooking which exposes them to high indoor air pollution (Table 2).

Table 2: Environmental characteristic of the respondents, Munesa district, Arsi Zone, Oromia Region, Ethiopia, July 2018 (n=344 mothers and children's pair).

Variable	Frequency	%
Most of time Fuel used for cooking		
Charcoal	60	17.5
Wood	257	74.7
Animal dangling	27	7.8
Place of food preparation		
Main house	82	23.8
Kitchen	262	76.2
Separate kitchen from house (n=262)		
Yes	247	94.2
No	15	5.8
Number of windows in the Living room (Main house)		
One	118	34.3
Two	188	54.7
Three or above	24	7
None	14	4
Place of child stay during cooking		
On cooking mother back	74	21.5
Beside mother	86	25
Outside of cooking house	184	53.5
Kitchen has window(n=256)		
Yes	97	37.9
No	159	62.1

Among 344 children 270(78.4%) whose mothers were interviewed were breast fed exclusively during the first six month and 15 (4.4%) were not given breast milk during six months of life. The majority of children 212(64.4%) were breast feed more than one year. Regarding to history of illness in the past two weeks, the majority of children, 303(88.1%) and 304(88.4%)

respectively, had no any history of diarrhea and URTI during or two weeks before the survey (Table 3).

Table 3: Nutritional factors, past comorbidities and vaccination status of under five children, Munesa district, Arsi Zone, Oromia Region, Ethiopia, 2018(n=344 mothers and children's pair).

Variable	Frequency	%
Breast feeding status of the child during the first 6 months		
EBF	270	78.4
Partial breast feeding	59	17.2
Not breast feeding	15	4.4
Duration of breast feeding(n=329)		
less than 6 months	39	11.9
6 to 12 months	78	23.7
more than 1 years	212	64.4
Diarrhea		
Yes	41	11.9
No	303	88.1
AURTI		
Yes	40	11.6
No	304	88.4

Among 344 children 61(17.7%) of them had history of cough and/or difficult breathing plus Fast breathing and/or chest in drawing during or within the last two weeks of the time of survey. The prevalence of pneumonia was common (21.6%) in 2 to 11 month aged children. The prevalence of pneumonia among urban children was estimated to be 3(10.0%) where as its prevalence in rural children was 58(18.5%). The overall prevalence of 2 to 59 months children pneumonia during the time of two week survey was estimated to be 61(17.7%) of which 10(3%) was severe pneumonia.

Association of each independent variable on outcome variable was assessed by binary logistic regression. The finding revealed that male children were about 3 times (AOR=2.777; 95% CI: [1.262, 6.109]; p: value<0.011) more likely to develop pneumonia than female children. The survey showed that children were about 2.5 times (AOR=2.489; 95% CI: 1.200, 5.162); p: value<0.014) more likely to develop pneumonia, if they were not using latrine than using latrine. According to this study, caring child on mothers back during food cooking increase the risk of developing pneumonia by 12 times (AOR=11.758; 95% CI: [4.596,30.081]; p: value<0.000) compared to keeping the child outside of the food cooking house. Children who had past history of AURTI were 4 times (AOR=4.256; 95%CI [1.562, 11.593]; p: value=<0.005) more

likely to develop pneumonia. Children who were live in the house that have three or above windows were 23 times (AOR=0.044; 95% CI [0.003, 0.625]; p: value=0.021) less likely to develop pneumonia compared to those who were live in the house that has no window (Table 4).

Table 4: Variable associated with under five pneumonia in Munesa District, Arsi Zone, Oromia Region, Ethiopia, 2018.

Variable	Pneumonia		COR (95%CI)	AOR (95%CI)	P: value
	Yes	No			
Sex of child					
Male	39	140	1.811(1.022,3.209)	2.777(1.262,6.109)*	0.011*
Female	22	143	1	1	
Fuel used for cooking					
Charcoal	4	56	0.236(0.052,1.071)	0.412(0.074,2.297)	0.312
Wood	52	205	1.138(0.411,3.145)	2.007(0.583,6.907)	0.269
Animal dung	5	22	1	1	
Place of food cooking					
Main house	23	59	2.298(1.271,4.153)*	2.117(0.758,5.917)	0.153
Kitchen	38	224	1	1	
Number of windows in the main house					
one window	26	92	0.342(0.106,1.105)	0.225(0.041,1.238)	0.086
two window	26	162	0.187(0.058,0.601)	0.171(0.028,1.067)	0.059
three or > window	2	22	0.106(0.017,0.650)	0.044(0.003,0.625)*	0.021*
None	6	7	1	1	
On cooking mother back	30	44	7.159(3.585,14.296)*	11.758(4.596,30.081)*	0.000*
Beside mother	15	71	2.218(1.040,4.729)*	1.734(0.665,4.525)	0.111
Out: side of cooking house	16	168	1	1	
Types of breast feeding					
EBF	48	222	0.432(0.141,1.323)	0.416(0.047,3.696)	0.431
PBF	8	51	0.314(0.085,1.159)	0.513(0.045,5.850)	0.591
Not breast feeding	5	10	1	1	
Diarrhea in the last 2 wks					
Yes	12	29	2.145(1.024,4.491)	2.286(0.759,6.891)	0.142
No	49	254	1	1	

AURTI in the last 2 weeks					
Yes	14	26	2.944(1.433,6.051)	4.256(1.562,11.593)*	0.005*
No	47	257	1	1	

DISCUSSION

The finding of this study revealed that prevalence of pneumonia among under five years of children was 17.7%. Which is high when compared to national EDHS 2011 and EDHS 2016 [15,16] in which prevalence of pneumonia is stated to be (7%). This might be due to seasonal variation, the inclusion of single district and difference in provision health service between districts, zonal and regional.

In this study, the occurrence of pneumonia was not affected by the residence. This is comparable to the findings from the cross sectional survey in Este town, Northwest Ethiopia [17].

Among factors associated with under five pneumonia, male children were about 3 times more likely to develop pneumonia as compared to female children. The result is similar to studies conducted in Omdurman Pediatric Hospital; Khartoum, Sudan [13]. It also line with report from lancet 2013 which showed higher occurrence of pneumonia in boys than in girls (median OR=1.3) [18].

According to this study caring of the child on mothers back during cooking increase the risk of child to develop pneumonia by 12 times. It is consistent with community based cross sectional study conducted at Este town Northwest Ethiopia [17] and public hospitals cross sectional study in Jimma zone, Ethiopia [19].

This study finding also indicated that, children who had AURTI in last two weeks were 4 times more at risk to develop CAP. This was in line with institutional based Cross sectional study conducted in Jimma zone [19], unmatched case control study in Kersa District, Southwest Ethiopia [20] and case–control study in Netherlands [21].

This study revealed that Children who were live in the house that have three or above windows were 2.3 times less vulnerable to develop pneumonia compared to those who were live in the house that has no window. This is similar to studies conducted in Wondo Genet district, Sidama Zone, Ethiopia [4]. Improved household air quality and supplying a house or room continuously with fresh air can reduce cases of severe pneumonia [6].

LIMITATION

The cross-sectional could not help establish temporal relationship between the possible determinants 2 to 59 month's old children pneumonia.

CONCLUSION

The present study had identified a comparatively high prevalence of pneumonia in 2 to 59 months old children. The study also identified that, sex of child, caring of child on mothers back during food cooking; ventilation of house and history of upper respiratory tract infection in the last 2 weeks were independent variable potential predictors of under five pneumonia.

RECOMMENDATION

Woreda Health Office and Health Extension should educate mothers to discourage carrying of child on mothers back when food cooking. Woreda health office should work in collaboration with different stakeholders including creating community awareness on health benefits of ventilated and improved housing conditions.

ETHICAL CONSIDERATION

Arsi University College of Health science Ethical Committee granted clearance for this study. Permission from district health offices and Health facility was obtained before data collection. From all participant mothers and guardians verbal informed consent was obtained after explanation of the purpose of the study to participate in the study on behalf of their children. The participant consent was documented as yes/no question to participate or not on the first page of the questioner. The interviewer was not proceeding unless the respondent responds as yes to participate. Mothers of children were told that they had the right to withdraw from the study at any time during the interview.

AVAILABILITY OF DATA AND MATERIALS

The dataset analyzed during the current study available from the corresponding author on reasonable request.

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