Prevalence of pneumonia and factors associated among children 2-59 months old in Wondo Genet district, Sidama zone, SNNPR, Ethiopia.

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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 was to determine the prevalence and factors associated with pneumonia among children 2-59 months old in Wondo Genet district.

Methods: Institutional based cross sectional study was employed on 206 child- mothers/ caregivers pairs. Data were collected using structured and pre-tested questionnaire. Data analysis was conducted using statistical package for social sciences version 20 software. Odds Ratio along with 95% confidence interval was estimated to identify determinates of pneumonia.

Results: Prevalence of pneumonia among under-five children was 33.5%. Absence of separate kitchen, absence of window in the kitchen, breast feeding less than one year and children at age range of 2-12 months were identified determinates.

Conclusion: Prevalence of pneumonia in under-five children is high. Identified determinates can be prevented and controlled through community mobilization on health benefits of ventilated and improved housing conditions, importance of separate kitchen, importance of kitchen which has windows and/or chimneys or hoods and importance of breast feeding to prevent under five pneumonia.

Abbreviations: AIDS: Acquired Immune Deficiency Syndrome; ARI: Acute Respiratory tract Infection; CBE: Community based education; CHERG: Child Health Epidemiology Reference Group; CI: Confidence Interval; EBF: Exclusive Breast Feeding; EDHS: Ethiopian Demographic and Health Survey; HIV: Human Immunodeficiency Virus; PBF: Partial Breast Feeding; UC: Unit cost; UNICEF: United nations Children's Fund; WHO: World Health Organization; SNNPR: Southern Nation Nationalities and Peoples' Republic

Introduction

Pneumonia is the number one infectious killer of children under age 5 globally, killing an estimated 935,0002 children each year, that's more than 2500 per day [1]. Pneumonia causes 15% of all deaths in children under age 5 worldwide – 2% of which are newborns [2]. Ethiopia is among 15 top under five pneumonia high burden countries [3]. Pneumonia is the single leading cause of death among children younger than five years in Ethiopia. It was estimated that 3,370.000 children

encounter pneumonia annually which contributes to 20% of all causes of deaths killing over 40,000 under five children every year and leading cause of death during postnatal period [3,4].

Study conducted in New Delhi, India revealed that overall prevalence of Acute Respiratory Infection (ARI) among under five was 4.5% for one month period [5]. Other study conducted in Bangladesh reported that 21.3% under five children suffered from ARI two weeks preceding survey [6]. According to 2011 Ethiopian Demography and Health Survey (EDHS) prevalence of ARI in Ethiopia is 7% with the significant variation across regions [7]. Other local study conducted in Northwest, Ethiopia showed overall two weeks prevalence of pneumonia among under-five children was 16.1% [8].

Evidence showed that different factors were associated with occurrence of under-five pneumonia. Factors could be child, maternal, environmental, access to health care, overcrowding, indoor air pollution, Charcoal use for cooking, carrying the child on back during cooking,

cooking within the main house, Co morbid diseases such as HIV/AIDS, Malaria, Exclusive breast feeding, duration of breast feeding as well as nutritional status of the child [9-19].

Even though there are studies conducted in Ethiopia, little is known about the prevalence and associated factors of pneumonia in the study area. Therefore this study was aimed to assess the prevalence and factors associated with pneumonia among under-five children.

Methods and Materials

Study Area and Period

The study was conducted in Wondo Genet District located 24km to North East of Hawassa, the capital city of SNNPR and 265.km to South of Addis Ababa, the capital of the country, Ethiopia. According to1999 E.C census the population of the district is about 149,355. There are 5 Health Centers 16 Health Posts and 4 Private clinics in the district. The study was conducted from June 27–July 15, 2016 G.C

Study Design

Institutional based cross sectional study was employed in under five children which utilizes quantitative method.

Source and Study Population

All under five children living in Wondo Genet District were source population. Study population was children 2-59 months old and mother/care givers who visited Wosha Soyama and Kella Health Centers during data collection period.

Inclusion and Exclusion Criteria

Inclusion criteria:

- children 2-59 months old and their mothers/ primary caretakers visiting the selected Health Centers.

Exclusion criteria:

- Children and mothers or caretakers who are severely ill and /or have hearing impairments or talking problem.

Sampling

Sample size: The sample size was determined using single population formula. Prevalence of pneumonia among under five children in Este town and the surrounding rural kebeles, Northwest Ethiopia was 16% and tolerated margin of error was 5%

$$n = \frac{(Z\alpha/2)^2 \, p(1-p)}{d^2}$$

Where: **n**: is the minimum sample size required

$\quad$ **p**: is an estimate of the prevalence of pneumonia

$\quad$ **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)

$\quad$ **d**: is the margin of error to be tolerated (%)

$$n = \left[(1.96)^2 \times 0.16(1-0.16) \right] / (0.05)^2 \approx 206$$

Sampling Procedures

Out of the five health centers found in the district we picked 2 health centers, Wosha and Kella, by simple lottery method. Then we collected data from study subjects who were available at the time of the study who fulfilled the criteria until the calculated sample size was reached.

Variables of the Study

Dependent variables: Pneumonia in under five children (Yes/No)

Independent variables:

- Socio demographic characteristics includes
  - Age ,Sex, Occupation of mother and father, Educational status of mother and father, Size of family, marital status and location
- Environmental factors
  - Presence of separated kitchen or not
  - Ventilation status of the house
  - Presence of cigarette smoker in the house
- Nutritional factors and comorbidities
  - Breast feeding status of the child
  - Vaccination status of the child
  - HIV status of the child
  - History of diarrhea
  - History of measles

Data Collection

Interviewer administered structured questionnaire was used to collected data on the prevalence and risk factors of pneumonia among under five children visiting the health centers.

The questionnaire used in this study consists:

- Section I- Socio demographic information assessment question
- Section II- Sign and symptoms
- Section III- Environmental factors
- Section IV– Breast Feeding and Comorbidities related questions

Five students who were final year medical students of Hawassa University College of Medicine and Health Sciences participated in data collection.

Data Quality Assurance

Before conducted the research, two days training was given for data collectors on the questioners and then pre-test was done on 5 % of a sample to ensure the validity, reliability and internal consistency of the instrument.

After collecting the pretest data, each individual questionnaire response were checked for any potential problem related to the instrument, such as any difficult question which did not satisfy the respondent psychology, understandable or unclear question to reply, etc. and corrective measures were taken.

Data Analysis

Data coding, entry, cleaning and Analysis were done with the software SPSS version 20.0. Results are presented using tables and graphs. Bivariable and multivariable logistic regression analysis were performed to determine significant association and interpreted as significant at a p-value of <0.05 and 95% CI.

Operational Definitions

Respiratory rate=the number of respirations in one full minute (also called breathing rate)

Respiratory distress=respiratory difficulty manifested by flaring of alanasi, grunting, supraclavicular or intercostal retractions and lower chest in drawing.

Pneumonia=child having cough with fast breathing

Comorbidity=diseases associated with another disease, pneumonia in this case.

Ethical Considerations

Letter of Permission was obtained from Hawassa University, College of Medicine and Health Science,

Table 1. *Socio-demographic characteristics of the respondents Wondo Genet District, Sidama Zone, SNNPR, Ethiopia, 2016*

Variable	Frequency	Percent
Educational status of the mother		
Un educated	91	44.2%
Primary school	115	55.8%
Educational status of father		
Uneducated	20	9.7%
Primary	149	72.3%
Secondary and above	37	18%
Maternal occupation		
House wife	140	68%
Civil servant	16	7.8%
merchant	50	24.3%
Paternal occupation		
Farmer	82	39.8%
Civil servant	19	9.2%
Merchant	82	39.8%
Driver	18	8.7%
Others	5	2.4%
Age of the child		
2-11 month	75	36.4%
12-59 month	131	63.6%
Sex of the child		
Male	107	51.9%
Female	99	48.1%

before data collection and then it was given to the study health centers administrative bodies. Brief explanations were also given on the objectives as well as the benefit of the study to the concerned officials and their verbal consent was obtained. Each respondent who were interviewed were asked to give their consent after explaining the purpose, objective, and benefit of the study. Confidentiality and privacy of every respondent's information were ensured.

Results

Socio demographic characteristics of the respondents. Total of two hundred six (206) mothers/care givers and children pair were included in the study with a response rate of 100%. More than half of mothers 115 (55.5%) attended primary education. Husbands who attended secondary and above level were 18%. Regarding occupation status of mother more than half of mothers 140 (68.0%) was housewife. Regarding occupation status of husbands 82 (39.8%) were farmers. Children aged 12-59 months accounts largest proportion of surveyed children 131 (63.6%). Male accounts more than half (51.9%) of the participated children (Table 1).

Environmental and Housing Characteristics of the Respondents

Majority of mothers 171 (83.0%) used wood as source of cooking fuel whereas 35 (17%) of mothers used charcoal or electricity. The highest proportion of respondents, 168(81.6%) cook their food in the kitchen. One hundred twenty nine (76.2%) of kitchen were separated from the living room. More than half of the kitchens (58.3%) do not have windows at all. One hundred eighteen (57.3%) living

Table 2. *Environmental characteristic of the respondents, Wondo Genet District, Sidama Zone, SNNPR, Ethiopia, 2016*

Variables		Frequency	Percentage
Fuel used for cooking	Wood	171	83%
	Charcoal/ Electricity	35	17%
Place of cooking	Main house	38	18.4%
	Kitchen	168	81.6%
Separate kitchen (n=168)	Yes	129	76.2%
	No	39	23.2%
Number of windows in the main house	One	118	57.3%
	Two	78	37.9%
	three	10	4.9%
Kitchen has window (n=168)	Yes	70	41.7%
	No	98	58.3%
Place of the child during cooking	On the back of the mother or besides her	12	5.8%
	Outside the cooking room	194	94.2%
Any cigarette smoker	Yes	28	13.6%
	No	178	86.4%

rooms have only one window. Only 5.8% of children stay on their mothers' back or in the cooking room while she is cooking; the rest, 94.2% stay outside the cooking room/ kitchen or in respondents house .Twenty eight (13.6%) reported that there are smokers in the household while 178(86.4%%)reported that there is no cigarette smoker in the house (Table 2).

Nutritional, Past Co-morbidities and Vaccination Status of Children

The majority of children 190 (92.2%) were breast feed more than 1 year. Fifty two (25.2%) of the children have history diarrhea. Only 6 (2.9%) of children has history of measles. Among children/mother interviewed during the time of survey only 1 (5%) was not vaccinated at all and the rest were vaccinated. Among the vaccinated the majority of children 146 (71.2%) were completely vaccinated. The rest of children 59(28.6%) were vaccinated up to their age (Table 3).

Prevalence of Pneumonia

Among 206 children interviewed, 82 (39.8%) of them had history of cough during or within the last two weeks of the time of survey. Twenty three (11.2%) children had difficulty of breathing and 42 (20.4%) had fast breathing at the time of the survey. Of the total 206 children, 122 (59.2%) had fever; 46 (22.3%) had vomiting and 21 (10.2%) had chest in drawing. One hundred nine (52.9%) children were reported having loss of appetite during the survey. Only 2 (1%) children were observed while convulsing during the three week survey period. The overall prevalence under five children pneumonia during the time of three week survey was estimated to be 66(33.3%) (Table 4).

Factors Associated with Pneumonia

Association of each independent variable on outcome variable was assessed by bivariable logistic regression. Different parental, childhood, environmental and

Table 3. *Nutritional factors, past comorbidities and vaccination status of under five children, Wondo Genet District, Sidama Zone, SNNPR, Ethiopia, 2016*

Variables		Frequency	Percent
Duration of BF	6-12months	16	7.8
	>1 year	190	92.2
Nutritional Status	Normal (MUAC>13.5 cm)	199	96.6
	Mild (MUAC 12.5-13.5 cm)	7	3.4
History of diarrhea	Yes	52	25.2
	No	154	74.8
History of Measles	Yes	6	2.9
	No	200	97.1
Vaccinated	Yes	205	99.5
	No	1	0.5
Vaccination Status	Completed	146	71.2
	Up to date	59	28.8

household variables were tested for their association with the presence of pneumonia among under-five children.

Variables which have significant association with outcome variable at bivariable analysis are; age of the child, type of fuel used for cooking, kitchen separated from main home and kitchen without window and vaccination status. Children who are at age range of 2-12 month were 2.5times more likely to develop pneumonia as compared to children at age range of 12-59 months (OR=2.49 CI=(1.37, 4.54)). Children from households which use wood for cooking purpose were 2.3times more likely to develop pneumonia as compared to children from households where charcoal or electricity was used (OR=2.27 (95% CI) (1.23, 5.51)). Children from households where no separate kitchen were 3.68 times more likely to develop pneumonia as compared to children from households where kitchen is separated from main home (OR=3.68 (95% CI) (1.74, 7.79)). Children from households where their kitchen does not have window were 2.64 times more likely to develop pneumonia as compared to children from households where their kitchen has windows (OR=2.64 (95% CI)=(1.31, 5.3)). Children vaccinated up to date were 2.6time more likely to develop pneumonia as compared to children completed their vaccination (OR=2.6 (1.42, 4.97)) (Table 5).

Adjusted odds ratio was computed using multivariable logistic regression to identify determinates for under five pneumonia. Variables like age of child, households

Table 4. *Signs and symptoms of pneumonia in under five children, Wondo Genet District, Sidama Zone, SNNPR, Ethiopia, July, 2016 (n=206)*

Signs and symptoms	Frequency	Percentage
Cough		
Yes	82	39.8%
no	124	60.2%
Difficulty of breathing		
Yes	23	11.2
No	183	88.8
Fast breathing		
Yes	69	33.3%
No	137	66.7%
Vomiting		
Yes	46	22.3%
No	160	77.7%
Fever		
Yes	122	59.2%
No	84	40.8%
Chest in drawing		
Yes	21	10.2%
No	185	89.8%
Convulsion		
Yes	2	1%
No	204	99%
Loss of appetite		
Yes	109	52.9%
No	97	41.1%

Table 5. *Bivariable and multivariable logistic regression analysis to determine variable associated with under five pneumonia in Wondo Genet District, Sidama Zone, Ethiopia, 2016*

Variables	Pneumonia		COR (95%CI)	AOR (95%CI)
	Yes	No		
Mothers 'Educational Status				
Illiterate	30	61	0.958 (0.53, 1.71)	1.0 (0.44, 2.29)
Primary	39	76	1	1
Mothers' Occupation				
House wife	46	94	0.91 (0.494, 1.69)	0.69 (0.29, 1.68)
Trader	23	43	1	
Age of the child				
0-11 months	35	40	2.49 (1.37, 4.54)*	4.04 (1.85, 8.80)*
12-59 months	34	97	1	1
Sex				
Male	42	65	1.90 (0.86, 4.16)	1.85 (0.84, 4.12)
Female	27	72	1	1
Fuel type				
Wood	65	109	2.27 (1.23, 5.5)*	2.92 (0.78, 10.84)
Charcoal or Electricity	7	28	1	1
Separated kitchen				
No	21	18	3.68 (1.746, 7.79)*	6.83 (2.76, 16.86)*
Yes	31	98	1	1
Kitchen has window				
Yes	15	56	1	1
No	37	60	2.64 (1.31, 5.3)*	3.4 (1.52, 7.8)*
Child during cooking				
On mother's back	7	130	1.45 (0.44, 4.75)	1.37 (0.24, 7.83)
Outside the cooking room	5	64	1	1
BF Duration				
<one year	9	7	2.78 (0.99, 7.834)	4.2 (1.07, 16.6)*
>one year	60	130	1	1
Vaccination status				
Up-to-date	29	30	2.6 (1.42, 4.97)*	0.626 (0.16, 2.42)
Complete	39	107	1	1

without separate kitchen, kitchen without any ventilation and child feed breast for less than one year were identified determinates for under five pneumonia. Children at age range of 2-12 months were 4 times more likely to develop pneumonia as compared to children at age range of 12-59 months (AOR=4.04 (95%CI)=(1.85, 8.80)). Children from household without kitchen were 6.8times more likely of develop pneumonia as compared to children from household has kitchen. (AOR=6.8 (95% CI)=(2.76, 16.86). Children from households which have kitchen without ventilation were 3.4times more chance of developing pneumonia as compared to children from households which have kitchen with ventilation (AOR=3.4 (95% CI)=(1.52, 7.8)). Children who fed breast milk for less than one year were 4.2times more risk to develop pneumonia as compared to children who fed breast milk more than year (AOR=4.2(95% CI)=(1.07, 16.6)) (Table 5).

Discussion

The main aim of this study was determine prevalence and factors associated with under five children. In this study prevalence of under-five pneumonia was 33.5% which is higher than national prevalence (7%) of under-five pneumonia [7]. Also the prevalence is higher than study conducted in Este town, Ethiopia where prevalence of under-five pneumonia is (16.1%) [8]. This discrepancy could be due to seasonal variation. This study was conducted during rainy season where most of households use wood to make indoor environment warm which result in indoor air pollution. Other additional reason could be lack of confirmatory laboratories and imaging investigations so that none pneumonia cases might have similar signs and symptoms diagnosed as pneumonia. Institutional basis of the study could also affect the prevalence. The prevalence of pneumonia in children in this study setting is lower than findings from a cross sectional survey in Uganda [16], where pneumonia prevalence was found to be (53.7%) and cross sectional survey in Bangladesh showed the prevalence of under-five pneumonia was estimated to be 53% [17]. The difference could be due to difference in study setting in which study from Uganda was conducted in the National referral hospital of Uganda.

Among factors associated with under five pneumonia at multivariable logistics regression, children at age rang 2-12 months were 4 times more likely to develop pneumonia as compared to older age groups. The result

is similar to studies conducted in in Urban Areas of Oromia Zone, Amhara Region and Ethiopia [9]. Where children at age rang 2-11months were 85% higher chance to have pneumonia as compared to older age, 2013 lancet report, which revealed higher occurrence of pneumonia in children younger than 2 years of age and a case control study from Pakistan showed that pneumonia tend to occur more frequently in younger children [10,18]. Other studies conducted among the Suruí Indians in Rondônia and the Guarani from the South and Southeastern regions of Brazil, also revealed that children under the age of twelve months are more likely to be hospitalized for low respiratory tract diseases, especially pneumonia [19,20]. The immaturity of immunologically system of the children and limited access to vaccination put this group vulnerable to pneumonia and other infections.

In this study lack of separate kitchen and kitchen without ventilation were significantly associated with occurrence of pneumonia AOR=6.83 (95%CI) (2.76, 16.86) and AOR=3.4 (95%CI) (1.52, 7.8), respectively. Similar result is reported at study conducted in Este town Northwest Ethiopia where risk of acquiring pneumonia is higher among children from household in which cooking takes place at main house and study conducted in Nigeria where indoor cooking smoke associated with childhood pneumonia and bronchiolitis [8,21]. Furthermore, the finding agree with study conducted in Ndola, Zambia where significant association was observed between not having a separate room for cooking and occurrence of ARI in under-five children Ndola, Zambia and study in Kenya in which cooking near the bed was significantly associated with occurrence of ARI in under-five children [22,23]. In both cases risk of indoor air pollution is high which increase vulnerability of children to acquire ARI including pneumonia.

In this study duration of breast feeding showed significant association with occurrence of pneumonia. Children who fed breast milk less than one year were 4.2 times higher chance to acquire pneumonia as compared to child fed more than a year (AOR=4.2 (95%CI) (1.07, 16.6)). Evidences showed that breastfeeding protect infants against infection and has protective factor for reducing risk of respiratory illness among infants [24,25].

Conclusion

In this study prevalence of pneumonia at under-five children was high. The study also identified determinates for under-five pneumonia such as; young age (2-12 months), households which lack separate kitchen, kitchen without window and feeding breast milk for less than one year.

There should be organized effort to mobilize communities

- On health benefits of ventilated and improved housing conditions, to use separate kitchen, use kitchen which has windows and/or chimneys or hoods.

- Create awareness about breast feeding initiation, termination and their importance to decrease child hood illness like pneumonia

- Infant at age group 2-12 month to receive appropriate care and intervention (exclusive breast feed and vaccination)

Acknowledgement

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