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Prevalence and associated factors of pneumonia among children from 2-59 months at public health facilities in Hulet Ejju Enesie District, Northcentral Ethiopia: multi facility based study

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Abstract

Introduction: *pneumonia is an inflammation of the parenchymal structure of the lung which is the leading and substantial cause of mortality and morbidity in under-five children.* ***Methods:*** *institutional based cross-sectional study was conducted using a systematic random sampling technique. Collected data entered to Epidata version 3.1 and analysed with Statistical Package for the Social Sciences (SPSS) version 20. Bivariable and multivariable logistic regression at P<0.05 was used.* ***Results:*** *among a total of 343 study participants, 176 (50.3%) was males and the mean age of study participants was 22.78 months, median age 21 months with (SD)± 14.65. The overall prevalence of pneumonia was 99 (28.9%) at [95% CI; 24.2-33.5]. caring on mothers back or besides during cooking (AOR 15.64; 95% CI (3.10-49.23), P = 0.004), children sleep in the same cooking room (AOR 6.63, 95% CI (3.88-50.09), P = 0.007) and presence of smokers in family (AOR 13.72, CI (1.74-21.09), P = 0.022) P< 0.05 were factors associated with pneumonia.* ***Conclusion:*** *the current prevalence of pneumonia was relatively high. Holding children back or besides during cooking, children sleep in the same cooking room and the presence of smokers in the family were factors associated with pneumonia. There should be appropriate and adequate health education regarding pneumonia prevention, control strategies, and early interventions.*

Introduction

Pneumonia is an inflammatory condition involving the lungs, which includes the visceral pleura, connective tissue, airways, alveoli, and vascular structures [1]. In a person with pneumonia, the alveoli are filled with pus and fluid, which makes breathing painful and reduces the oxygen intake. There are various causative agents of Pneumonia such as viruses (rhinoviruses, coronaviruses, influenza virus, respiratory syncytial virus, adenovirus, and parainfluenza), and bacteria *(Streptococcus pneumonia, Haemophilus influenza, Chlamydophila pneumonia* and *Mycoplasma pneumonia)*, and fungi [1,2]. The clinical manifestation of pneumonia in children includes cough, the difficulty of breathing, fast breathing, fever, and chest in the drawing. However, children with cough and cold were not classified as "pneumonia" but with fast breathing were classified as "pneumonia" and were given an oral antibiotic to take at home for five days. Furthermore, children who had chest in drawing with or without fast breathing were classified as "severe pneumonia" and were subjected to injectable penicillin treatment. Children who had any general danger signs were classified as "severe pneumonia or very severe disease" [3]. Children can be protected from pneumonia by preventive interventions such as routine pneumococcal vaccination, exclusive breastfeeding, and complementary feeding; main treatment strategies that rely on community capacity development can reduce pneumonia mortality in developing countries [4].

Pneumonia is a leading cause of death among children worldwide but those at highest risk in developing countries have limited access to clinical services; effective and low-cost alternatives are a global public health priority [5]. Globally, 19% of all deaths by pneumonia in children aged less than 5 years. In the previous, between 2000 and 2015, global hospital admissions accounted for over 1,400 cases of pneumonia per 100,000 children in South-East Asia and the African Region [3,5] and about 490,000 children under-five died by pneumonia in 2016 in sub-Saharan Africa (SSA) [6]. In developing countries, pneumonia is the leading cause of death for children [3] which accounted for up to 21% of deaths in children under the age of five years [3,6]. The mortality rates of children under the age of five years in most developing countries range from 60 to 100 per 1000 live births, one-fifth of these deaths are due to pneumonia [7]. Ethiopia is one of the developing countries which are fifth (62 deaths in 1000) among 15 countries having the highest death rate of under five years of pneumonia. On the other

hand, it is estimated as 3,370,000 children with pneumonia annually, which contributes to 18% of all causes of deaths killing over 40,000 under-five children every year. Even if, these problems easily preventable and treatable, pneumonia continued to cause a high rate of death on under-five children in this country. However, there was a limited and inconsistent study on prevalence and associated factors of pneumonia among (2-59) month children in Northcentral part of Ethiopia in general and in Hulet Ejju Enseie District in particular. Hence, this study aimed to assess the prevalence of pneumonia and its associated factors among 2-59 month children at public health facilities of Hulet Ejju Enesie District, Northwest Ethiopia [7-9].

Methods

Study design, period, and area: institutional based cross-sectional study was carried out from 1-30, October 2020 on five selected public health facilities in Hulet Ejju Enesie District such as Shegaw Motta General Hospital (SMGH), Debre Gubaye Health Centre (DGHC), Konter Health Centre (KHC), Motta Health Centre (MHC) and Muger Health Centre (MHC).

Study population and participants: all 2-59 months age children who visited the outpatient departments (OPD) at public health facilities of Hulet Ejju Enesie District were the source population. Those randomly selected (2-59) months of children visited outpatient departments of selected public health facilities in Hulet Ejju Enesie District during the data collection period were our study population.

Inclusion and exclusion criteria: children of 2-59 months of age with mother/caregivers visiting OPD ofHulet Ejju Enesie District public health facilities were recruited in this study. Whereas, mothers or caregivers of children who were having hearing impairments or unable to talk, referred children with pneumonia from the data collection site to SMGH, and children with ageless than two months were excluded.

Sample size and technique: the sample size was determined using single population proportion formula by taking prevalence of pneumonia among under five children in Jimma, Southwest Ethiopia [11], based on the assumption; degree of freedom (d) =5%, 95% confidence level;

$$N = \frac{(Z\alpha/2)^2 p(1-p)}{d^2} = \frac{(1.96)^2 0.281(1-0.281)}{0.05^2} = 312$$

Where: N=total sample size, Zα/2=1.96 at 95% confidence interval, P=28% (prevalence of under five children pneumonia), d = degree of freedom (5%). Therefore, using 10% non-response rate, 343 Participants were selected using systemic random sampling technique.

Sampling procedure: first, public health facilities were selected by random lottery method. Five public health facilities were selected, then after study participants were proportionally allocated for each health facility (HFs) based on client flow rate. Accordingly, every other (K^{th}= 2) client presented with pneumonia in each selected health facility was enrolled in this study.

Data collection: the data were collected by trained nurses and the principal investigator. English version prepared questionnaire was translated into the Amharic version and finally, it was translated back to the English version to check its consistency. Thus, socio-demographic, environmental factors, health facility factors, child care factors, and pre-existing medical conditions of the child were collected by structured pre-tested Amharic version questionnaire using face-to-face interviews with parents/guardians. Clinical diagnosis, co-morbid disease, weight, and height of the child were undertaken soon after interview from hospital record.

Data quality control: the training was given for data collectors on the aim of the study, data collection tool, and procedures. The 5%

questionnaires were pretested at Ginde Woin Health Center and Chemo Health center in Goncha Siso Enesie district on 18 children to ensure consistency and completeness of the structured questioners. Data collectors were supervised throughout the data collection period and the overall process was coordinated and controlled by the principal investigator to ensure data completeness.

Data analysis: data were entered by EpiData version 3.1 and exported to SPSS version 20 for analysis. The prevalence of pneumonia, frequency tables, percentages, and figures were determined by descriptive statistics to describe the study population with other variables. Multivariable logistic regression was done by entering the variables with P< 0.2 in bivariable logistic regression to identify the associated factor and clinical predictors by considering P< 0.05 as statistically significant association with pneumonia (2-59) month children.

Ethical consideration: the ethical approval by Debre Tabor University, College of Health Science Institutional Review Board (IRB) (Reference number 061/10), and a permission letter were obtained from Hulet Ejju Enesie district health office. Written informed consent was obtained from the children´s parents/guardians after they were informed about the objectives and procedures of the study. Furthermore, their rights to refuse participation at any time were entirely volunteer-based and their confidentiality was kept by coding rather than a name for identification.

Operational definition: under-five children: children age less than 59 months, pneumonia: there are 8 symptoms to diagnose pneumonia in the questionnaire, diagnosed with cough and one of the other symptoms considered to have pneumonia.

Results

Socio-demographic characteristic of study participants: among a total of 343 study participants, 176 (50.3%) were males and 167 (48.7%) were female participants. The mean age of the study participant was 22.78, age of median 21 with standard deviation (SD) 14.65. However, the majority; 132 (38.5%) were 24-59 months age followed by 12-23 months who accounted for 109 (31.8%). The majority of children had both mother and father alive accounting for 258 (75.2%). The majority of participants were from rural which accounted for 182 (53.1%) (Table 1).

Prevalence: the prevalence of pneumonia was 99 (28.9%) at [95% CI; 24.2-33.5]. The majority of pneumonia were reported in males 58 (16.9%) and rural 54 (15.7%). On the other hand, the highest pneumonia was also recorded from married parents 70 (20.4%), mothers who was unable to read and write 34 (9.9%), and farmer mothers 51 (14.9%) (Table 1). Prevalence of pneumonia per selected health facilities were in Shegaw Motta General Hospital (SMGH) 134 (39.1%), Debre Gubaye Health Center (DGHC) 72 (21.0%), Konter Health Center (KHC) 96 (28.0%) and Muger Health Center (MHC) 41 (12.0%). The highest prevalence of pneumonia report was from Shegaw Motta General Hospital (SMGH) and the least was from Muger Health Center (MHC) which accounted for 40 (11.7%) and 16 (4.7%) respectively (Figure 1).

Factors associated with pneumonia: all independent variables showing P-value of < 0.2 in the bivariable analysis were entered into multivariable logistic regression analysis. Caring mothers back or besides during cooking (AOR 15.64; 95% CI, 3.10-49.23, P-value = 0.004), children sleep in the same cooking room (AOR 6.63, 95% CI, 3.88-50.09, P-value = 0.007) and presence of any smokers in family (AOR 13.72, CI, 1.74-21.09, P = 0.022)at P < 0.05 were significantly associated with pneumonia (Table 2). Thus, caring for a child on the mother's back or besides during cooking was 15.64 times more likely to develop pneumonia than those who were not. Children who slept in the same cooking room were 6.63 times more likely to develop pneumonia than those who were not. And, the presence of any smokers in the family was 13.72 times more likely

to develop pneumonia than those children living with no smoker (Table 2).

Discussion

The prevalence of pneumonia was 99 (28.9%) at [95% CI; 24.2-33.5]. Hence, this finding is comparable with the previous studies accounted for 27.68%, 27.2%, 33.5%, and 28% in Nigeria [8], Uganda [9], Sidama Zone Ethiopia [10] and Jimma Ethiopia [11] respectively. However, it was much higher than studies 16.4% in India [12], 22% in Tanzania [13], in 16.1% Ethiopia [14], 17.7% in Arsi, Ethiopia [15], 5.6% in Addis Ababa [16], 12% in Gondar [16], 17.1% in peri-urban areas of Northeastern Ethiopia [17]. The possible reason for the difference in the prevalence of pneumonia might include the time of data collection, assessment method used, and difference in the level of advancement as well as the aggregation of risk factors. Prevalence of pneumonia in this study was much lower than findings accounting for 43.7% in Ethiopia [17], 34% in East Africa [18], 56% in Uganda [19], 74.3% in Kenya [20] and 65% in Sudan [21]. Such variation could be attributed to different geographical regions, methodology, socio-economic conditions, sample size, climatic conditions. Holding children back or besides during cooking foods [AOR 15.64; 95% CI = 3.10-49.23, p-value = 0.004] was the factor found to be significantly associated with pneumonia. Similarly, children sleep in the same cooking room [AOR= 6.63, 95% CI = 3.88-50.09, p-value = 0.007] was another factor demonstrated as significant association with pneumonia among 2-59 months children. The consistent finding was report as carrying the child on the back during cooking food in Ethiopia [11], Jimma [14], Munesa District, Arsi Zone [15], Gumay district, South-west of Ethiopia [22], and place of the child during cooking in [23]; systematic review and meta-analysis in East Africa [24] including food cooking in the main house in Ethiopia [25].

This association might be due to the reason that cooking foods in living rooms may cause indoor air pollution and holding a child on the back while cooking foods can increase the probability of inhaling smokes and food vapours (steams) which in turn may increase the risk of acquiring pneumonia by altering the structure and function of the respiratory tract. The presence of any smokers in the family [AOR = 13.72, CI =1.74-21.09, P = 0.022] was also significantly associated with pneumonia among (2-59) months old children. A similar finding in the previous study was reported in Hiwot Fana Specialized University Hospital, Harar, Ethiopia [26]. This association might be due to the presence of any smoker in the home leads to children inhaled smoke. This cigarette smoke inhalation kills normal flora which able to compete for pathogen from adherence and altered bacterial acquisition and oral mucosal colonization in favour of periodontal pathogens. On the other hand, presence of cough [AOR =35.13; P=0.001], having difficulty of breathing [AOR = 19.39; P= 0.001], fast breathing [AOR =39.41; P = 0.001], fever [AOR=24.09;P = 0.001], and having chest in drawing [AOR= 34.53; P = 0.001] were the identified clinical predictor for pneumonia among 2-59 month children in the current study. This also in agreement with a chest in drawing in Addis Ababa, Ethiopia [16], and the result of systematic reviews and meta-analysis in developing countries showed that having fast breathing, chest in drawing, cough, and fever were clinical predictors of pneumonia in 2-59 month children [27].

Conclusion

The prevalence of pneumonia in Hulet Ejju Enesie district was relatively high. Holding children back or besides during cooking foods, children slept in the cooking room and the presence of a smoker in the family were factors associated with pneumonia.

Limitation of the study: the data was obtained by a face-to-face interview questionnaire which was subjected to recall bias.

What is known about this topic

- *Research findings in various countries about under five pneumonia were inconsistent and inconclusive;*
- *Under 5 pneumonia was the leading cause of morbidity and mortality in peri-urban and urban population.*

What this study adds

- *The leading causes of morbidity for children (2-29) months were secondary to pneumonia in the Hulet Ejju Enesie District;*
- *The prevalence of pneumonia in Hulet Ejju Enesie District was higher than the national average prevalence.*

Competing interests

The authors declare no competing interests.

Authors' contributions

NM: Participated in the conception, design, data collection, analysis, and interpretation of the study. SD: facilitated the data collection and management, drafted, analysis and critically reviewed the manuscript. All authors read and approved the final manuscript.

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Tables and figures

Table 1: sociodemographic characteristics of study participants among children 2-59 months in public health facilities in Hulet Ejju Enesie District, 1-30, October 2020

Table 2: factors associated with pneumonia among children 2-59 month at public health facilities in Hulet Ejju Enesie District, 1-30, October 2020

Figure 1: prevalence of pneumonia per health facilities among children (2-59) months in Hulet Ejju Enesie District, 1-30, October 2020

References

1. Bénet T, Sylla M, Messaoudi M, Picot VS, Telles JN, Diakite AA *et al*. Etiology and factors associated with pneumonia in children under 5 years of age in Mali: a prospective case-control study. PLoS One. 2015;10(12): e0145447. **PubMed**| **Google Scholar**
2. Barson WJ, Kaplan S, Torchia M. Pneumonia in children: epidemiology, pathogenesis, and etiology. UpToDate. Waltham, MA. 2014. **Google Scholar**
3. World Health Organization & United Nations Children's Fund (UNICEF). Global action plan for prevention and control of pneumonia (GAPP). World Health Organization. 2009. Accessed on January 28, 2018.
4. Qazi S, Aboubaker S, MacLean R, Fontaine O, Mantel C, Goodman T *et al*. Ending preventable child deaths from pneumonia and diarrhea by 2025, development of the integrated global action plan for the prevention and control of pneumonia and diarrhoea. Archives of disease in childhood. 2015 Feb 1;100(Suppl 1): S23-8. **PubMed**| **Google Scholar**
5. McAllister DA, Liu L, Shi T, Chu Y, Reed C, Burrows J *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): e47-e57. **PubMed**| **Google Scholar**

6. Yaya S, Bishwajit G, Okonofua F, Uthman OA. Under-five mortality patterns and associated maternal risk factors in sub-Saharan Africa: a multi-country analysis. PloS One. 2018 Oct 25;13(10): e0205977. **PubMed**| **Google Scholar**
7. Walker CLF, Rudan I, Liu L, Nair H, Theodoratou E, Bhutta ZA *et al*. Global burden of childhood pneumonia and diarrhea. The Lancet. 2013;381(9875): 1405-1416. **PubMed**| **Google Scholar**
8. Bashir AO, Ibrahim GH, Bashier IA, Adam I. Neonatal mortality in Sudan: analysis of the Sudan household survey. BMC Public Health. 2013;13: 287. **PubMed**| **Google Scholar**
9. Nanda R, Tumwine JK, Ndeezi G, Ostergaard MS. Asthma and pneumonia among children less than five years with acute respiratory symptoms in Mulago Hospital, Uganda: evidence of under-diagnosis of asthma. PLoS One. 2013 Nov 29;8(11): e81562. **PubMed**| **Google Scholar**
10. Abuka T. Prevalence of pneumonia and factors associated among children 2-59 months old in Wondo Genet district, Sidama zone, SNNPR, Ethiopia. International Journal of Pediatrics. 2016. **Google Scholar**
11. Lema K, Murugan R, Tachbele E. Prevalence and associated factors of pneumonia among under-five children at public hospitals in Jimma zone, South West of Ethiopia. J Pulmonol Clin Res. 2018. **Google Scholar**
12. Nirmala N, Mahanta TG, Boruah M, Rasaily R, Kotoky RP, Bora R. Prevalence and risk factors of pneumonia in under-five children living in slums of Dibrugarh town. Clinical Epidemiology and Global Health. 2018;6(1): 1-4. **Google Scholar**
13. Lugangira K, Kalokola F. Morbidity and mortality of children aged 2-59 months admitted in the Tanzania Lake Zone´s public hospitals: a cross-sectional study. BMC research notes. 2017;10(1): 502. **PubMed**| **Google Scholar**
14. Fekadu GA, Terefe MW, Alemie GA. 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): 150-155. **Google Scholar**
15. Lema B, Seyoum K, Atlaw D. Prevalence of community-acquired pneumonia among children 2 to 59 months old and its associated factors in Munesa District, Arsi Zone, Oromia Region, Ethiopia. Clinics Mother Child Health. 2019;16: 334. **Google Scholar**
16. Negash AA, Asrat D, Abebe W, Hailemariam T, Hailu T, Aseffa A *et al*. Bacteremic community-acquired pneumonia in Ethiopian children: etiology, antibiotic resistance, risk factors, and clinical outcome. In: open forum infectious diseases. 2019 Jan 23;6(3): ofz029. **PubMed**| **Google Scholar**
17. Beletew B, Bimerew M, Mengesha A, Wudu M, Azmeraw M. Prevalence of pneumonia and its associated factors among under-five children in East Africa: a systematic review and meta-analysis. BMC pediatrics. 2020 May 27;20(1): 254. **PubMed**| **Google Scholar**
18. Adhanom G, Gebreegziabiher D, Weldu Y, Gebreyesus Wasihun A, Araya T, Legese H *et al*. Species, risk factors, and antimicrobial susceptibility profiles of bacterialIsolates from HIV-infected patients suspected to have pneumonia in Mekelle Zone, Tigray, Northern Ethiopia. BioMed Research International. 2019 May 5;2019: 8768439. **PubMed**| **Google Scholar**

19. Anteneh Tesfaye, Desta Hiko, Teshome Kabeta. Prevalence and associated factors of Pneumonia among children 2-59 months of age in Gumay district, South-west of Ethiopia. 2017 (Doctoral dissertation). Research Square. 2019. **Google Scholar**
20. Alamneh YM, Adane F. Magnitude and predictors of pneumonia among under-five children in Ethiopia: a systematic review and meta-analysis. Journal of Environmental and Public Health. 2020 May 30;2020: 1606783. **PubMed**| **Google Scholar**
21. Bayu D, Mekonnen A, Mohammed J, Bodena D. Magnitude of Streptococcus pneumonia among under-five children with symptom of acute respiratory infection at Hiwot Fana Specialized University Hospital, Harar, Ethiopia: associated risk factors and antibacterial susceptibility patterns. Risk Management and Healthcare Policy. 2020 Dec 8;13: 2919-2925. **PubMed**| **Google Scholar**
22. Beletew B, Bimerew M, Mengesha A, Wudu M, Azmeraw M. Prevalence of pneumonia and its associated factors among under-five children in East Africa: a systematic review and meta-analysis. BMC pediatrics. 2020 Dec;20(1): 1-3. **PubMed**| **Google Scholar**
23. Lindstrand A, Kalyango J, Alfvén T, Darenberg J, Kadobera D, Bwanga F *et al*. Pneumococcal carriage in children under five years in Uganda-will presentpneumococcal conjugate vaccines be appropriate. PloS One. 2016 Nov 9;11(11): e0166018. **PubMed**| **Google Scholar**
24. Ndungu EW, Okwara FN, Oyore JP. Cross-sectional survey of care seeking for acute respiratory illness in children under 5 years in rural Kenya. American Journal of Pediatric. 2018;4(3): 69-79. **Google Scholar**
25. Gritty SM, Elamin MO, Rahimtullah H, Ali AYH, Dhiblaw A, Mohamed EA *et al*. Risk factors of pneumonia among children under 5 years at a pediatric hospital in Sudan. International Journal of Medical Research & Health Sciences. 2018;17(4): 60-68. **Google Scholar**
26. Gizachew N. Magnitude of pneumonia and associated factors among under-five children in Debre Berhan Referral Hospital, North Shoa, Ethiopia (Doctoral dissertation). 2019.
27. Rambaud-Althaus C, Althaus F, Genton B, D'Acremont V. Clinical features for diagnosis of pneumonia in children younger than 5 years: a systematic review and meta-analysis. The Lancet Infectious Diseases. 2015 Apr 1;15(4): 439-50. **PubMed**| **Google Scholar**

Table 1: sociodemographic characteristics of study participants among children 2-59 months in public health facilities in Hulet Ejju Enesie District, 1-30, October 2020				
Variables	**Categories**	**Pneumonia**		
		Yes, N (%)	**No**, N (%)	Total, N (%)
Sex	Male	58(16.9)	118(34.4)	176 (50.3)
	Female	41(12.0)	126(36.7)	167 (48.7)
Age (in month)	2-11	21(6.1)	81(23.6)	102 (29.3)
	12-23	43(12.5)	66(19.2)	109 (31.8)
	24-59	35(10.2)	97(28.3)	132(38.5)
Family status	Orphan	10(2.9)	18(5.2)	28 (8.2)
	Only mother alive	9(2.6)	26 (7.6)	35(10.2)
	Only father alive	10(2.9)	12(3.5)	22 (6.4)
	Both mother and father alive	70 (0.4)	188 (54.8)	258 (75.2)
Residence	Urban	45(13.1)	116(33.80	161 (46.9)
	Rural	54 (15.7)	128(37.3)	182(53.1)
Family size	<5	52(15.2)	143(41.7)	185 (56.9)
	>5	47(13.7)	101 (29.4)	148(43.1)
Marital status of parent	Marred	70(20.4)	200(58.3)	270 (78.7)
	Single	9 (2.6)	8(2.3)	17 (5.0)
	Divorced	12 (3.5)	27(7.9)	39 (11.4)
	Windowed	8 (2.3)	9 (2.6)	17 (5.0)
Educational status of a mother	Unable to read and write	34 (9.9)	84(24.5)	118 (34.4)
	Able to read and write	16(4.7)	35(10.2)	51 (14.9)
	Primary	17(5.0)	66(19.2)	83 (24.2)
	Secondary	16(4.7)	33(9.6)	49 (14.3)
	Above secondary	18(4.7)	26 (7.6)	42 (12.2)
Educational status of the father	Unable to read and write	8 (2.3)	28 (8.2)	36 (10.5)
	Able to read and write	34 (9.9)	93 (27.1)	127 (37.0)
	Primary	21 (6.1)	40 (11.7)	61 (17.8)
	Secondary	14(4.1)	40 (11.7)	54 (15.7)
	Above secondary	22(6.4)	43 (12.5)	65 (19.0)
Maternal occupation	Farmer	51(14.9)	131(38.2)	182 (53.1)
	Housewife	24(7.0)	46(13.4)	70(20.4)
	Civil servant	14(4.1)	41(12.0)	55(16.0)
	Merchant	5(1.5)	11(3.2)	16 (4.7)
	Daily labor	5(1.5)	15(4.4)	20 (5.8)
Paternal occupation	Farmer	52(15.2)	131(38.2)	183(53.4)
	Civil servant	25(7.3)	49 (14.3)	74 (21.6)
	Merchant	14(4.1)	45(13.1)	59 (17.2)
	Daily labor	3 (0.9)	6 (1.7)	9(2.6)
	Other	5(1.5)	13(3.8)	18 (5.2)
N - frequency, % - percent				

Table 2: factors associated with pneumonia among children 2-59 month at public health facilities in Hulet Ejju Enesie District, 1-30, October 2020

Variables	Category	Pneumonia		COR (95%CI) p value	AOR (95% CI) p value
		Yes N (%)	No N (%)		
Sex	Male	58(16.9)	118(34.4)	1	1
	Female	41(12.0)	126(36.7)	1.5(1.9-2.4)0.087*	2.32(0.67-7.91)0.355
Usually cooking your food	Living room	15 (4.4)	19 (5.5)	1.8(0.9-3.8)0.099*	1.95(0.99-4.87)0.128
	Kitchen	81(23.6)	189 (55.1)	9.4(2.4-6.8)0.001*	10.42(0.58-17.65)0.09
	Outdoors	3(0.9)	36 (10.5)	1	1
Location of a child during cooking	Caring mothers back or besides	82 (26.9)	65 (21.3)	12.9(6.9-24.5)0.001*	15.6(3.10-49)0.004**
	Outside of the cooking house	14 (4.6)	144 (47.2)	1	1
Children sleep in the same room	Yes	83 (27.5)	66 (21.9)	14.8(7.6-28.9)0.001*	6.6(3.8-50)0.007**
	No	12 (4.0)	141 (46.7)	1	1
Window in the kitchen	Yes	54 (19.7)	152(55.5)	1	1
	No	29 (10.6)	39 (14.2)	2.09(1.18-3.71)0.011*	2.57(0.79-10.21)0.112
Smoking exposure	Yes	7 (2.0)	3 (0.9)	6.1(1.5-24.1)0.010*	13.7(1.74-21)0.022**
	No	92 (26.8)	241 (70.3)	1	1
Complementary feeding	Yes	92 (27.1)	202 (59.9)	1	1
	No	6 (1.7)	42 (12.2)	3.2(1.3-7.8)0.010*	8(0.9-11.1)0.061
Measles	Yes	13 (3.8)	15 (4.4)	2.3(1.0-5.0)0.036*	1.3(0.2-5.8)0.098
	No	86 (25.1)	229 (66.8)	1	1
Nutritional status	Not malnourished	83(24.2)	193(56.3)	1	1
	MAM	9(2.6)	46(13.4)	2.2(1.0-4.6)0.042*	4.2(0.45-8.11)0.102
	SAM	7(2.0)	5(1.5)	0.3(0.1-0.9)0.049*.	1.7(0.9- 6.1)0.095
The child with ARTI the last two Weeks	Yes	18 (5.2)	5 (1.5)	10.6(3.8-29.5)0.000*	13.5(0.8- 19.2)0.105
	No	81 (23.6)	239 (69.7)	1	1
History of chronic diseases	Yes	12 (3.5)	10 (2.9)	3.2(1.4-7.7)0.009*	4.2(0.9- 8.9)0.094
	No	87 (25.4)	234 (68.2)	1	
household ARTI the last two Weeks	Yes	7 (2.0)	3 (0.9)	6.1(1.5-24.1)0.010*	7.1(0.8- 12.9)0.073
	No	92 (26.8)	241 (70.3)	1	1

AOR- Adjusted Odd ratio, COR - Crude Odd Ratio, N - Frequency, %- Percent, CI - Confidence interval, * Variables entered multivariable logistic regression, **statistical significance

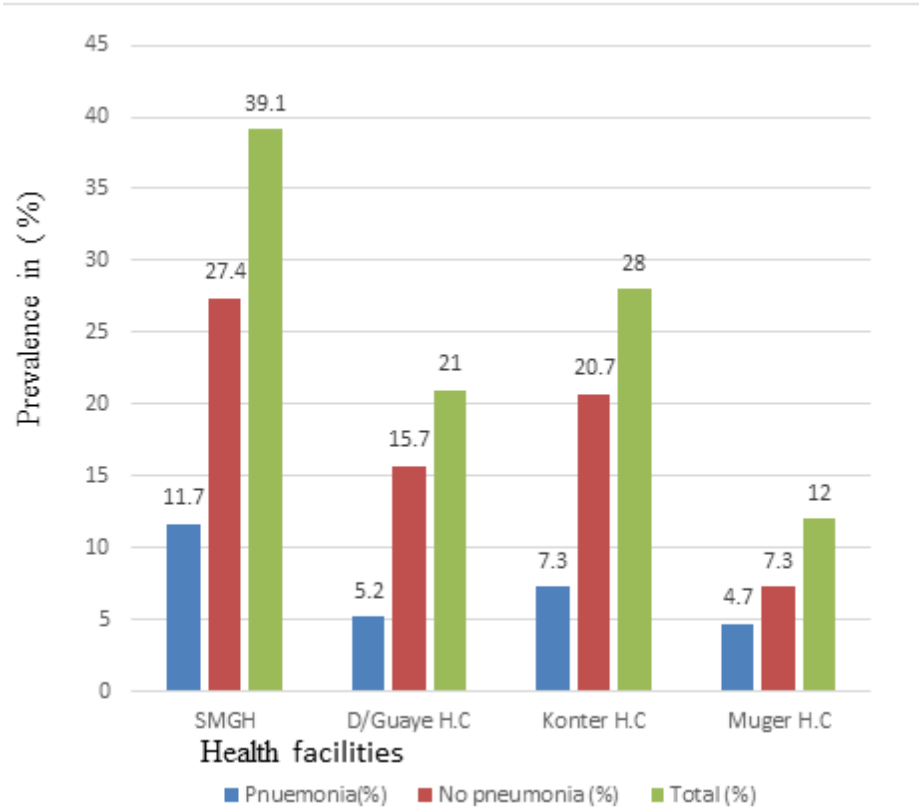

Figure 1: prevalence of pneumonia per health facilities among children (2-59) months in Hulet Ejju Enesie District, 1-30, October 2020