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Determinants of pneumonia among under two children in southern Ethiopia: A case control study 2016.

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Abstract

Introduction: Pneumonia is world's leading killer of children in developing countries particularly in sub Saharan Africa and Asia. It accounts for the death of one out of five children despite presence of tremendous prevention mechanisms. Despite the sever effects of pneumonia, there were no studies done on determinants of pneumonia so far in Gamo Gofa Zone. Therefore the aim of this study was to assess determinants of pneumonia among under two children.

Methods: Facility based unmatched case control study was used on randomly selected 558 mothers with under two children from 30thJanuary to 20th March 2016. Cases were children with pneumonia, while controls were non-pneumonic children of the same age. A pretested &structured questionnaire was used. Multivariable logistic regression was employed to determine predictors of the outcome variable using SPSS version 20.0 statistical software. P-value<0.05 at 95% confidence interval was considered as significant.

Results: A total of 558 mothers with under two children were participated. Ninety seven (17.4%), 245 (43.9%) and 119 (21.3%) of children were underweight, wasted and stunted respectively. Being married, completing secondary school and above, children without young siblings breastfeeding within an hour of delivery, being vaccinated, and exclusive breastfeeding were protective against pneumonia as statistically evidenced by (AOR: 0.053, 95% CI: [0.005, 0.559], (AOR: 0.253, 95% CI: [0.093, 0.688]), (AOR: 0.225, 95%CI: [0.067, 0.760]), (AOR: 0. 311, 95% CI: [0.135, 0.718]), (AOR: 0.317, 95% CI: [0.185, 0.542) and (AOR: 0.635, 95% CI: (0.356, 0.934]) respectively.

Conclusion: Being married, completing secondary school and above, children with young siblings, breastfeeding within one hour of delivery, children with history of vaccination and exclusive breastfeeding were protective of pneumonia. Hence, study concludes that many factors were interwoven to affect the occurrence of pneumonia. Therefore, information communication education has to be disseminated to alleviate modifiable factors of pneumonia.

Keywords: Pneumonia, Under two children, Determinants, Case control.

Abbreviations: OPD: Out-Patient Department, IMNCI: Integrated Management of Newborn and Child illness, IgG: Immuno-globulin G, IgM: Immuno globulin M, EPI: Expanded Program of Immunization, AOR: Adjust Odd Ratio, SD: Standard Deviation, CI: Confidence Interval

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Introduction

Pneumonia is treatable and preventable disease. However delays in recognizing pneumonia contribute to the death of 1.1 million children under the age of five every year. Pneumonia contributed to18% of all deaths of under five children worldwide [1]. Pneumonia is a major cause of global morbidity with an estimated 156 million episodes and 14.9 million hospitalizations per year [1,2].

World Health Organization and United Nation Child Fund jointly implemented Global Action Plan for Prevention.

Even these strategies were initiated, there is unfairly large disparities between countries in exclusive breastfeeding, zinc supplementation, indoor air pollution, vaccination against Hemophilus influenza b, pneumococcus, measles and pertussis, preventing mother-to-child transmission of Human Immune Virus, and promoting regular hand washing [3,4].

The child mortality due to pneumonia in least developing, developing and industrialized countries is 545,000(39%), 1,390,000 (>99%) and 2,000 (<1%), respectively [5]. Its prevalence in sub-Saharan Africa countries alone is 46 % [5]. In Ethiopia, one of Sub-Saharan African countries, the infant and under five mortalities are 59/1000 and 88/1000 live births, respectively [6]. Of these deaths, 21% of the deaths are caused by pneumonia even if The Global Alliance for Vaccines and Immunization has raised funding to purchase the children immunization program [5,7]. It´s impact may be increased in the case of early onset, prematurity or an underlying pulmonary condition like Respiratory Distress Syndrome, meconium aspiration or broncho-pulmonary dysplasia, when the pulmonary capacity is already limited [8,9].

Poverty (low socio-economic status), poor immunization status, indoor air pollution, overcrowding, malnutrition/ poor nutritional practices, low birth weight, non-exclusive breastfeeding, parental smoking, zinc deficiency, lack of education in the mother, vitamin A deficiency, birth order and outdoor air pollution are the major risk factors for child pneumonia in developing countries [10-16]. Predisposing factors for the above problems in least developing countries are presence of war, conflict, population displacement, natural disasters or economic crisis [17].

Furthermore, lack of rapid diagnostic testing and limited data on antibiotic use for suspected childhood pneumonia plays a major role in the continual presence of pneumococcal pneumonia disease in developing countries. In this regard less than a third of children with suspected pneumonia received antibiotics in sub-Saharan Africa and South Asia [18]. World Health Organization designed the fourth Millennium Development Goal to reduce child mortality by two-thirds between 1990 and 2016, but pneumonia is still world's leading killer of children under the age of five. Of these, nearly three fourth of deaths occur in sub-Saharan Africa and South Asia [18,19]. Even if pneumonia took life of one child every 23 seconds, until recently, pneumonia has received little attention [19].

Ethiopian government introduced Pneumococcal conjugate vaccine in 2011 and rotavirus in 2013 to prevent pneumonia [7]. In addition to these the government create strong political will, organized capacity building efforts and prioritized funding for immunization programs to reduce infant mortality and morbidity in each corner of the countries, but as a result of large populations, health disparities in vulnerable subgroups, including girls, rural dwelling children, and poor communities there were discrepancies across the region within Ethiopia [17]. Despite the above burden of pneumonia, there was no study done before on determinants of pneumonia among under two children in Southern Ethiopia in general in Gamo Gofa Zone in particular. This study is, therefore, aimed at assessing the determinants of pneumonia in under two years' old children in Gamo Gofa Zone, Southern Ethiopia.

Methods

Study Setting, Design and Period

This facility based case control study was conducted in Gamo Gofa Zone from January 30 to 20 March, 2016. The name for Gamo Gofa is given for the Gamo and Gofa peoples whose homelands lie in this area and the administrative center of Gamo Gofa is Arba Minch. According to the 2007 census, it has a population of 1,595,570. Of the total population, 801,085 were females. There are a total of three hospitals and 68 health centers. Cases were under two years' old children who have pneumonia as confirmed by Integrated Management of Newborn and Child illness diagnosis guideline, and controls were non-pneumonic under two years old children. Children with any co-morbidity were excluded from the study

Sample Size Determination and Sampling Technique

The sample size was calculated using Epi-Info version 3.5.1 statistical software package by considering major-determinants' of pneumonia from previous research, 95% confident interval (CI), 80% power of the study and case to control ratio of 1:2 [20]. Considering non-response rate of 10% the maximum sample size was 186 pneumonic case and 372 control with total of 558 participants.

In Gamo Gofa zone, there are 68 health centres and 12 of them were selected by using simple random sampling techniques. Based on the number of clients/patients who visited each health centre during the previous one year, the total sample size was proportionally allocated to each selected health centres. Screening for pneumonia in pediatrics outpatient department (OPD) and emergency department was performed based on the Integrated Management of Newborn and Child Illness (IMNCI) guideline. Controls were selected from Growth monitoring and expanded program of immunization (EPI) units. Finally, interviewing of the mothers was carried out in each selected department/ units as case or control using systematic sampling methods by considering the 1st comers as starting point, and then every other at exit time.

Data Collection Techniques

After reviewing of the relevant literature, the questionnaire was developed as appropriate to address the study objectives. Primarily the questionnaires were prepared in English and translated to local language (Amharic) and the Amharic version was used for interview. Data

collectors categorized in to examiners and data collectors. Measuring of height and weight of children as well as diagnosis of cases were carried out by assigned 12 health professionals in under five OPD and emergency ward. Height and weight of children for controls were measured by health professionals in EPI and Growth monitoring units. Finally, twenty four data collectors, who were diploma holders, know the local language, and resident of the study were selected to interview the mothers at the exit time from 30thJanuary to 20th March 2016.

Data Quality Assurance

Questionnaire was prepared in English and translated to Amharic, and re translated back to English to make sure the consistency of the questionnaire. Pre-test of the tool was performed outside the study area to readjust the questionnaire. Intensive training for data collectors was given for two days. Continues supervision of data collection process was carried out to assure the quality of data. Finally, the collected data was carefully checked on daily basis for completeness, outlier and missing value as well as consistencies.

Data Analysis

The collected data were cleaned, coded and entered into Epi-info version 3.5.1 statistical software package. The statistical analysis was done using SPSS version 20. Frequency distribution for selected variables was performed. The statistical significance and strength of the association between independent variables and an outcome variable was measured by bivariate logistic regression model. A variable P value less than 0.25 was transferred to multivariable logistic regression model to adjust confounders' effects and a p value less than 0.05 was considered as significantly associated in this model. Finally, the results of the study were presented using tables, figures and texts based on the data obtained.

Ethical Clearance

The study was approved by the Scientific Ethical Review Committee of Arbaminch University, and Gamo Gofa zone health office. Informed assent was obtained from mothers after detailed explanation of the purpose of the study. Any involvement of the mothers was after their complete consent. Mothers were told as they would have the right to withdraw from the study at any time during the interview.

Results

Socio-Demographic Characteristics

A total of 558 women with 186 under two year's pneumonic children and 372 non-pneumonic children were interviewed in this study. From these, 33 (5.9%) of the respondents were in the age range of 15-19 years. Regarding their educational status, 158 (28.3%) of the participants were non-educated. Three hundred fifty four (63.4%) participants were house wives. In relation to the wealth index of the respondents, 118 (21.14%) were in the lowest wealth quintiles, and only 100 (17.9%) of the respondents were the higher quintiles (Table 1).

Anthropometry Measurement of Children

In relation to children's socio-demographic profile, 253 (45.4%) were less than 6 months of age with the mean age and weight of 8.29 month (SD 5.94) and 7.32 kg (SD 2.00) respectively, and 306 (54.8%) were male. Regarding to the nutritional indicators 97 (17.4%), 245 (43.9%) and 119(21.3%) of children were underweight, wasted and stunted as measured by weight for age, height for age and weight for height respectively (Table 2).

Table 1. *Socio-demographic profile of the respondents in Gamo Gofa zone, 2016 (n=558)*

Variables		Frequency	Percent
Maternal age	15-19 years	33	5.9
	20-24 years	113	20.3
	25-29 years	198	35.5
	30-34 years	139	24.9
	Above 35 years	75	13.4
Maternal religion	Protestant	304	54.5
	Orthodox	218	39.1
	Muslim	27	4.8
	Catholic	9	1.6
Marital status	Married	532	95.3
	Not married	26	4.7
Maternal educational status	Non Educated	158	28.3
	Read and write	54	9.7
	Grade 1-6	111	19.9
	Grade 7-8	82	14.7
	Grade9-12	79	14.2
	above 12	74	13.3
Maternal occupational status	Housewife	354	63.4
	Farmer	53	9.5
	Government employee's	59	10.6
	Merchants	68	12.2
	Private gainful work	24	4.3
Family size	Below three	160	28.7
	3-5	335	60.0
	Above 5	63	11.3
Residence	Urban	271	48.6
	Rural	287	51.4
Wealth index	Lowest	118	21.14
	Second	125	22.40
	Middle	99	17.74
	Fourth	116	20.78
	Highest	100	17.92

Table 2. *Anthropometry measurement and obstetric history of the respondents, 2016 (n=558)*

Variables		Frequency	Percent
Age of child	Below six month	253	45.4
	6-12 month	205	36.7
	12-24 month	100	17.9
Weight of the child	Below 8 kg	403	72.2
	8 and above 8 kg	155	27.8
Sex of child	Male	306	54.8
	Female	252	45.2
Weight for age	Normal	461	82.6
	Underweight	97	17.4
Height for age	Wasted	245	43.9
	Normal	313	56.1
Weight for height	Stunted	119	21.3
	Normal	439	78.7
Number pregnancy	Below three	430	77.1
	3-5	100	17.9
	Above 5	28	5.0
Number of Abortion	No	553	99.1
	One and above	5	0.9
Number of still birth	No	550	98.6
	One and above	8	1.4
Number of live birth	One	333	59.7
	Two and above	225	40.3
Birth status of the child	Preterm	13	2.4
	Term	532	95.3
	Post term	13	2.3
Birth order of the child	1st	180	32.3
	2nd	157	28.1
	3rd	110	19.7
	4th and above	111	19.9
Children with young siblings	Yes	22	3.9
	No	536	96.1

Obstetric History

Regarding their obstetric history, only 28 (5%) of the respondents got pregnant for five times. Five hundred fifty three (99.1%) and 550 (98.6%) respondents had no history of abortion and stillbirth respectively. Most of the respondents (95.3%) reported their child birth status was term. 176 (31.5%) children were 12-24 month less than their elder sibling. From total involved children, 22 (3.9%) of them had younger siblings (Table 2).

Health Services Utilization

All but sixty women said that they had visited antenatal clinics in hospital, health center, health post and private clinic during the last pregnancy. From these, 375 (67.2%) visited antenatal clinic more than four times. 89 (15.9%) of them delivered at home. Tetanus toxoid (TT) vaccination was given for 428 (76.7%) participants. In related to children health services utilization, 324 (58.1%) children utilized postnatal care. 496 (88.9%) children were vaccinated. However, 304 (54.5%) were partially vaccinated (Table 3).

Children Feeding Practice

Almost all children 534 (95.7%) had history of breastfeeding and 442 (79.2%) of them initiated breastfeeding within one hour of delivery. The level of exclusive breastfeeding (EBF) was 67.2%, but the duration is varied from below six month (62.4%) to above 12 months (1.3%). The level of partial breast feeding was 90 (16.1%). 38 (6.8%), 27 (4.8%) and 254 (45.5%) children were introduced to other foods before initiation of breast milk, within three days of delivery and within six months of age respectively. The level of complementary feeding introduction like cow milk, soup and adult food before six month and at 6 month and above was 45.5%) and 2%, respectively. 53 (9.5%) of children had history of formula feeding (Table 3).

Factors Associated with Child Pneumonia

In multivariable logistic regression analysis, marital status of the mother, educational status of the mother, children without young siblings, child vaccination, timing of breastfeeding initiation and types of breast feeding were significantly associated with risk of pneumonia among under two years old children.

Marital status of the mother was significantly associated with pneumonia in which being married is protective and decrease the development of pneumonia (AOR: 0.053, 95%CI: [0.005, 0.559]) than non-married women. Level of education also showed strong statistical association with pneumonia. Completing secondary school and above was protective for pneumonia (AOR: 0.253, 95%CI: [0.093, 0.688]) than non-educated women.

The odds of not delivering a baby after the surveyed children had less chance to develop pneumonia (AOR: 0.225, 95%CI: [0.067, 0.760]) than their counterparts. Child vaccination has also been an important predictor of pneumonia. Children who were vaccinated were less likely to develop pneumonia (AOR: 0. 311, 95% CI: [0.135, 0.718]) than non-vaccinated children.

The timing of first breastfeeding was significantly associated with pneumonia. Initiating of breast feeding within one hour of delivery were protective for pneumonia (AOR: 0.317, 95% CI: [0.185, 0.542]) than starting after one hour of delivery. The probability of getting pneumonia was significantly associated with types of breastfeeding. Children who got exclusive breastfeeding were (AOR: 0.635, 95% CI: (0.356, 0.934]) less likely to develop pneumonia than their counterparts (Table 4).

Discussion

This facility based unmatched case-control study with the

Table 3. *Health services utilization and feeding practice of the respondents in Gamo Gofa, 2016 (n=558)*

Variables		Frequency	Percent
Antenatal care utilization	Yes	498	89.2
	No	60	10.8
Time of initiation antenatal care	Within four month	349	62.5
	After four month	149	37.5 26.7
Utilization of tetanus toxoid vaccine	Yes	428	76.7
	No	130	23.3
Utilization of post natal care	Yes	324	58.1
	No	234	41.9
Vitamin A supplementation	Yes	217	38.9
	No	341	61.1
Place of service utilization	Health center	450	88.9
	Hospital	82	16.2
	Health post	90	17.9
Types of children' diseases	URTI	53	9.5
	Diarrheal disease	71	12.7
Family history of smoking near to child	Yes	15	2.7
	No	543	97.3
Average smoking of family per day	1-6	13	2.3
	≥ 7	2	0.4
Has your child ever breastfed?	Yes	534	95.7
	No	24	4.3
Starting time for breast feeding after delivery	Within 1 hour	442	79.2
	After 1 hour	92	16.5
Give the child breast milk at any time	Yes	491	88.0
	No	43	7.7
Providing food before initiation of breast feeding	Yes	38	6.8
	No	520	93.2
Providing of food within three day	Yes	27	4.8
	No	531	95.2
Feeding by using bottle	Yes	111	19.9
	No	447	80.1
Start complementary feeding	Yes	265	47.5
	No	293	52.5
When the child started complementary feeding?	Before 6 month	254	45.5
	At 6 month and above	11	2.0
Initial Time of bathing after delivery	Within 24 h	189	33.9
	After 24 h	369	66.1

objective of the assessment of determinants of pneumonia among under two years old children was conducted in Gamo Gofa Zone public health centers, Southern Ethiopia.

Among the socio demographic factors, the key predictors for pneumonia among under two children in this study were educational and marital status of the respondents. Children born from women completing secondary school and above were less likely to acquire pneumonia as compared to those born to non-educated women. This finding is similar with the study conducted in Ethiopia, and Bangladesh [13,21]. This could be explained by the fact that education has a valuable input in enhancing child health care service utilization and help women develop greater confidence and capability to make decisions about their children's health. Thus, literate women seek out higher quality health services and have greater ability to use health care inputs that offer better health outcomes for themselves and their children.

Marital status of the mother was significantly associated with pneumonia. The odds of acquiring pneumonia

Table 4. *Factors associated with Pneumonia among under two children in Gamo Gofa zone, 2016*

Variables		Cases	Controls	COR (95% CI)	AOR (95%CI)
Marital status	Married	161	371	0.017 (0.002,0.129)* 0.053 (0.005, 0.559)*	0.053 (0.005, 0.559)* *
	Not married	25	1	1 1	1
Maternal educational status	Non Educated	74	84 1	1	1
	Read and write	23	31 0.842(0. .452, 1.571)	0.842 (0.452, 1.571)	0.429 (0.168, 1.100)
	Grade 1-6	37	74 0.568(0.343, 0.939)*	0.568 (0.343, 0.939)*	0.905 (0.479, 1.709)
	Grade 7-8	20	62 0.366(0.202,0.663)*	0.366 (0.202,0.663)*	0.403 (0.177, 0.914)*
	Grade9-12	22	57 0.438(0.245, 0.785)*	0.438 (0.245, 0.785)*	0.657 (0.290, 0.985)*
	Above 12	10	64 0.177 (0.085, 0.370)*	0.177 (0.085, 0.370)**	0.253 (0.093,0.688)* *
Did you delivered little child	Yes	14	7	1	1
	No	172	365	0.236 (0.093, 0.594)*	0.225 (0.067, 0.760)*
Antenatal care utilization	Yes	143 355	143 355	0.159 (0.088, 0.288)* 0.159 (0.088, 0.288)* 1.970 (0.340, 11.399)	1.970 (0.340, 11.399)
	No	43 17	43 17	1 1	1 1
Vitamin A utilization	Yes	59 0.629(0.434, 0.912)*	158 0.710(0.448, 1.127)	0.629 (0.434, 0.912)*	0.710 (0.448, 1.127)
	No	127 214 214	214 1 1	1	1
When you start ante natal care?	Within four month	84 265	265 1 1	1	1
	After four month	60 89	89 2.127(1.413, 3.202) * 0.665(0.414, 1.069)	2.127 (1.413, 3.202) *	0.665 (0.414, 1.069)
Status of fetus during delivery	Single	147 362 0.104(0.051, 0.214)*	362	0.104 (0.051, 0.214)*	0.416 (0.142, 1.218)
	Twin	39	10	1	1
Did child vaccinated?	Yes	141	355	0.150 (0.083, 0.271)* *	0. 311 (0.135, 0.718)*
	No	45	17	1	1
Has your child ever breast feeding	Yes	163	371	0.019 (0.003, 0.143) *	0.288 (0.032, 2.628)
	No	23	1	1	1
When the child start breastfeeding	Within 1 h	111	331	0.057 (0.007, 0.436) **	0.317 (0.185,0.542)* *
	After 1 h	52	40	1	1
Types of breast feeding	EBF	89	286	0.026 (0.003, 0.024)** 0.026 (0.003, 0.024)*	0.635 (0.356, 0.934)* *
	Predominant breast feeding	40	29	1.951 (0.198, 3.178) 1.951 (0.198, 3.178)	1.8829 (0.887,3.994)
	Partial breast feeding	34	56	1	1

*Statistically significant at p<0.05, **statistically significant at p<0.00

for children born to non-married women were higher as compared to their counter parts of children born to married women. The reason could be married couples could have the resource for children health from both father and mother dimensions, and it facilitate dynamic decision making in the family for children health services utilization. This contributes for the prevention of diseases like pneumonia at the family level in general for children in particular. Further, being married help to minimize economical risks. If one becomes unemployed, the other may have other assets and income to cover the expense for the family including foods and health care. In short, the benefits of marriage include social support during times of stress, which can protect health by reducing inflammation and increasing serotonin release to elevate moods, and encouragement to engage in healthy behaviors to the family as a whole to their children particularly. However, the study conducted in Ethiopia Shebedino district and Bangladesh indicated no statistical significant association between marital status and child pneumonia [13,21]. This may be explained by difference in knowledge and enabling environment. Therefore, those who have resources, however are not protected may not have knowledge and enabling environments to protect their children from pneumonia. But those who were protected like in this study may have knowledge and resource as well as enabling environments at a time for protection of pneumonia.

In descriptive analysis, 97 (17.4%), 245 (43.9%) and 119 (21.3%) of children were underweight, wasted and stunted respectively which showed significant level of malnutrion, but the analytical analysis showed no statistically significant association with pneumonia in this study. However, the study conducted in Ethiopia, Bangladesh, Southern Brazil and Brasilia [13,21-23] indicated that presence of malnutrition was significantly associated with pneumonia. This may be explained by difference in sample size. In this regard, the sample size was high in this study as compared with the above studies. The other responsible factor for this difference can be using of different screening criteria for pneumonia among under two years old children. Screening criteria for pneumonia in this study was Integrated Management of Newborn and child guide line, but pneumonia was diagnosed by using clinical presentation and X-ray in Bangladesh, Southern Brazil and Brasilia [21-23].

In general, children who are undernourished before age two are at high risk of diseases related to nutrition even if there was no statistically association in this study [24]. Many studies have found a strong association between under nutrition and child mortality [25]. Even mild degrees of malnutrition double the risk of mortality for respiratory and diarrheal disease mortality and malaria [26].

The other factor that protects child pneumonia was children without young siblings. Children without young siblings had less chance for contracting pneumonia than their counterparts. This result is in line with the study finding in from Southern Brazil and Brasilia [22,23]. This could contribute to a positive effect of optimal birth interval on child survival by reducing; behavioral effects associated with competition between siblings (e.g. competition for parental time or material resources among closely spaced siblings), the inability (or lack of desire) to give a child adequate attention if his or her birth came sooner than desired; and disease transmission among closely spaced siblings. Planning optimum interval between pregnancies increase the chance of good health outcome for the mother and their babies, two and half years to three years interval, limits risk of child death due to diseases like pneumonia.

Child vaccination has also been an important predictor of pneumonia. Vaccinated children were less likely to develop pneumonia as compared with non-vaccinated children vaccinated. This finding is similar with the result from Kenya, Gambia and India [27-29]. This association of pneumonia with children vaccination can be attributed to the fact that vaccinated children can develop immunity against the causes of pneumonia in addition to acquired immunity, and also, the antigen material from vaccine stimulates an individual immune system to develop adaptive immunity to the pathogen of pneumonia. Similarly, visiting health institution at the time of vaccination create greater opportunity to mothers to access information about the types, benefits and availabilities of children health care services.

Concerning to the timing of the first breast feeding, starting of breast feeding within one hour of delivery found to be protective for pneumonia as compared with initiation of breast feeding after one hour of delivery. This evidence is in line with similar study conducted in Ghana and Nepal [30,31]. This can be explained by the fact that providing of breast feeding immediately after delivery within one hour is an important factor in growth and development of child by preventing different disease since the immediate breast milk contain colostrum which is rich in proteins and antibody that provide passive immunity to the baby.

The probability of pneumonia was highly associated with types of breast feeding. Children who were exclusively breastfed were less likely to develop pneumonia than mixed fed children. This finding was consistent with the findings from Bangladesh, Brazil Federal district, and United State of America [21,32-34]. This can be as a result of EBF contains carbohydrate, protein, fat, vitamin, mineral, digestive enzymes and hormones which are essential for growth and development of children. Breast milk also contains antibody or immunity like IgM and IgG and lymphocytes from the mother that help the baby resist infection like pneumonia.

Conclusion

The findings of this study indicated that some variables of socio demographic profiles, health services utilization like vaccination, and feeding practice were predictors of

occurrences of pneumonia in under two year old children. In this regard children whose mothers completing high school and above, married, children without young siblings, children being vaccinated, initiation of breast feeding within on hours of delivery and exclusive breastfeeding were protective from pneumonia in Gamo Gofa zone, Southern Ethiopia. It is recommended that early initiation, exclusive breast feeding and vaccination of children have to be given more emphasis to minimize the risk of pneumonia. Therefore, information has to be disseminated through different ways such as community health agents, health development army and mass media to promote the above protective factors.

Authors Contributions

YW had the primary responsibility in all steps of the study and supervised field work together with DH and TG. YW, DH and TG developed the study design and analysed data together. All authors were involved the writing of the manuscript and have approved the final version of the manuscript.

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