Risk Factors Associated with Pneumonia among under 5 Years Children at Banadir Hospital, Mogadishu, Somalia

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

Aims: Pneumonia burden among children aged five years and below in Somalia remains one of big health problems. Higher risk factors of child Pneumonia in Somalia includes child stunting, child wasting and indoor air pollution. The main objective of this study was to investigate the risk factors associated with pneumonia among under 5 years children attending Banadir Hospital, Mogadishu, Somalia. The specific objectives were to determine the prevalence of pneumonia among children aged under 5 years; to establish the socio-demographic factors, environmental factors and health facility related factors associated with Pneumonia among children aged under 5 years.
Study Design: The study adopted cross-sectional study design.
Place and Duration of Study: Banadir Hospital, Mogadishu, Somalia in 2022.

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Methodology: The study used a systematic random sampling technique to select 188 under 5 children with pneumonia. A structured questionnaire and interview guide were employed in collecting data. Qualitative data was analyzed using content technique. Quantitative data was analyzed using descriptive and inferential statistics. The inferential statistics entailed the multivariable logistic regression analysis to determine the risk factors that predict pneumonia among the under 5 years children.

Results: The results indicated that the social demographic factors that were protective and decreased the odds of prevalence of pneumonia among under 5 years children were age of 4 - 5 years (Odds= 1.125, P=0.008<0.05); caretakers who had attended university (0.964;P=0.010<0.05); caretakers who earned 300-400$ (Odds=1.315; P=0.006<0.05); birth weight over 3kgs (Odds=2.422; P=0.014<0.05); permanent housing (Odds= 0.810; P=0.007<0.05). The environmental factors that were associated with high prevalence of pneumonia among under 5 years children were living in an environment without safe air quality (Odds= 1.402; P=0.033<0.05); and living in an environment where firewood is used for cooking (Odds=0.704;P=0.038<0.05). The health related factors that were protective and decreased the odds of prevalence of pneumonia among under 5 years children were pneumonia vaccination (Odds=0.948; P=0.008<0.05).

Conclusion: The study concluded that the risk factors for pneumonia among children aged under 5 years were age, level of education, income, birth weight, exclusive breast feeding, pneumonia vaccination, postnatal care, and history of acute respiratory tract infection. The study recommends that the health centres should equip the mothers and the caregivers with the basic knowledge regarding health and the hospitals to conduct post-natal training programs to the mothers and caregivers.

Keywords: Socio-demographic factors; environmental factors; health facility related factors; pneumonia & children aged under 5 years.

1. INTRODUCTION

Pneumonia is a severe respiratory disease that infects lungs spawned by viruses, fungi and bacteria. The primary bacterial cause of Pneumonia in children is *Streptococcus pneumonia,* major viral cause is syncytial virus while major fungal cause is *Pneumocystis jiroveci* for children born with HIV [1]. Pneumonia remains a major burden in the Asian and Sub-Saharan countries. In the Sub Saharan Africa (SSA), there were 1,621 Pneumonia cases for every 100,000 children as for 2018 [2]. In 2018, the Pneumonia related deaths for under children in Sub Saharan Africa included 162,000 deaths in Nigeria, 40, 000 deaths in DRC, 32,000 deaths in Ethiopia, 18,000 deaths in Chad, 16, 000 in Angola, 15, 000 in Tanzania and 13,000 under 5 years deaths in Niger [3]. In Kenya, 15% of children deaths in 2018 was attributed to pneumonia, which was approximately 9,000 pneumonia related deaths for under 5 years children [4]. Key risk factors of Pneumonia amongst children under the age of five years in SSA comprise health facility related factors, environmental factors and other modifiable related risk factors [5].

Pneumonia burden remains a major health problem affecting children in Somalia. In 2018, there were 122 under five year's deaths per 1000 live births because of pneumonia [2]. It was also found 21% (15,165) of children deaths in Somalia was attributed to pneumonia in 2018; whereas in 2017, pneumonia was the highest single killer of under-5 years of age children [3]. UNICEF, [4] indicated that Pneumonia killed 2 children every hour in Somalia in 2018. Between 2000-2018, the reduction rate in pneumonia in Somalia is -0.39%, and at the same rate, Somalia is to achieve the 2025 Global Action Plan for Pneumonia and Diarrhoea (GAPPD) target later than 2050. The global target is 3 deaths per 1000 live births by 2025, as projected by GAPPD.

Pneumonia burden among under 5 years of age children in Somalia remains one of major health problems (Mohamud, et al. 2020). The under 5 years Pneumonia related deaths in Somalia was 14,700 in 2015, 14,945 deaths in 2016, 15,041 deaths in 2017 and 15,165 children under-five in 2018. According to the World Health Organization (WHO), pneumonia is the leading cause of death among children under 5 in Somalia, accounting for 15% of all deaths in this age group (WHO, 2020). The incidence of pneumonia in Somalia is also high, with an estimated 400,000 cases reported annually. The mortality rate among children with pneumonia in

Somalia is also high, with a reported case fatality rate of 5-7%. Globally, Somalia ranks 13th of countries with highest burden of Pneumonia [2]. Between 2000-2018, the reduction rate in pneumonia in Somalia is -0.39% which is every low and Somalia might not attain the by 2025 GAPPD but later in 2075 (Save the Children, 2017). The global target is 3 deaths per 1000 live births by 2025, as projected by GAPPD [3]. In addition, the global outbreak of Covid-19 first recorded in Somalia in March, 2020 worsened the under 5 mortality resulting from Pneumonia. Covid-19, another respiratory disease competed the attention of the heath care facilities and authorities causing significant disruptions in the health system featured by overstretched health personnel and demand for supplementary oxygen. It is expected that Covid-19 will result to children deaths arising from pneumonia.

Higher risk factors of child Pneumonia in Somalia according to UNICEF [3] was child stunting, child wasting and air pollution from fuel burns. Save the Children report (2017) strongly linked childhood pneumonia to poverty-linked factors like indoor/outdoor pollution, sanitation, inadequate safe water for drinking and problems related to access quality healthcare. In addition, financing the health care system in Somalia remains low. As for 2019, the 2019 health required fund for Somalia was $USD94.1 million, but just $USD20.5 million (22%) of their requirement was met. Funding Pneumonia disease in Somalia remains poorly funded according to UNICEF [2].

There are many risk factors identified in the empirical studies. The risk factors are grouped into socio-demographic factors, environmental factors and factors related health facilities. The socio-demographic factors include household income, lack of exclusive breastfeeding [6], age of the child, gender, birth order, low birth weight, prematurity [7], low education attainment by mothers and low socio-economic status [8-10], exclusive breastfeeding, birth weight, immunization levels, education attainment of mothers/guardians, healthy behavior, household income levels, nature of houses lived, and active standby village strata are significant predictors of pneumonia among under 5 children [11]. The environmental factors include poor housing ventilation, and exposure air [7]; poor home aeration and use of wood cooking fuel (Beletew, et al. 2020), indoor air pollution [12], McAllister, et al. [12]; (Caroline, et al. 2018). The health facility related factors include vaccination status, presence of concomitant illness Fadl, et al. [7], child history of acute respiratory infection, family history of ARI (Keleb, et al. 2020), incomplete immunization [12,13]. The inadequate or lack of access to these health facility services may result to acquisition of pneumonia [7,13]. However, pneumonia risk factors tend to vary from region to region based on social setting of the people, access to health facilities and environmental factors. There is perception that there exist many other risk factors that predict pneumonia among under 5 years children in Somalia but not studied.

This study helped identify gaps in healthcare services for children in Mogadishu, Somalia, and inform policies and interventions to improve healthcare access and quality. Since Pneumonia is a leading cause of morbidity and mortality among children under 5 years. A study on the risk associated with pneumonia in Mogadishu, Somalia, was necessary to contribute to the efforts to prevent and control this disease.

The study theoretical model was based on the child, parental and the environmental factors as shown in Fig. 1.
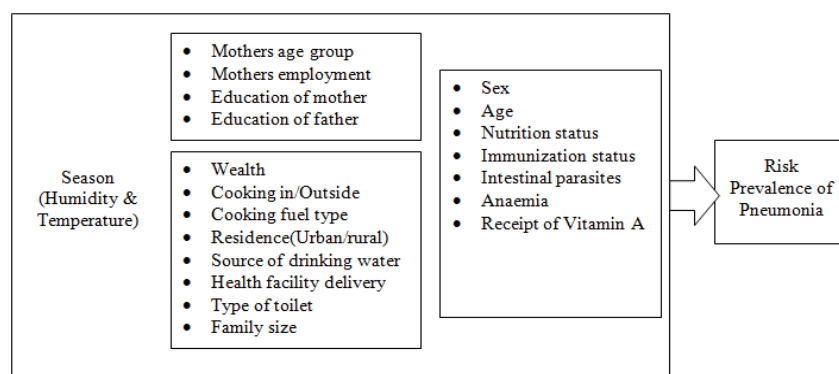

Fig. 1. Theoretical framework
Adopted from (Alemayehu et al. [14]); BMC Pediatrics

Child factors included: age modeled as 0–11 months, 12–23 month, and 24–59 months; sex; underweight defined as being less than –2 standard deviations from the international reference population; receipt of Bacillus Calmette–Guérin (BCG) vaccine; receipt of drugs for intestinal parasites in the last 6 months; anemia status categorized as not anemic (above 10.9 g/dl), mild or moderate anemia (7.0-10.0 g/dl), severe anemia (below 7.0 g/dl), and not-measured; receipt of vitamin A in the last 6 months. Vitamin A is routinely distributed to children age 6–59 months twice-yearly at 'mothers and child health week' events which are advertised through campaigns.

Parent factors included: mother's age group, mother's employment status, and whether either mother or father had completed secondary school. Household and community factors include whether the household was in the bottom 10 % (calculated from the DHS household wealth factor score); whether the household uses improved cooking fuel (electricity, liquid petroleum gas, natural gas, biogas, kerosene, coal, lignite, charcoal) or unimproved cooking fuel (wood, animal dung, straw/shrubs/grass), whether the household has an improved water source (piped into dwelling, piped to yard/plot, public tap/standpipe, tube well or borehole, protected well, protected spring, bottled water) and whether the household has an improved toilet (flush to piped sewer system, flush to septic tank, flush to pit latrine, ventilated improved pit latrine, pit latrine with slab, composting toilet).

Therefore, a combination of child, parental and environmental factors can contribute to the high prevalence of pneumonia among children, and addressing these factors through interventions such as improving access to healthcare, promoting good nutrition, improving sanitation and hygiene, and reducing air pollution, can help to reduce the burden of pneumonia in children.

2. METHODOLOGY

The study adopted cross-sectional study design. The study was carried out in Banadir Hospital. Banadir Hospital, a teaching hospital in the Wadajir District of Mogadishu, Somalia. The hospital is a major pediatric unit in Somalia. The study used a systematic random sampling technique to select 188 under 5 children with pneumonia. Purposive sampling was also used to select 12 pediatric health specialists at Banadir Hospital. A structured questionnaires

and interview guide were employed in collecting data. Qualitative data was analysed using a content technique. Quantitative data was analyzed using descriptive and inferential statistics. The inferential statistics entailed the multivariable logistic regression analysis to determine the risk factors that predict pneumonia among the under 5 years children.

3. RESULTS AND DISCUSSION

The researcher distributed 188 questionnaires to the respondents. A total of 162 respondents successfully filled and returned their questionnaires translating to an 84.4% response rate.

3.1 Prevalence of Pneumonia

A total of 162 children participated in the study. 54 were found to have pneumonia whereas, 108 tested negative for pneumonia as shown in the Fig. 2. The results indicate that the prevalence rate was at 33%.

A study conducted in Nigeria by Ujunwa, and Ezeonu, (2019) had revealed the prevalence of pneumonia in under-five children to be 31.6% which was consistent with the findings of this study. This consistency might be due to similarities in socio-economic status as Nigeria is an African country probably having comparable socio-economic status with Eastern African countries. The key informant, health specialist (HS1) concurred that;

> *"........at least 70 to 85 cases likely due to incomplete vaccination."* (HS1)

Another interviewed health specialist (HS2) was asked on what are the notable symptoms that you have observed with the child. The response was that;

> *"....the patient comes with fever, high grade cough, and sometimes heavy breathing."(HS2)*

Mengstie (2022) assessed the prevalence of pneumonia and associated factors among children aged 6–59 months and the prevalence of pneumonia in children under five was 5.8% which is significantly lower as compared to this study. Chekole et al. [15] examined the prevalence and associated risk factors of pneumonia in under five years children using the data of the University of Gondar Referral Hospital
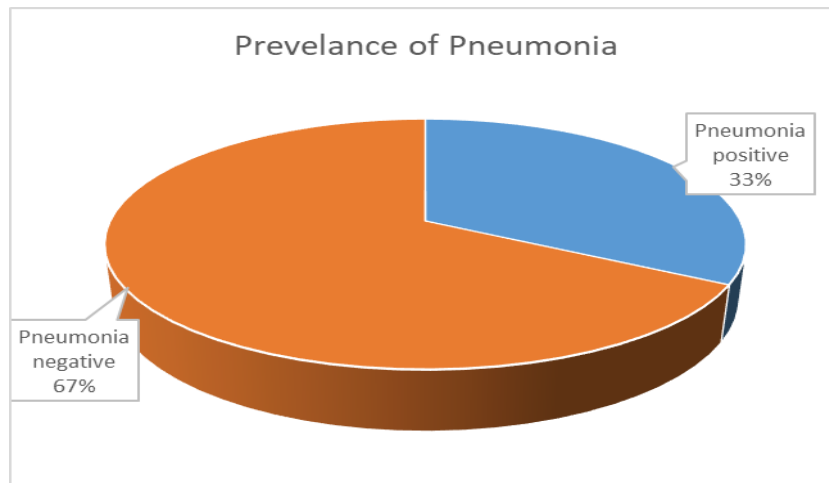
Fig. 2. Prevalence of pneumonia among children under 5 years

and the prevalence of pneumonia among children under five was 18.5%. Abuka (2017) assessed the prevalence of pneumonia and factors associated among children 2-59 months old in Wondo Genet district, Sidama zone, SNNPR, Ethiopia and the prevalence of pneumonia among under-five children was 33.5%. Beletew, Bimerew, Mengesha, Wudu and Azmeraw (2020) assessed the prevalence of pneumonia and its associated factors among under-five children in East Africa and the pooled prevalence of pneumonia in East Africa was 34%. Thus, the majority of the prevalence ranged within +/-5 with the study.

3.2 Social Demographic Factors Associated with Pneumonia in Children

The social demographic factors investigated included gender, age, education, income, birth order, birthweight, housing, whether born premature or not and if breastfed exclusively. The results indicated that 51.2% of the respondents were male as compared to female as male were 48.8% and therefore the gender representation difference was negligible. Majority of the children were 7 months – 1 year at 42.6% followed by less than 6 months at 27.8%. This implied that majority of the children with pneumonia case were 7 months – 1 year when weaning is likely to begin. On the educational level of the caregivers, majority had not attended school (41.4%). This was an indication that most of care givers had no basic education. On household monthly income in dollars, majority of the respondents earned less than 100$ (58.0%). The birth order of the respondents indicated that

majority were 2nd order (28.4%) followed by the 3rd birth order (23.5%). Under birth weight, majority were born with 1.1-2 kg (57.4%) followed by 2.1-3 kg at 32.7%. Majority of the respondents lived in semi-permanent and represented by 59.3%, followed by thatched house at 32.7% and the least was permanent housing at 8.0%. Further, a total of 51.2% had received exclusive breastfeeding while 48.8% did not receive exclusive breastfeeding.

3.3 Bivariate Analysis

Chi-square test was conducted for the categorical variables to determine their association with prevalence of pneumonia among children under 5 years.

The following factors were statistically significantly associated with pneumonia infection among the under 5 children age (X^2 =16.790, df =3, p* <.0.008), level of education of caretaker (X^2 =13.901, df =4, p* <.0.009), level of income of caretaker (X^2 =14.790, df =4, p* <.0.031). Birth weight (X^2 =6.938, df =1, p* <.0.007), birth of a child prematurely (X^2 =11.210, df =1, p* <.0.027), exclusive breast feeding (X^2 =12.025, df =1, p* <.0.009). Pneumonia vaccination (X^2 =13.062, df =1, p* <.0.000), postnatal care (X^2 =15.889, df =1, p* <.0.000). Existing Acute Respiratory Tract (X^2 =10.222, df =1, p* <.0.006).

All the statistically significant factors at bivariate analysis were subjected to multiple logistic regression to establish if they could be predictors to pneumonia infection among the under 5 children. The results indicated that the children aged 4 - 5 years had 1.125 less odds of

prevalence of pneumonia among under 5 years children as compared to those with less than 6 months (P=0.008<0.05). The children with caretakers who had attended university had 0.964 less odds of prevalence of pneumonia among under 5 years children as compared to those with primary education (P=0.010<0.05). The children with caretakers who earned 300-400$ had 0.964 less odds of prevalence of pneumonia among under 5 years children as compared to those with those with less than 100$ (P=0.006<0.05). The children with birthweight over 3kgs had 2.422 less odds of prevalence of pneumonia among under 5 years children as compared to those with those less than 1kg (P=0.014<0.05). The children who lived in permanent housing had 0.810 less odds of prevalence of pneumonia among under 5 years children as compared to those with those living in thatched houses (P=0.007<0.05).

Table 1. Chi-square table showing the association between socioeconomic factors and pneumonia

Risk factors	Chi-Square	df	Asymp. Sig.
Gender	2.469a	1	0.116
Age	16.790b	3	**0.008**
Level of Education	13.901c	4	**0.009**
Income	14.790c	4	**0.031**
Birth order	3.185d	5	0.671
Birth weight	16.938b	3	**0.007**
Housing	.481e	2	0.786
Born premature	11.210a	1	**0.027**
Exclusive breast feeding	12.025a	1	**0.009**
Housing ventilation	1.593e	2	0.451
Smoker	1.593e	2	0.451
Nearby Construction site	.099a	1	0.753
Air quality	.222a	1	0.637
Mode of cooking	2.778e	2	0.249
Pneumonia vaccination	13.062a	1	**0.000**
Drugs availability	1.210a	1	0.271
Postnatal care	15.889a	1	**0.035**
Postnatal clinics visits	1.852b	3	0.604
History of Acute Respiratory Tract infection	10.222a	1	**0.006**

Table 2. Multivariate logistic regression for socio-demographic factors associated with pneumonia among children under 5 Years

Prevalence of pneumonia among children under 5 years	Coef.	Std. Err.	Z	P>|z|	[95% Conf.	Interval]
Age						
7months - 1year	0.877	0.486	-0.240	0.812	0.296	2.597
2 -3 years	1.069	0.634	0.110	0.911	0.334	3.417
4 - 5 years	-1.125	-0.624	-8.210	**0.008**	0.379	3.338
Gender						
Female	1.008	0.391	0.020	0.983	0.472	2.155
Education						
Secondary	0.718	0.440	-0.540	0.589	0.216	2.390
Polytechnic	0.759	0.462	-0.450	0.651	0.230	2.505
University	-0.964	-0.562	-8.060	**0.010**	0.308	3.020
None	1.409	0.856	0.560	0.573	0.428	4.636
Income						
100-200$	1.181	0.717	0.270	0.784	0.360	3.879
200-300$	1.464	0.821	0.680	0.497	0.487	4.396
300-400$	-1.315	-0.718	0.500	**0.006**	0.451	3.834
over 400$	0.977	0.623	-0.040	0.971	0.280	3.410
Birth_order						

Prevalence of pneumonia among children under 5 years	Coef.	Std. Err.	Z	P>|z|	[95% Conf.	Interval]
2nd	0.894	0.570	-0.180	0.861	0.257	3.118
3rd	0.363	0.285	-1.290	0.197	0.078	1.693
4th	0.905	0.537	-0.170	0.866	0.283	2.895
5th	1.573	0.971	0.730	0.046	0.469	5.275
Other	0.952	0.634	-0.070	0.941	0.258	3.515
Birthweight						
1.1-2 kg	1.334	0.700	0.550	0.583	0.477	3.730
2.1-3 kg	1.514	0.755	0.830	0.406	0.569	4.026
Over 3 kg	-2.422	-1.446	2.480	**0.014**	0.751	7.806
Housing						
Semi-permanent	1.611	0.704	1.090	0.275	0.684	3.795
Permanent	-0.810	-0.389	-0.440	**0.007**	0.316	2.074
Born premature						
No	1.026	0.379	0.070	0.009	0.498	2.115
Exclusive breastfeeding						
No	0.986	0.376	0.040	**0.010**	0.467	2.080
_cons	0.294	0.265	-1.360	0.174	0.050	1.718

The key informant pediatric health specialists (HS6), Indicated that

> *"The most commonly reported socio-demographic risk factors that result to pneumonia cases are inadequate breastfeeding and premature births."* (HS6)

The findings are consistent with Ibraheem, Abdulkadir, Gobir and Johnson [16] study in Nigeria who found that infancy and families with few children are socio-demographic features that are likely to determine early-to-intermediate presentation of children with pneumonia while high respiratory rates and bronchopneumonia are disease related factors that predict early presentation. The results are also in line with Chekole et al. [15] whose results showed that children who had a history of diarrhea for one month, immunization history, breastfeeding of the child, household history of ALRI, and children living in an overcrowded house were found to be statistically significant factors for pneumonia infections. The findings are in tandem with Endale, Gari, Haji, Tiruneh and Wudneh (2022) who established that maternal age< 25 years, family size> 4, non-exclusive breastfeeding, stunting, history of diarrhea, charcoal use as cooking fuel, and parental smoking were risk factors of community-acquired pneumonia. The study by Barday, Slogrove and Engelbrecht (2022) found that here was no association in univariable or multivariable analysis between severe pneumonia and adverse household environmental factors including tobacco smoke exposure, overcrowding, and indoor smoke exposure.

3.4 Environmental Factors Associated with Pneumonia among Children Aged Under 5 Years

The environmental factors that were investigated included housing ventilation, smoking, nearby construction site, air quality and mode of cooking. The results indicated that the children that lived in an environment without safe air quality had 1.402 less odds of prevalence of pneumonia among under 5 years children as compared to those with in an environment without safe air quality (P=0.033<0.05). In addition, the children living in an environment using wood for cooking had 0.704 more odds of prevalence of pneumonia among under 5 years children as compared to those with those living in an environment using electricity for cooking (P=0.704<0.05).

The findings were supported by the qualitative data, in which the key informant, a pediatric health specialists (HS1) indicated that

> *"……..indoor air pollution, crowded homes, parental smoking and the radiation from climate change played a role in prevalence of pneumonia among under 5 years children (HS1)."*

A pediatric health specialists (HS4) was asked on the commonly diagnosed risk factors causing pneumonia among the under five children brought to the hospital and indicated that;

> *"The common risk factors are weather like hot and cold which is integrated with bacterial infection."(HS4).*

Table 3. Multivariate Logistic regression for Environmental Factors associated with Pneumonia among Children Under 5 Years

Prevalence of pneumonia among children under 5 years	Coef.	Std. Err.	Z	P>|z|	[95% Conf.	Interval]
Housing ventilation						
No	0.740	0.256	-0.870	0.385	0.375	1.459
Smoker						
No	0.736	0.256	-0.880	0.377	0.372	1.454
Nearby construction site						
No	0.841	0.287	-0.510	0.612	0.431	1.642
Safe air quality						
No	1.402	0.487	10.970	**0.033**	0.709	2.770
Mode of cooking						
Gas	0.755	0.327	-0.650	0.517	0.324	1.763
Wood	0.704	0.283	0.870	**0.038**	0.320	1.547
_cons	0.730	0.293	-0.780	0.433	0.333	1.604

The findings supported by Kasundriya, et al. [17] study, who found that living in a kuchha house, poor house aeration, crowding, history of measles, incomplete vaccination, premature birth; acyanotic congenital heart disease and cases of open defecation are significant risk factors. The study by Andualem, et al. [18] established that living in unpaved dusty roads, living within heavy traffic areas, house ventilation, and cockroach infestation were significant predictor of Pneumonia. The results are in line with the study by Nirmolia, et al. [9] who established that education of mothers, socio economic status, completing immunization, exclusive breastfeeding, indoor/outdoor air pollution are significant risk factors. Hoang, et al. (2019) established a significant pneumonia risk factors of include exposure to cigarette smoking, low level of education of mothers and incomplete immunization [19,20].

3.5 Health Facility Related Factors associated with Pneumonia among Children Aged under 5 Years

The health facility related factors that were considered included; completed pneumonia vaccination, suffering from other disease, Pneumonia drugs availability, postnatal care, postnatal clinics and history of acute respiratory tract infection. The results indicated that the children without pneumonia vaccination had 0.948 more odds of prevalence of pneumonia among under 5 years children as compared to those with pneumonia vaccination (P=0.008<0.05). In addition, the children that did not attend postnatal care had 0.604 more odds of prevalence of pneumonia among under 5 years children as compared to those who attended

postnatal care (P=0.014<0.05). Lastly, the children with history of acute respiratory tract infection had 0.752 more odds of prevalence of pneumonia among under 5 years children as compared to those without history of acute respiratory tract infection (P=0.041<0.05).

A Heath specialist (HS7) responded that;

> *"…….they do not complete the ANC visits and this puts the baby at risk." (H7)*

The results were consistent with McAllister, et al. [12] study who established that incomplete immunization, lack of excusive breastfeeding, indoor air pollution and crowding were found to be significant risk factors. The study by Sitaresmi, and Wahab (2021) also found out that significant risk factors included medical examinations, incomplete basic immunizations, lack of exclusive breastfeeding, low birth weight, wasting and indoor air pollution are significant risk factors of pneumonia. The findings also concur with Wahyuningrum, and Asturiningtyas (2021) who established that the host risk factors for increasing pneumonia cases among under 5 children involved acute respiratory infection, incomplete basic DPT-HB-HiB vaccination, wasting and younger child age 6-23 months. The study by Acácio, et al. (2015) established that clinical diagnosis of pneumonia is significant in treatment of pneumonia. Hadisuwarno, Setyoningrum, and Umiastuti (2015) on the other hand established that the significant factors included incomplete immunization and lack of exclusive breastfeeding is associated with pneumonia cases. According to Fadl, Ashour, and Yousry [7], the factors that were found to be independently associated with pneumonia are:

Table 4. Multivariate logistic regression for health facility related factors associated with pneumonia among children under 5 years

Prevalence of pneumonia among children under 5 years	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Pneumonia vaccination						
No	0.948	0.344	0.150	**0.008**	0.465	1.931
Diseases						
No	1.788	0.626	1.660	0.097	0.901	3.551
Postnatal care						
No	0.604	0.210	1.450	**0.014**	0.306	1.193
Postnatal clinics						
4-6 times	0.493	0.247	-1.410	0.159	0.185	1.318
7-9 times	0.577	0.270	-1.180	0.239	0.231	1.442
More than 10 times	0.683	0.312	-0.840	0.403	0.279	1.672
History of Acute Respiratory Tract infection						
No	0.752	-0.260	0.820	**0.041**	0.382	1.481
Cons	0.823	0.366	-0.440	0.661	0.344	1.967

age ≤ 12 months, male gender, birth order, low birth weight, prematurity, place of delivery either at home, presence of concomitant illness, poor home aeration and exposure to outdoor air pollution.

4. CONCLUSION

The study concluded that age, level of education, income, birth weight, exclusive breast feeding, pneumonia vaccination, postnatal care, history of acute respiratory tract were significant predictors of Pneumonia among children aged under 5 years.

The study recommends that the government should partner with the hospitals and distribute supplement food and other preventive items to the caregivers and the expectant mothers. Addressing poverty through strategies such as poverty reduction programs, education and employment opportunities, and social safety nets can help reduce the incidence of pneumonia in this population.

Under the environmental factors, the identified risk factors 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.

Under the health related factors, limited access to healthcare services is a major contributing factor to the high burden of pneumonia in children in Somalia. Efforts should be made to improve access to healthcare services, especially in rural areas, to ensure timely diagnosis and treatment of pneumonia the study recommends that the hospitals to conduct post-natal training programs to the mothers and caregivers.

Vaccination against common pathogens that cause pneumonia, such as *Streptococcus pneumoniae* and *Haemophilus influenzae* type b, can significantly reduce the incidence and severity of pneumonia in children in Somalia. Efforts to improve vaccination coverage, especially in remote and underserved areas, are critical.

CONSENT

All authors declare that 'written informed consent was obtained from the parents for publication of this case report and accompanying images.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

ACKNOWLEDGEMENTS

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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