

The Prevalence and Risk Factors Associated with Otitis Media in Children under Five Years of Age in Mogadishu, Somalia: A Hospital-Based Cross-Sectional Study

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Abstract

Background: Otitis media (OM) is highly prevalent and is one of the most important causes of preventable hearing loss in developing countries and it may have long-term impacts on the children. Several hospital-based cross-sectional studies have been conducted in East African countries to assess the prevalence of OM; however, no similar studies have been conducted in Somalia. Therefore, we conducted a hospital-based cross-sectional study to identify the prevalence and the underlying risk factors of OM among children under the age of five in Mogadishu, Somalia. **Methodology:** A hospital-based cross-sectional study was conducted from July 2022 to November 2022 at three main hospitals in Mogadishu, Somalia. A total of 384 children aged less than 5 years were included. Parents of these children were interviewed with a questionnaire and a clinical examination was performed for each child. The Statistical Package for Social Sciences, SPSS (Version 22, IBM, Inc.), was used for the statistical analysis. **Result:** The prevalence of otitis media among the 384 children recruited was 31.25% (120/384). Otitis media was significantly associated with age less than one year ($P = 0.006$), malnutrition ($P < 0.001$), upper respiratory tract infections ($P < 0.001$), feeding in lying position ($P < 0.001$), and dripping something into a child's ear ($P < 0.001$). The duration of breastfeeding, on the other hand, was significantly associated with an overall reduction in OM ($P = 0.039$). The lowest risk of developing otitis was found in children who received breast milk for more than one year. **Conclusion:** In summary, the present study found that otitis media was highly prevalent (31.25%) in Mogadishu, Somalia. The majority of the affected children were younger than one year. Age of the child, malnutrition, upper respiratory tract

infections, feeding in lying position, and dripping something into a child's ear were found to significantly increase the risk of developing otitis media in children. In contrast, breastfeeding for more than one year has been found to reduce the risk of developing otitis media in children.

Keywords

Otitis Media, Children under Five Years, Prevalence, Risk Factors

1. Introduction

Otitis media (OM), also known as “acute middle ear infection” is an inflammation in the middle ear, which is associated with the effusion of fluid into the middle ear due to an infection that may be accompanied by the presence or absence of tympanic membrane perforation. OM affects almost two-thirds of all ages of children [1]. It commonly affects infants and young children, but it occurs in adolescence and adulthood; one in every two has had three experiences by the age of three [2]. Otitis media affects approximately 10,000 people per 100,000 worldwide. It is estimated that 51% of the cases occur in children under the age of five. In Central Europe, the prevalence of the disease is 3640/100,000, while in Sub-Saharan West Africa, it rises to 43,337/100,000 [3].

It has been reported that 42 million individuals over the age of three suffer from hearing loss due to otitis media, according to the World Health Organization (WHO) [4]. Majority of otitis media cases resolve unaided throughout three months, but 30% - 40% of children experience recurrence. Moreover, almost 75% of children experience otitis media at least thrice in the first year [5].

Otitis media (OM) is a wide spectrum of diseases caused by bacteria, viruses, and fungi and is often the result of other infections, including respiratory infections [6]. The malfunction of the Eustachian tube is among the main causes of otitis media. Due to inflammatory factors, enlarged adenoids, sinusitis, or neoplasm, the Eustachian tube can become obstructed, causing fluid to accumulate in the middle ear [7].

In underdeveloped countries, purulent infections are critical side effects of uncontrolled otitis media. These include chronic middle ear infections, mastoiditis, meningitis, cerebral abscesses, infectious illnesses, and epidural abscesses. According to reports, over 20 thousand children under 5 die yearly from the consequences of neglected otitis media. Regarding all of that, the disease should be quickly diagnosed and treated, and contributing variables eliminated. In addition, due to the high prevalence and impact of hearing loss, language, and cognition impairment, risk factors must be investigated and controlled [8].

The acute form of otitis media is known as acute suppurative otitis media (ASOM). The peak age for acute otitis media is between 6 to 18 months. More than 80% of kids under three have the condition, and 30% - 45% have had two or more attacks. In addition, acute inflammation is the main characteristic of

ASOM [9]. On the other hand, chronic suppurative otitis media (CSOM) is a complication of AOM characterized by otorrhea that persists for two to three weeks in a perforation in the tympanic membrane. CSOM can cause long-lasting middle ear inflammation or hearing loss [10].

In developing countries, one of the most important causes of preventable hearing loss is CSOM, and a reason of serious concern, particularly in children, because it may have long-term impacts on early communication, language development, auditory processing, psychosocial and cognitive development, and educational progress and achievement [11].

In sub-Saharan Africa, the prevalence of CSOM among school children is high, with rates ranging from 16 out of 1000 in Tanzania [12], 24 of 1000 in Kenya [13], and 23 out of 1000 in Nigeria [14]. It has been reported that CSOM is independently associated with decreased academic performance and may have long-term effects on language and cognitive development [14].

Across East Africa, several hospital-based cross-sectional studies have been conducted to assess the prevalence of OM. These studies have provided valuable insights into the burden of OM in the region. In countries like Kenya [15], Ethiopia [16], Tanzania [17], and Uganda [18], researchers have explored various factors contributing to the prevalence of OM, including socioeconomic status, hygiene practices, and access to healthcare services. However, no similar studies have been conducted concerning the occurrence of OM in Somalia. To fill this gap, we conducted a hospital-based cross-sectional study to identify the prevalence and the underlying risk factors of OM among children under the age of five in Mogadishu, Somalia.

2. Methodology

2.1. Study Design and Population

The study was a prospective cross-sectional study conducted from July 2022 to November 2022 among children aged less than five years who attended the pediatric departments of three national referral hospitals (Benadir, SOS, and Dermartino Hospital) in Mogadishu, Somalia. Children aged less than five years who attended the pediatric clinic at the three selected hospitals and whose parents or guardians consented were included in the study. Children with congenital abnormalities, sick children who needed to be admitted, and children who were uncooperative were excluded from the study. The sample size was obtained through consecutive sampling of those who met the eligibility criteria. A total of 384 patients were recruited, including 58 at Benadir Hospital, 180 at SOS Hospital, and 146 at Mercy Hospital. Parents or caregivers of the selected participants were fully informed of the research's purpose, benefits, and risks and were requested to participate. Those eligible patients whose parents accepted the participation signed a consent/assent form by writing their names and signatures. Participants were interviewed following their meeting with their pediatrician. A pediatrician examined the children and performed an otoscopy in the consulta-

tion room. Otoscopy was used to confirm the diagnosis of Otitis media.

2.2. Data Collection

Data collected included the basic demographic characteristics of the children such as the age of the child, gender, occupation of the mother, marital status, maternal age, and the educational level of the mother. Parental smoking, child snoring, upper respiratory tract infection, previous otological complaints, recurrent ear infection, the first episode of ear infection, breastfeeding duration, feeding position, nutritional status, dripping something to the child's ear, kind of dripping and the otoscopic findings of the child.

2.3. Data Analysis

Data were analyzed using the Statistical Package for Social Science version (SPSS) Version 2021. Descriptive statistical analysis was made to determine the prevalence and risk factors of otitis media among under five years children. Frequency distribution tables were used to assess the distribution of the variables. Information on the contributing factors to the study's variables has been gathered using both univariate and bivariate analysis. Data were presented in percentages, tables, and charts.

3. Results

3.1. Patient's Clinical Characteristics

During the period of July 2022 to November 2022, 384 children attending pediatric departments of three national referral hospitals in Mogadishu, Somalia, were enrolled to participate in this study. Participants in this study were aged 0 - 59 months. The majority of them 51.3% were aged 0 - 12 months, and 33.1% and 15.6% were aged 13 - 36 months and 57 - 59 months; respectively. Overall, 50.8% of the children were male. A total of 18.2% of the mothers reported being employed, while 81.8 percent reported being unemployed. In terms of marital status, 82.5% of the mothers were married, 14.1% were divorced, and 3.4% were widowed.

The majority of mothers 49.5% were between the ages of 26 and 35, followed by 34.1% between 15 and 25. The majority of the mothers of the children 54.2% were illiterate. Socioeconomic status varied from low to middle to high at 47.7%, 49.7%, and 2.6%, respectively. Moreover, approximately 82% of respondents lived in ordinary houses while 18% lived in internally displaced camps (IDPs). A detailed description is presented in **Table 1**.

3.2. Prevalence of Otitis Media

The prevalence of otitis media among the 384 children recruited was 31.25% (120/384), as shown in **Figure 1**. Approximately 25% of the children diagnosed with otitis media had otorrhea, and 6.25% had eardrum perforation. On the other hand, the percentage of children who did not have otitis media was 68.75%

Table 1. Socio-Demographic characteristics.

Variable	Categories	Frequency	Percentage
Age	0 - 12 m	197	51.3
	13 - 36 m	127	33.1
	57 - 59 m	60	15.6
Gender	Male	195	50.8
	Female	189	49.2
Occupation	Employed	70	18.2
	Unemployed	314	81.8
Marital status	Married	317	82.5
	Divorced	54	14.1
	Window	13	3.4
Maternal age	15 - 25 yrs	131	34.1
	26 - 35 yrs	190	49.5
	>35 yrs	63	16.4
Educational status	Illiterate	208	54.2
	Primary	118	30.7
	Secondary	43	11.2
	University	15	3.9
Socioeconomic status	<200 Shs/day	183	47.7
	200 - 400 Shs/day	191	49.7
	>400 Shs/day	10	2.6
Residence	IDPs camps	69	18
	Normal House	315	82

Diagnosis of Otitis Media

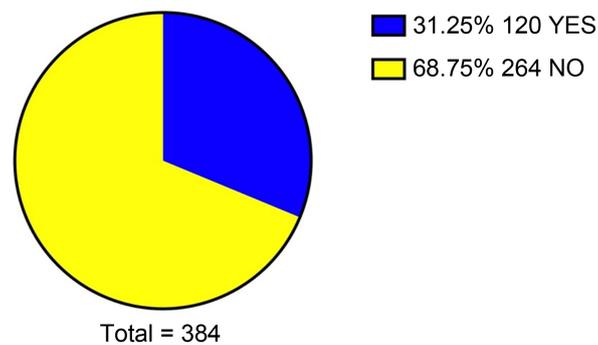


Figure 1. The prevalence of otitis media.

(264/384).

3.3. Association between Age of Child and Gender for Otitis Media

There were 52 (43.3%) children between the ages of 0 and 12 months who had otitis media, 39 (32.5%) children between the ages of 13 and 36 months, and 29

(24.2%) children between the ages of 37 and 59 months also suffered from otitis media. Bivariate analysis indicates that children aged 0 to 12 months are significantly ($P = 0.006$) more likely to develop otitis media than other groups. However, we found that of the children with OM, 55.8% were males and 44.2% were females, indicating that the gender difference was not statistically significant ($P = 0.182$) (Table 2).

3.4. Association between Occupation, Age, and Educational Level of the Mother and Otitis Media in Children

We found that there was no association between maternal occupation and otitis media in children ($P = 0.803$). Among children with employed mothers, 21 (17.5%) had otitis media, whereas 99 (82.5%) of children with unemployed mothers had OM. Similarly, no significant association was found between maternal age and otitis media ($P = 0.328$). Thirty-five (29.2%) of mothers with children who had otitis media were between the ages of 15 and 25, 62 (51.6%) were between the ages of 26 and 35, and 23 (19.2%) were over the age of 35.

Considering the educational levels of the mother and the otitis media, we found that 50.9% of OM children were born to illiterate mothers. In contrast, 35%, 10.8%, had parents who had completed primary school, and secondary school, and only 3.3% had graduated from university. However, this association was not significant at (P -value = 0.668). In addition, otitis media in children was not associated with maternal marital status ($P = 0.372$). 79.2% of children with otitis media had married mothers. Meanwhile, 15.8% and 5% had divorced or widowed mothers (Table 3).

3.5. Relationship of Socioeconomic Status and Residency with Otitis Media

According to the bivariate analysis, there is a statistically significant association between the socioeconomic status of children and their development of OM

Table 2. Association between age of child and gender for otitis media.

	Otitis media			p-value	Odd ratio	95% C.I for EXP (B)	
	Yes	NO	Total			Upper	Lower
Age of child							
0 - 12 m	52 (43.3%)	145 (54.9%)	197 (51.3%)			Upper	Lower
13 - 36 m	39 (32.5%)	88 (33.3%)	127 (33.1%)	0.006	1.343	0.871	2.072
37 - 59 m	29 (24.2%)	31 (11.7%)	60 (15.6%)				
Gender							
Male	67 (55.8%)	128 (48.5%)	195 (50.8%)	0.182	0.648	0.485	0.866
Female	53 (44.2%)	136 (51.5%)	189 (49.2%)				

Table 3. Association between occupation, age, and education level of the mother.

	Otitis media					
	Yes	NO	Total	p-value	Odd ratio	95% C.L for EXP (B)
Occupation of the mother						
Employed	21 (17.5%)	49 (18.6%)	70 (18.2%)	0.803	0.931	Upper
Unemployed	99 (82.5%)	215 (81.4%)	314 (81.8%)			Lower
Maternal age						
15 - 25 yrs	35 (29.2%)	96 (58.5%)	131 (34.1%)	0.328	0.790	1.080
26 - 35 yrs	62 (51.6%)	128 (17.1%)	190 (49.5%)			
>35 yrs	23 (19.2%)	40 (24.4%)	63 (16.4%)			
Educational level						
Illiterate	61 (50.9%)	147 (55.7%)	208 (54.2%)	0.668	0.962	1.247
Primary	42 (35%)	76 (28.8%)	118 (30.7%)			
Secondary	13 (10.8%)	30 (11.4%)	43 (11.2%)			
University	4 (3.3%)	11 (4.2%)	15 (3.9%)			
Marital status						
Married	95 (79.2%)	222 (84.1%)	317 (82.6%)	0.372	0.743	1.140
Divorced	19 (15.8%)	35 (13.3%)	54 (14.1%)			
window	6 (5%)	7 (2.7%)	13 (3.4%)			

($P = 0.004$). The majority of children with otitis media, 60%, were from low socioeconomic backgrounds. However, the relationship between children's residence and OM was not statistically significant ($P = 0.065$). A total of 28 (23.3%) of the children with otitis media resided in IDPS and 92 (76.7%) in normal households (Table 4).

3.6. Association of Child Snoring and Malnutrition with Otitis Media

A significant association was found between snoring and otitis media in children ($P < 0.001$). The presence of snoring was reported by 35 (29.2%) of the patients with otitis media. Regarding the association between nutritional status and otitis media, 65 (54.2%) of children with OM had malnutrition. The association was found to be statistically significant ($P = 0.012$), indicating that malnourished children are more likely to develop OM (Table 5).

3.7. Association of Parenteral Smoking and Upper Respiratory Infections with Otitis Media

In this study, parenteral smoking was not associated with an increased risk of developing otitis media in children ($P = 0.987$). It was found that only 24.2% of the children exposed to parenteral smoking experienced otitis media. However, the risk of developing otitis media was significantly associated with a history of

Table 4. Relationship of socioeconomic status and residency with otitis media.

	Otitis media					
	Yes	NO	Total	p-value	Odd ratio	95% C.L for EXP (B)
Socioeconomic status of the mother						
<200 kshs	72 (60%)	111 (42%)	183 (47.7%)			Upper Lower
200 - 400 kshs	45 (37.5%)	146 (55.3%)	191 (49.7%)	0.004	1.870	2.822 1.239
>400 kshs	3 (2.5%)	7 (2.7%)	10 (2.6%)			
Residence						
IDPs camps	28 (23.3%)	41 (15.5%)	69 (18%)	0.065	0.085	0.091 0.080
Normal house	92 (76.7%)	223 (84.5%)	315 (82%)			

Table 5. Association of child snoring and malnutrition with otitis media.

	Otitis media					
	Yes	NO	Total	p-value	Odd ratio	95% C.L for EXP (B)
Child snoring						
Snoring	35 (29.2%)	28 (10.6%)	63 (16.4%)	0.000	3.406	Upper Lower
No snoring	85 (70.8%)	236 (89.4%)	321 (83.6%)			5.979 1.940
Nutritional status						
Malnourished	65 (54.2%)	178 (67.4%)	243 (63.3%)	0.012	1.751	2.274 1.126
Normal	55 (45.8%)	86 (32.6%)	141 (36.7%)			

upper respiratory tract infections in children ($P < 0.001$). A total of 67.5% of children with upper respiratory tract infections developed otitis media, suggesting that upper respiratory tract infections may increase the likelihood of developing otitis media in children (**Table 6**).

3.8. Association of Previous Otological Complaints, Recurrent Ear Infection, and the First Episode of Ear Infection with Otitis Media

Previous otological complaints were found to be significantly associated with otitis media ($P = 0.000$). Approximately, 84.2% of children with OM had previous otological complaints, and only 15.8% had not. Consequently, children who have previously experienced otological complaints are more likely to develop OM than those who do not. Furthermore, recurrent ear infections were associated with a greater risk of developing otitis media in children ($P < 0.001$). Hence, this indicated that children with recurrent ear infections are more likely to develop OM.

In terms of the association between the first episode of an ear infection and otitis media, we found that there is a significant association ($P = 0.000$). Approximately 28.3% of children with otitis media had their first episode of ear infection between the ages of 0 and 6 months, while 33.3% had it between the ages

Table 6. Association of parenteral smoking and URTI with otitis media.

	Otitis media			p-value	Odd ratio	95% C.I for EXP (B)	
	Yes	NO	Total			Upper	Lower
Parenteral smoking							
Yes	29 (24.2%)	64 (24.2%)	93 (24.2%)	0.987	0.6365	Upper	Lower
NO	91 (75.8%)	200 (75.8%)	291 (75.8%)				
URTI							
Yes	81 (67.5%)	108 (40.9%)	189 (49.2%)	0.000	3.000	4.724	1.905
NO	39 (32.5%)	156 (59.1%)	195 (50.8%)				

of 7 and 12 months. Nevertheless, only 5.8% and 1.7% of children had their first episode of ear infection at the ages of 13 - 36 months and 37 - 59 months; respectively. Furthermore, 30.9% of children with otitis media had not previously experienced an ear infection (**Table 7**).

3.9. Association of Feeding and Otitis Media

In terms of the relationship between breastfeeding duration and otitis media. We found that there is a significant association between the two ($P = 0.039$). A majority, of the children with otitis media 38.3% had no previous history of breastfeeding. Meanwhile, 32.5% and 19.2% of the children with Otitis media had breastfeeding duration of <6 months and 6 - 12 months; respectively. Moreover, only 10% of the children diagnosed with otitis media had a previous history of breastfeeding >12 months. Based on these findings, children who received breast milk for more than one year had the lowest risk of developing otitis. This indicates that breast milk had a protective effect against otitis media.

On the other hand, bottle-feeding was significantly associated with an increased risk of otitis media in children ($P = 0.007$). Approximately 75.8% of the children with OM were bottle-fed, which indicates that bottle-feeding increases a child's risk of developing otitis media.

There was also a significant association between feeding in laying position and the development of OM in the children ($P < 0.001$). Approximately 62.5% of the children with OM were fed in a lying position. The lying position is therefore associated with a significantly increased risk of otitis media in children (**Table 8**).

3.10. Association between Dripping Kind or Dripping of Child's Ear and Otitis Media

Regarding of the dripping of a child's ear, we found that dripping something into a child's ear was strongly associated with otitis media in the children ($P < 0.001$). It has been estimated that approximately 75% of children with OM have previously had something dripped on their ears by the caregivers. Furthermore, Western medicine was found to be the most common method of drip application

Table 7. Association of previous ontological complaints, recurrent ear infection and the first episode of ear infection with otitis media.

	Otitis media			p-value	Odd ratio	95% C.L for EXP (B)	
	Yes	NO	Total			Upper	Lower
Previous O. complain							
Yes	101 (84.2%)	32 (12.1%)	133 (34.6%)	0.000	1.6595	Upper	Lower
NO	19 (15.8%)	232 (87.9%)	251 (65.4%)			2.801	0.518
Recurrent ear infection							
Yes	78 (65%)	23 (8.7%)	101 (26.3%)	0.000	1.512	4.520	0.506
NO	42 (35%)	241 (91.3%)	283 (73.7%)				
The first episode of ear infection							
None	37 (30.9%)	238 (90.2%)	275 (71.6%)	0.000	1.505	1.505	2.512
0 - 6 m	34 (28.3%)	10 (3.8%)	44 (11.5%)				
7 - 12 m	40 (33.3%)	13 (4.9%)	53 (13.8%)				
13 - 36 m	7 (5.8%)	2 (0.7%)	9 (2.3%)				
37 - 59 m	2 (1.7%)	1 (0.4%)	3 (0.8%)				

Table 8. Association of feeding and otitis media.

	Otitis media			p-value	Odd ratio	95% C.L for EXP (B)	
	Yes	NO	Total			Upper	Lower
Breastfeeding duration							
Never	46 (38.3%)	21 (8%)	33 (8.6%)	0.039	0.765	Upper	Lower
<6 months	39 (32.5%)	114 (43.2%)	153 (39.8%)				
6 - 12 months	23 (19.2%)	103 (39%)	149 (38.8%)				
>12 months	12 (10%)	26 (9.8%)	49 (12.8%)				
Bottle feeding							
Yes	91 (75.8%)	163 (61.7%)	254 (66.1%)	0.007	1.718	2.874	1.028
No	29 (24.2%)	101 (38.3%)	130 (33.9%)				
Feeding in laying Position							
Yes	75 (62.5%)	113 (42.8%)	188 (49%)	0.000	1.936	3.070	1.221
No	45 (37.5%)	151 (57.2%)	196 (51%)				

at 46.7%. The second most common method was traditional medicine 28.3%, while 25% of children with otitis media did not receive any drip application. Thus, drip application of Western medicine or traditional medicine into a child's ear can significantly increase the risk of developing otitis media ($P < 0.001$) (Table 9).

Table 9. Association between dripping kind or dripping of child's ear and otitis media.

	Otitis media			p-value	Odd ratio	95% C.L for EXP(B)	
	Yes	NO	Total			Upper	Lower
Dripping to child's ear							
Yes	90 (75%)	19 (7.2%)	109 (28.4%)	0.000	1.7065	2.102	1.311
No	30 (25%)	245 (92.8%)	275 (71.6%)				
Kind of dripping							
Traditional Medicine	34 (28.3%)	8 (3%)	42 (10.9%)				
Western Medicine	56 (46.7%)	11 (4.2%)	67 (17.4%)	0.000	1.2695	1.690	0.849
None	30 (25%)	245 (92.8%)	275 (71.6%)				

4. Discussion

In this study, we conducted a hospital-based cross-sectional study to identify the prevalence and the underlying risk factors of OM among children under the age of five in Mogadishu, Somalia. We found that the prevalence of otitis media in children aged less than 5 years was 31.25 percent. Our finding is consistent with the previous study by Martines *et al.*, [19] who found that otitis media is highly widespread in young children, with a prevalence of 31.3% depending on the methodologies used and demographic variables such as race and environmental factors. Similarly, Holmquist *et al.*, [20] found that 31.3% of 893 children of similar ages in Kuwait suffered from otitis media. Moreover, 25% of the children diagnosed with acute otitis media had otorrhea, and 6.25% had a perforation of the eardrum, which is consistent with the findings of Hullege *et al.* [21]., who determined that 15% - 20% of children with acute otitis media (AOM) had acute onset ear discharge caused by spontaneous perforation of the tympanic membrane.

In terms of the association between the age of the child and otitis media, we found that the highest age group for otitis media was in the age range of 0 - 12 months (43.3%), which suggests that children under the age of one are significantly more likely to develop otitis media. This finding supports previous studies that found that otitis media primarily affects young children, with the highest occurrence observed during the first year of life [3]. It has been found that the higher occurrence of otitis media in this age can be attributed to the underdeveloped immune system and the structural and functional immaturity of the Eustachian tube. In infants, the Eustachian tube is characterized by a shorter length, a wider diameter, and a more horizontal orientation compared to adults. These anatomical differences explain the heightened prevalence of otitis media in infants and young children [22].

In terms of gender distribution, we found that there is no significant differ-

ence between males and females in the overall prevalence of middle ear infections, with males slightly higher 55.8% compared to females 44.2%. This was consistent with the study in Nigeria by Orji *et al.* [23], which showed that the proportions of males and females diagnosed with OM were not significantly different. Male predominance of the disease was reported in many studies; however, Humaid, *et al.* from Saudi Arabia did not observe a gender difference regarding the prevalence of OM among children [24].

In regards to the association between malnutrition and OM, it has been shown that 54.2% of children with OM suffer from malnutrition. This indicates that malnourished children are more likely to develop OM. The results of this study are consistent with the findings of Spero *et al.*, who conducted a study in Benin and discovered that 32.7% of the participants were suffering from global acute malnutrition [25]. Severe malnutrition may be a risk factor for the onset of AOM. This might be explained by the fact that starvation weakens the human body's immunological defense.

In terms of the association between upper respiratory tract infections and otitis media, we found that 67.5% of children with otitis media had upper respiratory tract infection. This indicates a very strong significant risk of developing Otitis media in those with upper respiratory tract infection. This finding supports the previously published studies that found that otitis media is common in children with upper respiratory infections. In addition, other studies reported that 29-50% of all children with upper respiratory tract infections develop otitis media. For instance, Revai, *et al.* [26], found a high prevalence of symptomatic viral URI among young children, and >60% of cases were complicated by acute otitis media (AOM). This is primarily attributed to the inflammatory response and cellular damage caused by viruses, which subsequently impair the function of the Eustachian tube. Consequently, there is a reduction in the ventilation of the middle ear and an accumulation of fluid and nasopharyngeal bacteria within the middle ear cavity [27].

On the other hand, otitis media was not associated with parental smoking in this study, which supports the findings of a study conducted in preschool-aged children in Nigeria. Only 24.2% of the children exposed to parental smoking were diagnosed with otitis media [28].

Breastfeeding has been shown to decrease the risk of developing otitis media in children [29]. In this study, we found that breastfeeding duration is significantly associated with otitis media. Children who received breast milk for more than one year had the lowest risk of developing otitis. The immune responses of children who are prone to otitis are defective or immature, especially with low levels of immunoglobulin G2 (IgG2) [30]. Therefore, breast milk contains numerous host defense factors, including those that inhibit Haemophilus influenza and lower respiratory tract infections, the leading causes of childhood OM [31].

Feeding in lying position has also been linked with the development of otitis media [32]. In line with these studies, we found that most children with OM were fed in lying position. In a study conducted by Rasool *et al.*, significant asso-

ciations were found between increased AOM incidence and breastfeeding position among 220 breastfed infants. Breastfeeding in a supine position was significantly related to an increased incidence of AOM [32]. Additionally, it has been demonstrated that feeding young infants upright contributes to a reduction in respiratory tract infections and ear diseases in young children [33].

This study has both strengths and weaknesses from a methodological perspective. First, to our knowledge, this was the first study to document otitis media prevalence in Somalia. Secondly, our study examined a large number of risk factors associated with otitis media in children under the age of five. Finally, we interviewed and assessed a large number of mothers and children. The study does, however, have some limitations. The percentage of children with otitis media was lower than that of normal children. Additionally, as a cross-sectional study, the responses were estimated by parents and therefore may not be quantified, and some may have been influenced by recall bias. The risk factors for otitis media among Somali children should be assessed in a further study.

5. Conclusion

In summary, the present study found that otitis media was highly prevalent (31.25%) and is a serious health problem in Mogadishu, Somalia. The majority of the affected children were younger than one year of age. Several factors have been found to increase the risk of developing otitis media in children, including their age, malnutrition, upper respiratory tract infections, feeding in lying position, and dripping something into a child's ears. On the other hand, breastfeeding was found to reduce the risk of developing otitis media in children. Several prospective cross-sectional studies with larger sample sizes are required in the future to assess the prevalence of this disease and the risk factors associated with it in Somalia.

Declarations

Authors' Contribution

Ismail Ali Mohamed conducted data collection, analysis and manuscript drafting. Zakaria Ahmed Mohamed performed the analysis of the data. Wang Xin and Fang Ning conceived and supervised the entire process of the study.

Availability of Data and Materials

The data that support the findings of this study are available on request from the corresponding authors.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendix I-Sample of Questionnaire

The information collected for this study will be collated and analyzed in order to form an accurate picture of this research project on the prevalence and risk factors associated with Otitis media in children under five years of age in Mogadishu, Somalia

Thank you for filling in this questionnaire. Please select the most accurate answer from the box provided.

- 1). Age of the child
 - A: 0 - 12 months
 - B: 13 - 36 months
 - C: 37 - 59 months
- 2). Gender of the child
 - A: Male
 - B: Female
- 3). Occupation of the mother
 - A: Employed
 - B: Unemployed
- 4). What is your marital status?
 - A: Married
 - B: Divorced
 - C: widow
- 5). Age of mother
 - A: 15 - 25 years
 - B: 26 - 35 years
 - C: >35 years
- 6). Educational level of mother
 - A: Illiterate
 - B: Primary
 - C: Secondary
 - D: University
- 7). Socio-economic level
 - A: <200 Shs/day
 - B: 200 - 400 Shs/day
 - C: >400 Shs/day
- 8). Where do you reside in
 - A: IDPs camps
 - B: Normal house
- 9). Parental smoking
 - A: yes
 - B: No
- 10). Is your child snoring?
 - A: yes
 - B: No

11). Does your child have recurrent (dry cough, sneezing, nasal discharge, congestion, runny nose, fever)

A: yes

B: no

12). Did your child have Previous otological complaints (like otalgia, irritability or fever and ear discharge)?

A: yes

B: No

13). Is your child having recurrent ear infections?

A: Yes

B: No.

14). When was the first episode of ear infection occurs on your child?

A: 0 - 6 months.

B: 7 - 12 months.

C: 13 - 36 months

D: 37 - 59 month

E: None

15). Breast feeding duration

A: Never

B: less than 6 months

C: 6 - 12 months

D: more than 12 months

16). Did you fed your child a Bottle?

A: yes

B: No

17). During feeding time do you feed your child in laying position?

A: Yes

B: NO

18). What is the nutritional status of child according Z-score?

A: W/H Z-score \leq median

B: W/H Z-score < -2

C. W/H Z-score < -3

19). Do you drip something into your child's ear?

A: yes

B: no

20). If yes, what do you drip to your child's ear?

A: Traditional medicine

B: Western medicine

C: None

21). Otoscope findings:

A: Discharge

B: Drum perforation

C: Normal

Thank you for your Participation