

## Risk Factors and Presentations of Acute Otitis Media in the Emergency Department of A Specialized Pediatric Hospital

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### Abstract

**Background:** Acute otitis media (AOM) diagnosis in children had always been a dilemma to diagnose, as children presentations usually are a combination of non-specific symptoms rather than an earache. **Objectives:** to identify the risk factors predisposing to AOM and the commonest presentations. **Methods:** Children presented with AOM to our hospital emergency department of age less than five were included. A thorough literature review was done to identify the risk and predisposing factors to AOM, data were collected using a data collection sheet which included the demographic data and the factors gathered from the literature over six months period between June and December 2015 all of the patients were presented in our hospital emergency department. **Results:** 112 children were diagnosed with AOM. The most frequently encountered risk factors for development of AOM was common cold (75%, n= 84), followed by crowding (63.1% n=70) and male sex (61.6%, n=69). Systemic symptoms were noted in the majority patients, fever appears as the commonest clinical presentation (80.4%, n=90) while convulsion is the least (15.2%, n=17), clear ear symptoms were not a constant presentation of our patients. It was found that an earache was statically related to older ages 4-5 years, while fever, irritability, feeding difficulties, and diarrhea were related to young ages of less than 1 year. **Conclusions:** the most frequently encountered risk factors for the development of AOM were a common cold, followed by crowding, and male sex. The most common clinical presentation among the children have AOM was fever, while clear ear symptoms were not constant presentations among our patients.

**Keywords:** *Otitis media, Presentation, Risk factors.*

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### Introduction:

Acute otitis media is one of the most commonly encountered infectious diseases of childhood worldwide.<sup>1</sup> it's defined as the presence of fluid in the middle ear accompanied by acute signs and/or symptoms of middle ear inflammation. (2) AOM is extremely common in children in fact 60 % of children have at least one episode by one year of age, 70% have at least one episode by age of 2 years<sup>3</sup> and by age of 3 years, 2 out of 3 children (80%)

had at least one episode of AOM<sup>1</sup> and nearly 50% have had 3 or more episodes. Peak ages ranged between from 6 to 36 months.<sup>1</sup> It was also reported that 90% of affected children didn't display subjective symptoms.<sup>4</sup> Prolonged contact between the children and smokers<sup>5</sup>, allergic rhinitis, asthma, cow's milk allergy, parenteral atopy, and history of parental otitis media were common risk factors for AOM development.<sup>6</sup>

Exclusive breastfeeding until at least three months of age reduces the incidence of AOM whereas pacifier use in children younger than three years of age increases it.<sup>6</sup> Also, overcrowding, poverty, upper respiratory tract infections, and poor living condition increase the risk for otitis media.<sup>7</sup> *Research question:* What are the risk factors and common presentations of otitis media in children under 5 years?

The main objective of this study is to determine risk factors and common presentations of otitis media at the emergency department at Ahmed Gassim Teaching Pediatrics Hospital.

### **Method:**

**Study design:** a Prospective hospital based cross sectional study design was used in this study. **Study subjects:** the subjects were collected using a simple random sampling of 112 children with otitis media who were attending to the emergency department at Ahmed Gassim Teaching Hospital, Khartoum- Sudan. **Inclusion criteria:** all children between 6 months to 5 years, whether girls or boys attending the pediatrics outpatient clinic with the diagnosis of acute otitis media. **Setting:** Ahmed Gassim Teaching Hospital emergency department, Khartoum- Sudan.

**Data Collection Tool:** Data collection sheet was made in the shape of a Semi-Structured interview questionnaire: it was developed by the researcher after an extensive review of related literature and the consultation of the experts in the field of pediatrics and E.N.T. The questionnaire was in Arabic language and composed of 43 questions.

Data collection tool composed of three parts were as the following:

Part I: Personal and demographic data: It included two questions in relation to their demographic data which are age and gender.

Part II: risk factors to acute otitis media: consisted of 19 questions as common cold, number of member/room, number of siblings, family history of allergy, family history of AOM, personal history of allergies, recent antibiotic use, passive smoking exposure, daycare attendance, lack of exclusive breast feeding, bottle feeding, thumb sucking, pacifier use, no vaccination, recent trauma, presence of chronic disease, tonsillitis, tonsillar enlargement, cleft lips and cleft palate,

Part III: clinical presentation of otitis media: It contained 22 items as irritability, fever, feeding difficulties, vomiting, diarrhea, coughing, snoring, rhinorrhea, convulsions, ear rubbing, earache, discharge, reduction in hearing, tonsillitis, chest infection, and duration of symptoms.

And with regards to local examination of the ear using the otoscope, the following findings were included: tympanic membrane congestion, bulging, air fluid level, opacity, presence of ear discharge and whether these findings are bilateral

**Validity and Reliability:** The content validity of the data collection tool was examined by three pediatrics experts. The tool was examined for content coverage, clarity, relevance, applicability, wording. Based on experts' comments and recommendations; minor modifications had been made such as rephrasing and rearrangements of some sentences.

Internal consistency was measured to identify the extent to which the items of tool measure the same concept and correlated with each other.

Internal consistency estimate reliability by grouping questions in the questionnaire that measure the same concept. Cronbach's alpha for reliability testing internal consistency was performed for each section of the semi-structured interview questionnaire and the results were 0.72 and 0.74 for risk factors and clinical presentation of otitis media respectively.

**Data Collection Procedure:** Children who met the selection criteria were invited to participate in the study. The purpose and the nature of study were explained to each legal guardian individually. The interview took place in the outpatients' rooms in the emergency department of Ahmed Gassim teaching hospital.

The study doctor asked legal guardian relevant history questions and marked their response in semi-structured interview questionnaire and performed otoscopy after diligent cleaning of ear cerumen for better visualization of the tympanic membrane, and cleaning the equipment with alcohol wipes after each patient. Children were treated afterward according to the standard care, each child was ranged from 25 to 30 minutes and at a rate of 3 to 5 child/ week. Data collection was conducted over a six months' period extending from June 2015 until December 2015. The study didn't interfere with applying the appropriate need care to the patients of the study or any other patients presented to the emergency department.

**Pilot Study:** The pilot study was conducted on 11 children who met the inclusion criteria. It was done to investigate and ensure the feasibility, objectivity, applicability, clarity, adequacy, content validity, and internal consistency of the study tool and to determine possible problems in the methodological approach or tool. The results of the pilot study were used to test the proposed statistical and data analysis methods. The tools were completed without difficulty, adding support to the validity of the instrument. A little modification was done e.g. rephrasing and rearrangements of some sentences. The time required for completion of the interview questionnaire didn't exceed 30 minutes. Children involved in the pilot study were included from the main study sample.

### **Statistical Analysis:**

The collected data were, coded, categorized, tabulated, and analyzed using the Statistical Package for the Social Science (SPSS 20.0). Qualitative data were expressed as frequency and percentage.

### **Ethical Consideration:**

An official written approval was obtained from the Research Ethical Committee of the Sudan medical specialization board and clinical governance manager at Ahmed Gassim Teaching Hospital. Informed written consents were sought from legal guardians. Patients were given study numbers to ensure preserving their confidentiality through collecting and analyzing data.

### **Results:**

Figure 1 showed the distribution of studied children as regard to their age. Children age distribution in this study was as follow: 20.5 % of ages were less than 1 year, 10.7 % were between 1-2 years, 28.6 % were aged 2-3 years, 15.2 % aged 3-4 years, and 25% aged 4-5 years

Figure 2 illustrated the distribution of studied children as regard to gender. The number of males included in the study was 69 (61.6%), more predominant than females (n =43 i.e. 38.4%)

Figure 3 presented distribution of studied children with regard to breast feeding. It was found that almost 70% of the studied children were exclusively breastfed up to 6 months (n=78).

Figure 4 shows distribution of studied children with regard to clinical presentation systemic symptoms were noted in almost all patients (93.8 %, n=105), fever appears as the commonest clinical presentation (80.4%, n=90), followed by cough (71.4 %, n=80), rhinorrhea (60.7%, n=68), irritability (51.8 %, n=58) and feeding difficulties (41.1 %, n=460). Patients presenting with vomiting and diarrhea were 38.4% and 31.3%

**Table 1: Risk factors of AOM**

Risk factors	N	%
Common Cold	84	75.0
More than 2 member/ room	70	63.1
Male sex	69	61.6
More than 2 siblings	53	48.6
Family history of allergy	50	44.6
Recent antibiotic use	44	39.3
Smoking	44	39.3
Personal allergy	36	32.1
Not exclusively breast fed	34	30.4
Tonsillitis	31	27.7
Family history AOM	30	26.8
Tonsillar enlargement	28	25.0
No vaccination	25	22.3
Trauma	15	13.4
Chronic disease	10	8.9
Cleft lip & palate	1	0.9

respectively. Convulsions (15, 2%, n=17) were the least clinical presentation in the study. Snoring was found in 19, 6 (n=22). Ear symptoms including ear rubbing (33%), earache (30.4%) and ear discharge (22.3%). 58.8 % of an earache was severe in nature while 41.2 % was mild.

Figure 5: illustrates the general examination findings. The most common examination finding reported was inflamed nasal mucosa (71.4%) then fever (65.2%), followed by tonsillar enlargement (25%) and tonsillitis (19.6%). Conjunctivitis was found in only 10.7%. In our study, only 6.3% (n=7) were found to have facial dysmorphias not involving the ears and only one (0.9%) was found to have cleft lip and palate. Most of our patients had good oral hygiene with only 3 were having problems with their oral hygiene (2.7%)

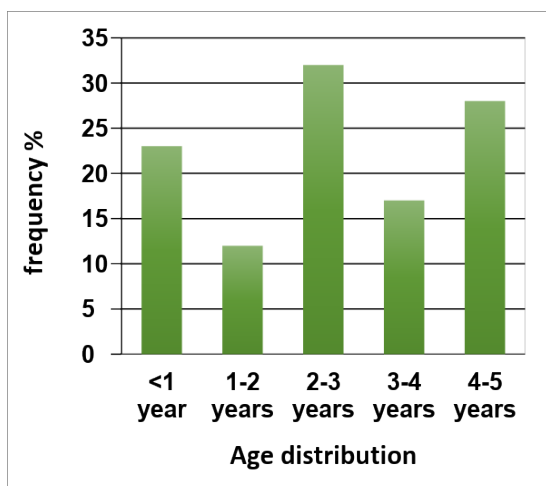
Table 1: presents the distribution of studied children with regard to risk factors of otitis media. 43.8 % of our patients were bottle fed at some point (n= 49} Furthermore 26.8 % (n=30) of our patients had a thumb sucking beside breastfeeding and only 3 patients (2.7%) used the

pacifier. Common cold was found (75%, n= 84) and half of the study population (49.1%) had a history of chest infection, 27.7% had tonsillitis, while only 8.9% suffer from a chronic illness. 39.3% of our children received antibiotics recently. While 60.7 % of population had not received antibiotics. 48.2% of those who received antibiotics received amoxicillin/clavulanic acid (n=27), 8.9% received injectable Penicillin (n=5), 17.9% received Macrolides (n=13) and 14.3 % received 2nd generation Cephalosporin (n=11). 32, 1 % of our patients have history of allergy (n=36) of whom 26.8% had asthma (n=30), 7.1% had eczema (n=8) and 1, 8% had both (n=2), while

**Table 2: Tympanic membrane findings**

Tympanic membrane findings	N	%
Congestion	109	97.3
Bulging	50	44.6
Opacity	24	21.4
Air / fluid level	18	16.1
Discharge	13	11.6

none had history of allergic rhinitis. 67.9% (n=76) of the study population does not go to the daycare while the rest do (32.1%, n=36). About 26.8% had a first degree relative with AOM (n= 30) while the majority (73.2 % i.e. n=82) didn't have a family history of such The family history of asthma was found in 44. 6% (n=50), allergic rhinitis in 8% (n=9), and eczema in 6.3% (n=7) Almost half of our patients had 2 or fewer siblings, and half had more than 2 siblings. 63.1 % of our patients' homes included more than 2 family member per room (n=70), while 36.9 % had 2 or less family member per room (n= 42). 39.3 % of the study population had a smoking parent (n=44) while 60.7%% didn't have a smoking parent (n=68). 77.7% were vaccinated according to the Sudanese EPI program (n=87) while 22.3% were not vaccinated (n=25). 13.4 %



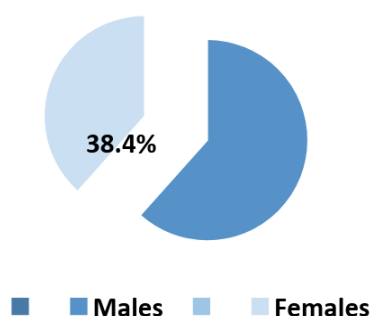
**Figure 1: Age Group Distribution of AOM Patients**

of the population has a history of trauma around the ear (n=15).

Table 2: report ear examination findings. Tympanic membrane congestion was reported in 97.3% of the population with AOM, 44.6% had a tympanic membrane which was bulging while 21.4% had opacity, clear air fluid level was seen in

**Figure 2: Sex Distribution of AOM Patients**

16.1% and discharge was found in only 11.6% of our patients. Bilateral findings were found in nearly half of our patients (56.6%) None of our patients had complications of AOM such as mastoiditis, facial palsy, etc. None of our patients had duration of symptoms of more than 2 weeks. None of our patients had a recurrent AOM and 20 had severe AOM



(18%). In our study we found earache

statically related to older ages 4-5 years (p value = 0 .010),fever, irritability, feeding difficulties , diarrhea related to young ages of less than 1 years (p values=0.031, 0.004, 0.004 , 0.002 respectively), convulsions were related to ages 1-3 years (p value .017) while no relationship was found between age and vomiting (*P* - value .196)

## Discussion:

Of the 112 children diagnosed with AOM, 20.5% of them were between 6-12 months, 10.7% in the 2nd year of life, 28.6% in the 3<sup>rd</sup> year (most common year affected), 15.2% in the 4th year, 25% ages in the 5<sup>th</sup> year (quarter of the study population), this slightly differs from Saad et al<sup>3</sup> observation that most children were between ages 3-6 years (34.2%), followed by 1-3 years (25%) and with international data that the peak prevalence is between 6 and 36 months of age <sup>1</sup>, essentially the 2<sup>nd</sup> 6 months of life.<sup>3</sup>

With regard to gender, it was found that just above two thirds (61.6%) of studied children were boys' child its concordance with who found that, 62.5% of his patients were boys and also with international data.<sup>7</sup>

The male predominance (61.6%) goes in concordance with similar studies including by saad et al<sup>3</sup> who found 62. 5% of his patients were males. This male predominance can't be explained as no knowledge of any anatomical difference between the ear anatomy of males and females has been found but some may argue that the high incidence of male patients presenting with AOM could be because of the active and adventurous nature of the boys that predispose them to traumas and more exposure to pathogens.<sup>8</sup>

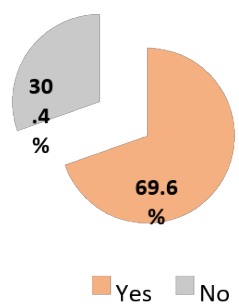
Almost 70% of the study population was breastfed of which the majority (96.2 %) was exclusively breastfed for 4-6 months. 43.8 % of our patients were bottle fed at some point. The lack of the protective

**Figure 3: Exclusive breast feeding**

effect among our patients can be explained by current feeding habits among Sudanese mothers since breast or bottle feeding on demand, falling asleep while feeding or feeding in the supine position are known to increase the risk of acquiring infections. Also, there is increased the occurrence of AOM in children who were burped occasionally after feeding or who were not burped at all.<sup>9</sup> Furthermore, 26.8% (n=30) of our patients had a thumb sucking beside breastfeeding and only 3 patients (2.7%) used the pacifier.

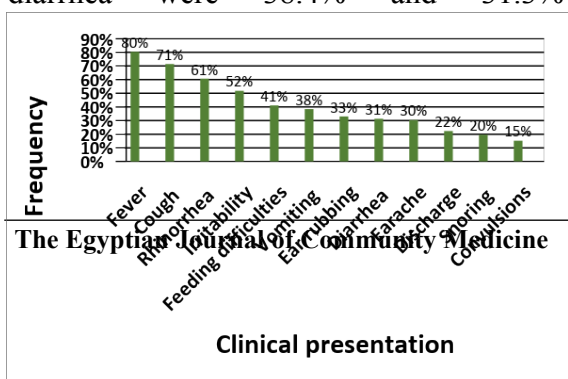
**Figure 4: Clinical presentations**

In the study population, systemic symptoms were noted in the majority patients (93.8%, n=105), fever appears as the commonest clinical presentation (80.4% much higher than Saad et al who documented only 51.7%<sup>3</sup> and more than international data which documented fever rates between third to half of cases<sup>2</sup>, followed by cough (71.4%, n=80), rhinorrhea (60.7%, n=68), irritability (51.8% same as Saad et al<sup>3</sup> and feeding



difficulties (41.1%).

Patients presenting with vomiting and diarrhea were 38.4% and 31.3%



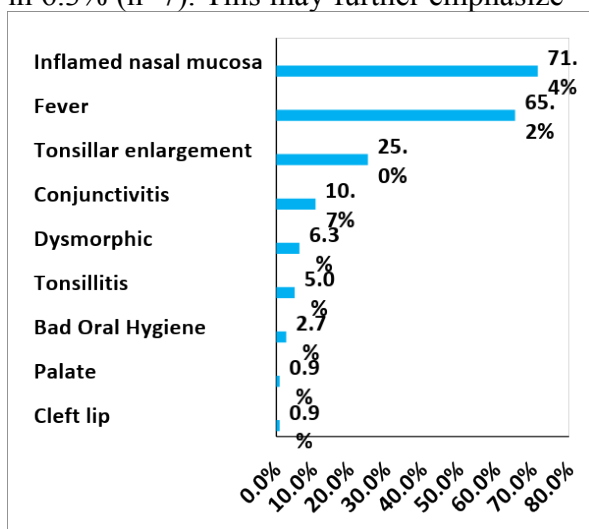
respectively (higher than Saad et al finding of only 11.7%).<sup>3</sup> Snoring was found in 19.6 (n=22) while in Saad et al study snoring was documented in 31.7.<sup>3</sup>

Ear symptoms including in order frequency ear rubbing (33%), earache (30.4%) and ear discharge (22.3%) and reduction of hearing in only 3 (2.7%) this disagrees with Saad et al finding who stated that ear discharge was found in half of his study population and higher rates of hearing reduction (22, 5%).<sup>3</sup> This also disagrees with a systematic review of 4 studies, that an earache was only present in 50% to 60% of children with AOM.<sup>10</sup> Although it was noted that children older than two years complained of ear pain more frequently than children younger than two years (25 vs 7 % as stated in a prospective study of 335 consecutive episodes of AOM.<sup>2</sup>

Recent history of common cold was found in the three quarter of our patients (75%, n= 84, similar to Seed et al study<sup>3</sup> and half of the study population (49.1%) had a history of chest infection, 27.7 % had tonsillitis, this support the contribution of viral infection to the onset of AOM that's supported by llechukwu et al<sup>1</sup> who mentioned that presence of viral infection increases bacterial adhesion in the nasopharyngeal tissue.

32, 1% of our patients had history of allergy (n=36) 26.8% of them has history of asthma (n=30, which is slightly higher than Saad et al observation of only 18% of his study population having asthma<sup>3</sup>, 7.1% with eczema (n=8) which may indicate the role of allergy in the development of AOM Although family history of allergies was more asthma was found in 44, 5% (n=50), allergic rhinitis in 8% (n=8), and eczema

in 6.3% (n=7). This may further emphasize



**Figure 5: General examination findings**

the role of allergy in the pathogenesis of asthma.

26.8% had a first degree relative with AOM (n= 30) while the majority (73.2 i.e. n=82) didn't have a family history of such [which may suggest that genetics have little effect on the occurrence of AOM in our study population.

63.1 % of our patients home included more than 2 family member per room (n=70) while 36.9% had 2 or less family member per room (n= 42), also almost half of our patients had 2 or fewer siblings, and half had more than 2 siblings, this observation comes in concordance of international data and Saad et al results that 60% of his patients live in overcrowded homes, although his patients had less than 3 siblings in 36.7%, between 3-6 siblings in 45.8%, and more than 6 siblings in 17.5%.<sup>3</sup> Bilateral findings in clinical examination were found in nearly half of our patients (56.6%), in disagreement with Saad et al observation of only 30%<sup>3</sup> and international data where 18-39% of cases were bilateral<sup>11</sup>, it was also noted that bilateralism is related to age and it is more common for ages less than 2 years (p = 0.027) and it is not related to particular

gender (p = 0.642) the propensity for unilateralism maybe explained by asymmetry of the URTI and recumbence to one side<sup>3</sup>, however it needs further evaluation.

Tympanic membrane congestion was reported in 97.3% of the population with AOM, 44.6% had a tympanic membrane which was bulging while 21.4% had opacity, clear air fluid level was seen in 16.1% and discharge was found in only 11.6% of our patients. None of our patients had complications of AOM such as mastoiditis, facial palsy, etc. None of our patients had duration of symptoms of more than 2 weeks. In our study we found earache statistically related to older ages 4-5 years (p value = 0.010), fever, irritability, feeding difficulties, diarrhea related to young ages of less than 1 years (p =0.031, 0.004, 0.004, 0.002 respectively), convulsions were related to ages 1-3 years (p = 0.017) while no relationship was found between age and vomiting (p value 0.196).

## Conclusion:

Otitis media affected in children ranged between 6 months to 36 months and boys more than girls. The most frequently encountered risk factors for the development of AOM were a common cold, followed by male gender. Fever was the commonest clinical presentation while convulsion is the least present among studied children.

AOM was found to affect children during their 3rd year with boys affected more than girls. The most frequently encountered risk factors for the development of AOM were a common cold, followed by crowding and male sex.

Systemic symptoms were noted in the majority patients, fever appears as the commonest clinical presentation while convulsion is the least, clear ear symptoms were not a constant presentation of our

patient. It was found that an earache statically related to older ages 4-5 years, while fever, irritability, feeding difficulties, and diarrhea related to young ages of less than 1 year.

Tympanic membrane congestion and bulging were the most common otoscopy finding while clear air fluid level and discharge were found the least.

#### Recommendations:

Otoscope examination should be performed to all children with fever, irritability, excessive crying, convulsions, vomiting, and diarrhea without a clear history of the underlying cause.

Training the entire health professional section involved with children about the use of otoscope and raising their awareness of possible presentations of AOM.

Breastfeeding should continue for at least the first 6 months and improving feeding practices, feed in upright position if bottle feeding is necessary

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