

Recurrent Otitis Media among Infants and Children in Arar City, Northern Saudi Arabia

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Abstract

Background: Otitis media (OM) is the inflammation of the mucous membrane of the middle ear cleft, which includes the middle ear cavity (tympanic cavity), mastoid antrum, mastoid air cells, and the Eustachian tube. It is the second most prevalent pediatric diagnosis of upper respiratory infections in the emergency department. **Method:** This is an analytical cross-sectional study that was carried out on 336 children in Maternity and Children Hospital in Arar city, Northern Saudi Arabia. The study aimed to show the prevalence and risk factors of recurrent otitis media among infants and children in Arar City, Northern Saudi Arabia. **Results:** The study found that more than half of cases, 53.6%, had otitis media in the last seven months, and 23.2% had recurrent otitis media (ROM). The most common symptoms of otitis media were otalgia reported by 70%, followed by crying and irritability 36.7%. As regard complication, 35.6% of OM cases had complications. More than half (54.7%) had otitis interna followed by 45.3% had a hearing impairment, and 17.2% had mastoiditis. **Conclusion:** The study concluded that the majority of cases had otitis media, but, recurrent otitis media occurred in 23% of cases. The most common symptom was otalgia. Although there were improvements in the treatment, complications occurred in a third of cases.

Keywords: Recurrent otitis media, prevalence, risk factors, treatment, complications.

INTRODUCTION

Otitis media is known as middle ear fluid infection. It is the second most prevalent pediatric diagnosis of upper respiratory infections in the emergency department [1]. Although otitis media occurs at any age, it is often observed at 6 to 24 months of age [2]. AOM is very common, and 75% of children experience at least one ear infection before starting school [3]. In up to 20% of children, recurrent AOM has been reported to occur in the first 6 months of life [4].

AOM risk factors include young age and regular interaction with other children, which contributes to increased exposure to viral diseases. Many risk factors include orofacial defects (such as cleft palate), household crowding, cigarette smoke exposure, use of pacifiers, shorter breastfeeding length, prolonged bottle feeding when lying down, and a family history of otitis media [5, 6]. Symptoms are unspecific and are insufficient to diagnose AOM on their own. Systemic symptoms, such as trouble sleeping or reduced playfulness, irritability, and fever, are typical even in the absence of AOM in respiratory viral infections (e.g., influenza and respiratory syncytial virus infections) [7, 8]. However, in infants with an illness, symptoms may be non-specific and difficult to identify [9].

Compared to older children, infants experiencing AOM before 12 months of age are more likely to develop

concomitant conductive hearing loss, prolonged middle ear effusion, recurrent AOM, and are more likely to require a tympanostomy tube surgery [10]. Due to the increasing antibiotic resistance, the potential for long-term learning disability, and high prevalence, treatment costs, it is essential to accurately characterize the incidence trends and related risk factors of otitis media [11].

The occurrence and severity of specific symptoms, observed by parents, when combined with known risk factor data, may provide clues to the absence or presence of concurrent AOM in young infants with URI [12].

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An epidemiological study was done in KSA among 9540 children aged up to 12 years to assess the prevalence of AOM and the rate of hearing impairment. 100 (1.05%) children with acute otitis media (AOM) were diagnosed. The incidence was lower in the age group of 8-12 years and higher in young children up to 4 years of age. Female children had a slightly lower rate of AOM as compared with males (0.80% and 1.36), respectively ($P < 0.01$). Moreover, AOM was more prevalent among children whose parents were cousins compared to non-relative parents (1.38 and 0.74%) ($P > 0.001$). Those with poor socio-economic conditions showed a higher rate, especially those living in the Southern part with poor or inadequate health services provided^[13].

Another study conducted to assess the usefulness of symptoms and other risk factors in predicting the incidence of AOM in infants reported that infants ($N=193$, mean age at first URI 3.9 ± 2.5 months) experienced 63 AOM events and 360 URI episodes. Symptoms including restless sleep, poor feeding, earache, fever, and irritability together (ETG-5) were statistically associated with the prediction of AOM ($P=0.006$). Multiple variable statistical models (J-Score) that included daycare attendance, earache, age, and the severity of cough best predicted AOM ($P < 0.001$), with 95% specificity. Both J-score and ETG-5 had relatively low sensitivity for predicting AOM^[14].

Study objectives:

To show the prevalence and risk factors of recurrent otitis media among infants and children in Arar City, Northern Saudi Arabia

METHODOLOGY:

An analytical cross-sectional study was performed in Children and Maternity Hospital in Arar City, Northern Saudi Arabia.

Sample size and sampling technique:

We calculated our sample size using standard online tools through the following formula ($N=(Z\alpha)^2 \times ([p(1-p)]/d^2)$)

Where:

n = estimated sample size, $Z\alpha$ at 5% level of significance = 1.96, d = level of precision and is estimated to be 0.05, p = prevalence of recurrent otitis media in two previous studies (50%).

The expected response rate was estimated to be 80%, adding a 20% non-response, so the minimum sample size was 343 children.

The sampled participants were selected using the systematic random sampling technique. We included every 2nd child until the end of the sample.

Data were collected from the mothers or caregivers of infants and children using a pre-designed questionnaire, which distributed to be self-reported. The questionnaire included a brief introduction or explanation of the idea of the research to children mothers. To collect data, mothers filled out the pre-designed questionnaire, including:

- Socio-demographic characteristics of the participants including sex and age of the child and educational and marital status of parents, consanguinity between parents, hereditary diseases and average monthly family income
- If the child has otitis media, recurrence of OM, and the number of recurrences if existed.
- Questions about otitis media (family history, symptoms, diagnosis, complications, and treatment of otitis media)

Statistical analysis:

Collected data were coded and analyzed using SPSS, v5. Descriptive statistics for the prevalence and quantitative variables were used. The relation between otitis media and socio-demographic characteristics was determined using A 2-sided p-value that was considered statistically significant if it was less than 0.05. The evaluation of the relation between (age, occupation, marital status, educational level) was done using the Chi-square test.

Ethical considerations:

This study was reviewed and approved by the Research Ethics Committee of the Faculty of Medicine, Northern Border University. Participants were informed that participation was entirely voluntary, and the questionnaire had a brief introduction to explain the research idea to participants. No names were recorded on the questionnaires, and all questionnaires were kept safe.

RESULTS

The study included 336 participants. Table 1 shows that 57.1% were aged 4-9 years, 33.0% were three years old or less, and the mean age \pm SD was 5.3 ± 3.0 . Males constituted 53.3%. The majority of mothers and fathers had a university degree or more (79.8%, and 60.1%, respectively), whereas only 5.4% and 2.1% of mothers and fathers had primary education or were illiterate, respectively. Consanguinity between parents was reported by 45.8%, and one or both parents were smokers in 45.8% of cases. Of all, 41.7% of families had a very good financial status. Artificial feeding was reported among 74.4%.

As shown in Table 1, the prevalence of ROM was 18%, 24.0%, and 39.4% among children aged three years or less, 4-9 years, and ten years or more, respectively. Females had a higher prevalence (27.4%) than males (20.1%). The highest prevalence of ROM among financial status groups was among poor families (37.5%), and the lowest was among excellent financial status families (18.9%). ROM was more common among children with consanguine

parents (25.3% vs. 22.0%). None of these factors was significantly associated with the prevalence of the disease ($P>0.05$).

Table 2 shows the prevalence of otitis media reported in children in the last seven months (53.6%), and prevalence of ROM (23.2%).

Table 3 shows the association between ROM and different clinical factors among children who suffered from otitis media one time or more in the last seven months. Symptoms were significantly associated with recurrence ($P=0.025$), as the highest recurrence rates were reported among the

children who had difficulty hearing (64.9%), discharge (57.1%), headache (54.5%), sleeplessness (53.1%), fever (48.8%), anorexia (48.6%), otalgia (44.4%), pressure on the ear (43.5%), crying and irritability (34.8%), and vertigo (33.3%). Recurrence was also significantly associated with performing culture sensitivity test as recurrence was reported among 65.0% of cases who performed a culture sensitivity test. Complications were also associated with recurrence ($P=0.030$), as recurrence was reported in 100% of cases who suffered from meningitis, adhesions, facial paralysis, and 86.2% who suffered from hearing impairment after the infection.

Table 1: Socio-demographic data of the participants, KSA, 2020 (N=336).

| Parameter | Frequency | Percent | ROM | P-value |
|--|-----------|---------|-------|---------|
| Age | | | | |
| • 3 ≥ years | 111 | 33.0% | 18.0% | 0.118 |
| • 4 – 9 years | 192 | 57.1% | 24.0% | |
| • 10 ≤ years | 33 | 9.8% | 39.4% | |
| Mean±S.D. | 5.3±3.0 | | - | |
| Gender | | | | |
| • Male | 179 | 53.3% | 20.1% | 0.226 |
| • Female | 157 | 46.7% | 27.4% | |
| Mother's educational level | | | | |
| • Primary education or illiterate | 18 | 5.4% | 33.3% | 0.805 |
| • Preparatory education | 11 | 3.3% | 27.3% | |
| • Secondary education | 39 | 11.6% | 25.6% | |
| • University or more | 268 | 79.8% | 22.4% | |
| Father's educational level | | | | |
| • Primary education or illiterate | 7 | 2.1% | 42.9% | 0.246 |
| • Preparatory education | 18 | 5.4% | 38.9% | |
| • Secondary education | 109 | 32.4% | 25.7% | |
| • University or more | 202 | 60.1% | 20.3% | |
| The financial status of the family | | | | |
| • Poor | 8 | 2.4% | 37.5% | 0.850 |
| • Average | 74 | 22.0% | 28.4% | |
| • Good | 24 | 7.1% | 25.0% | |
| • Very good | 140 | 41.7% | 22.9% | |
| • Excellent | 90 | 26.8% | 18.9% | |
| Consanguinity between parents | | | | |
| • Yes | 154 | 45.8% | 25.3% | 0.755 |
| • No | 182 | 54.2% | 22.0% | |
| One or two of the parents is a smoker | | | | |
| • Yes | 161 | 47.9% | 24.2% | 0.415 |
| • No | 175 | 52.1% | 22.9% | |
| Infant feeding | | | | |
| • Artificial feeding | 250 | 74.4% | 23.6% | 0.514 |
| • Breastfeeding | 86 | 25.6% | 23.3% | |

*The Chi-square statistic is significant at the 0.05 level.

Table 2: Prevalence of otitis media and recurrent otitis media among Saudi children, KSA, 2020 (N=336).

| Parameter | Frequency | Percent |
|--|-----------|---------|
| Otitis media in the last seven months | | |
| • Yes | 180 | 53.6% |
| • No | 156 | 46.4% |

| Recurrent otitis media (ROM) | | |
|------------------------------|-----|-------|
| • Yes | 78 | 23.2% |
| • No | 258 | 76.8% |

Table 3: Symptoms, management, outcome, complications, and prevalence of recurrent otitis media among self-reported otitis media Saudi children, KSA, 2020 (N=180).

| Parameter | Frequency | Percent | ROM | P-value |
|--|-----------|---------|--------|--------------|
| Symptoms | | | | |
| • Fever | 41 | 22.8% | 48.8% | 0.025 |
| • Headache | 22 | 12.2% | 54.5% | |
| • Otagia | 126 | 70.0% | 44.4% | |
| • Crying and irritability | 66 | 36.7% | 34.8% | |
| • Discharge | 28 | 15.6% | 57.1% | |
| • Difficulty hearing | 37 | 20.6% | 64.9% | |
| • Pressure on the ear | 23 | 12.8% | 43.5% | |
| • Vertigo | 15 | 8.3% | 33.3% | |
| • Anorexia | 37 | 20.6% | 48.6% | |
| • Sleeplessness | 49 | 27.2% | 53.1% | |
| Physician visit | | | | |
| • Yes | 162 | 90.0% | 43.8% | 0.960 |
| • No | 18 | 10.0% | 44.4% | |
| Physician prescribed treatment | | | | |
| • Yes | 163 | 90.6% | 43.6% | 0.782 |
| • No | 17 | 9.4% | 47.1% | |
| Improvement on the treatment | | | | |
| • Yes | 146 | 81.1% | 42.5% | 0.425 |
| • No | 34 | 18.9% | 50.0% | |
| Performing culture sensitivity test | | | | |
| • Yes | 20 | 11.1% | 65.0% | 0.044 |
| • No | 160 | 88.9% | 41.3% | |
| Tube placement | | | | |
| • Yes | 9 | 5.0% | 55.6% | 0.469 |
| • No | 171 | 95.0% | 43.3% | |
| Complications | | | | |
| • Yes | 64 | 35.6% | 54.7% | 0.030 |
| • No | 116 | 64.4% | 37.9% | |
| Mention (N=64) | | | | |
| • Otitis interna | 35 | 54.7% | 42.9% | 0.000 |
| • Mastoiditis | 11 | 17.2% | 45.5% | |
| • Meningitis | 1 | 1.6% | 100.0% | |
| • Adhesions | 3 | 4.7% | 100.0% | |
| • Facial paralysis | 1 | 1.6% | 100.0% | |
| • Hearing impairment | 29 | 45.3% | 86.2% | |
| Recurrent otitis media | | | | |
| • Yes | 79 | 43.9% | 100.0% | - |
| • No | 101 | 56.1% | 0.0% | |

*The Chi-square statistic is significant at the 0.05 level.

DISCUSSION

Otitis media (OM) is the inflammation of the mucous membrane of the middle ear cleft, which includes the Eustachian tube, mastoid air cells, mastoid antrum, and the middle ear cavity (tympanic cavity) [15]. It may be chronic (>6 weeks) or acute (<6 weeks) [16]. Otitis media is a common illness among children. 75% of children have one or more episodes of otitis media by 6 years of age, [17]. Most children experience at least one episode of otitis media by age 10 and some of them are at risk for recurrent episodes [18]. Several factors are known to increase children's risk of

developing recurrent otitis media, including the first episode in a child <12 months of age, daycare, absence of breastfeeding, passive exposure to tobacco smoke, white race, male gender, recurrent otitis in a sibling [19].

This analytical cross-sectional study was performed in 336 on 336 children in Maternity and Children Hospital in Arar City, Northern Saudi Arabia. The study aimed to show the prevalence and risk factors of recurrent otitis media among infants and children in Arar City, Northern Saudi Arabia.

Various prevalence rates of otitis media have been recorded from different parts of the world [20, 21]. Young children and infants are at the highest risk of otitis media, with peak prevalence at 6-36 months of age [22]. In the USA, AOM is of the most prevalent infection among children under 5 years of age, with a prevalence of 50%-80% [23, 24]. Our study found that more than half of cases, 53.6%, had otitis media in the last seven months from whom, 43.9% had ROM, but 23.2% of all samples had ROM. Also, a cross-sectional study carried out in Arar, which included 168 participants, reported that OM was 33.9% among the studied children [25], which was lower than our findings. However, in Riyadh, another study was carried out among 1500 children in the age range 7-14 years; the prevalence of OM in the study population was 10% [26]. Recurrent AOM was present in 23% of children with OM compared to 5% of normal children [26].

A study measured the prevalence of OM in a sample of 600 Nigerian children at the age of <12 years and found it to be 14.7% [27]. In Australia, another study found that the cross-sectional prevalence of OM at 5 to 7 years of age was 22.5% [28]. Also, in Western Australia, a Raine study reported the prevalence of ROM to be 26.8% [29]. Humaid *et al.* conducted a study in children aged 6-7 years and reported an OM prevalence of 23.8% [30]. However, Okur *et al.* reported a prevalence rate of 10.4% for children aged between 6-8 years [31].

Existing data on the incidence of OM vary significantly due to geographical locations, time periods of study, age groups, study designs, different case definitions, and other factors [32, 33].

AOM symptoms include earache in older children or rubbing, tugging, or pulling the ear or non-specific symptoms, including poor feeding, irritability, or fever in younger children. AOM signs include a distinctly cloudy, yellow, or red tympanic membrane [34].

Our study reported that the most common symptoms of otitis media were otalgia by 70% followed by crying and irritability 36.7%, sleeplessness 27.2%, fever 22.8%, difficulty hearing 20.6%, anorexia 20.6%, discharge 15.6%, pressure on the ear 12.8%, headache 12.2%, and vertigo 8.3%. Another study found that about half (52.6%) of the cases complained of crying, ear rubbing, lack of sleep, and yellow or bloody discharge, 24.6% had ear pain and vertigo, 15.8% had ear pain, crying and irritation and reduced appetite [25]. Another study reported; nasal discharge by 30%, snoring 18%, and hearing loss by 15% as the symptoms of OM [26]. A multi-country, multi-center, epidemiological, observational cohort study took place in Germany, Italy, Spain, Sweden, and the UK. The most common signs or symptoms included the redness of the tympanic membrane (52.8%) and ear pain (48.4%). Ear discharge was reported in 14.4% and varied by country from

26.5% in Sweden, to 18.2% in the UK, 15.2% in Spain, 9.1% in Italy, and 2.6% in Germany [35].

Our study found that the majority of cases, 90%, had visited a physician, and 90.6% had treatment. Improvement of the treatment occurred in 81.1% of cases, 11% performed culture sensitivity test, and only 5% needed tube placement.

As regards complications, our study reported; 35.6% of OM cases had complications. More than half (54.7%) had otitis interna, 45.3% had a hearing impairment, and 17.2% had mastoiditis. Similar to our findings, another study reported that more than one third (36.8%) of the cases were exposed to complications; 12.3% had a hearing deficiency, 10.6% had chronic OM, and 7% had sinusitis or inflammation of the inner ear (Otitis interna) [25].

CONCLUSION

The study concluded that the majority of cases had otitis media, but, recurrent otitis media occurred in 23% of cases. The most common symptom was otalgia. Although there were improvements in the treatment, complications occurred in a third of cases.

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