CORRELATES OF VARIOUS PRESENTATION MODES OF ACUTE OTITIS MEDIA IN SAUDI CHILDREN

Al-Joharaa M. Al-Quaiz, MRCGP, Department of Family & Community Medicine, College of Medicine, King Saud University, Riyadh, Saudi Arabia

Purpose: To describe correlates of various modes of presentation and identify some surrogates of poor outcome of children less than 5 years with Acute Otitis Media (AOM).

Patients and Methods: This is a cross-sectional survey conducted at 11 primary health care centers in Riyadh city over 3 month period. A total of 140 children, each less than 5 years of age and presenting with a new episode of AOM were enrolled. Twenty-eight family physicians participated in the study. Each physician made the diagnosis of AOM based on history and clinical examination of the tympanic membranes (TM) using an otoscope. Poor outcome was defined as children presenting with otorrhea.

Correspondence to: Dr. Al-Joharaa M. Al-Quaiz, Department of Family and Community Medicine, College of Medicine, King Saud University, P.O. Box 2925, Riyadh 11461, Saudi Arabia
Results: The majority of children presented with fever (62%), URTI (58%) and earache (54%). Presence of URTI, irritability, or sleeplessness were positively associated with redness and dullness of TM (p<0.05). Thumb sucking reduced the risk of bulging (OR = 0.29, 95% CI: 0.07-0.94). Children of illiterate fathers were more likely to present with otorrhea (X^2 = 4.66, p< 0.05). Bottle feeding increased the risk of otorrhea by two fold (OR = 2.26, 95% CI:1.01-5.05). Conclusion: Children with AOM presenting as URTI, irritability or sleeplessness will showed redness and dullness of the TM as clinical signs of the disease. Thumb sucking was found to be protective from bulging of the TM. Having an illiterate father and being bottle fed were found to be surrogates of otorrhea.

Key words: Acute otitis media, presentation, poor outcome, risk factors, Saudi Arabia.

INTRODUCTION
Acute Otitis Media (AOM) is one of the commonest childhood problems seen by general practitioners. In the UK about 10% of children under five years old are seen at least once every year with this condition. In the USA, AOM is the most common diagnosis for children under two years of age.

Although AOM is a very common problem worldwide, prevalence studies are not available in Saudi Arabia. In a recent epidemiological study, a representative sample of 6421 children aged 2 months to 12 years, were examined and screened for hearing loss. Hearing impairment was detected in 494 (7.7%) of the children. Chronic secretory and suppurative otitis media were responsible for 326 (5.07%), and sensori-neural hearing loss for 168 (2.6%) of these children. Acute otitis media episodes constitute the greatest risk factor for chronic secretory and suppurative otitis media and is considered the most common cause for antimicrobial use in children. Furthermore, there seems to be an emerging consensus among practitioners that AOM is over diagnosed and sometimes over treated. Of late, the value of prescribing antibiotics is being questioned, especially with the increasing reports of antibiotic resistance. There is thus need for family physicians to have good knowledge of the possible risk factors, presentation, and surrogates of poor outcome of AOM. This will help to accurately diagnose the disease, identify modifiable risk factors and prescribe antibiotic treatment more appropriately.

At the moment, there is a dearth of studies on AOM in Saudi Arabia and as a preliminary step, the present study was undertaken to describe correlates of various modes of presentation and identify some surrogates of the poor outcome of AOM in children less than five years old.

PATIENTS AND METHODS
The cross-sectional survey study was conducted at 11 primary health care centers (PHCC) in Riyadh, Saudi Arabia between September and December 1998 inclusive. These centers serve The National Guard employees and their families in their residential area (Iskan). Consequently, 90% of the study population were children of soldiers and army officers.

Children less than five years of age and presenting with a new episode of AOM during the study period were enrolled.
new episode was defined as a child’s visit with a diagnosis of AOM with no such diagnosis in the preceding 3 months. AOM was defined as redness of the TM, or loss of translucency of landmarks of the drum, or bulging of the drum, or perforation and otorrhea with local and systematic symptoms.7 Children with a history of chronic ear disease were excluded from the study.

A meeting was arranged with the physicians involved in the study and a standarization of the diagnosis of AOM was established to be followed throughout the study. Presentation of AOM was considered early when a child presented with redness, dullness/opacity or bulging of the TM, and a presentation late when there was otorrhea. Poor outcome was defined as presenting with otorrhea. Children were assessed at the time of the visit for poor outcome. The data collection sheet included items on patients’ demographic characteristics, presenting symptoms, suspected risk factors and clinical findings of the tympanic membrane. Past history was defined as one or more attacks of AOM occurring at least three months previous to the present attack. The suspected risk factors were sociodemographic factors, breast feeding, bottle feeding, the use of pacifiers, thumb sucking, smokers in household, presence of siblings, previous episodes of otitis media, number of children in one bed room, other siblings with AOM, and history of allergic rhinitis mentioned in previous studies.8,9

The minimum sample size for this study was estimated as 139 assuming a prevalence rate of 10% for AOM in the population and within this to tolerate an absolute deviation of 5% at a 95% confidence level. In the course of the last year, six hundred cases of AOM were diagnosed in the PHCC. And since thirty family physicians were available, it was estimated that each family physician would have seen an average of five children with new attacks of AOM over a three-month period. Accordingly, every doctor working in these centers was requested to complete the record form of five consecutive patients with AOM seen in his / her clinic.

Each physician based his clinical diagnosis of AOM on history and clinical examination of the tympanic membranes using an otoscope and following the agreed definitions of AOM. When the ear canal was blocked or the family physician had difficulty in examining the TM, it was reported as not visualized and was excluded from the analysis.

The data was processed in a microcomputer and analyzed by means of SPSS-version 9. The chi -square and Fisher's Exact Tests (when applicable) were used to assess the significance of associations between categorical variables. The risks of clinical signs of the TM were investigated by calculating the odds ratio and their 95% confidence intervals.

RESULTS
A total of 140 children who satisfied the inclusion criteria were enrolled over the three-month period of this study. However, five of the records were excluded because the data was incomplete in most of the variables. With 28 family physicians participating, the participation rate was 93.3%.

The demographic characteristics of the 135 subjects showed that their ages varied from 4 months to 60 months with a mean age of (25±16). A sizeable majority of the children (63%) were males. Sixty seven percent of the mothers were illiterate, while 51% of the fathers had elementary/intermediate education. Most of the children (91.1%) lived in small villas.

A sizeable majority of children were found to have redness of the TM (76.2%),
Table 1: Presenting symptoms related to clinical signs of children with AOM, Riyadh, Saudi Arabia 1999

| Presenting Symptoms | Total (%) (N=135) | Redness (%) (N=103) | Dullness (%) (N=38) | Bulging (%) (N=43) | Otorrhea (%) (N=43) |
|---------------------|-------------------|---------------------|---------------------|-------------------|-------------------|
| Fever               | 84 (62.2)         | 68 (66.0)*          | 31 (81.6)           | 30 (69.8)         | 25 (58.1)         |
| URTI                | 78 (57.7)         | 67 (65.0)*          | 28 (73.7)*          | 27 (62.8)         | 21 (48.8)         |
| Irritability        | 54 (40.0)         | 51 (49.5)*          | 31 (81.6)*          | 22 (51.2)         | 10 (23.3)*        |
| Sleeplessness       | 44 (32.5)         | 42 (40.8)*          | 25 (65.8)*          | 17 (39.5)         | 7 (16.2)*         |
| Vomiting/Diarrhea   | 11 (8.8)          | 10 (9.7)            | 3 (7.9)             | 2 (4.7)           | 3 (7.0)           |
| Earache             | 69 (51.1)         | 60 (58.3)*          | 25 (65.8)           | 25 (58.1)         | 14 (32.6)         |
| H/O Impaired hearing| 7 (5.1)           | 6 (5.8)             | 5 (13.2)*           | 3 (7.0)           | 2 (4.7)           |
| Ear discharge       | 47 (34.8)         | 20 (19.4)*          | 11 (28.9)           | 4 (9.3)*          | 38 (88.4)*        |

*Significant, p<0.05

Table 2: The estimated risk of some clinical signs of children with AOM with respect to some demographic variables, Riyadh, Saudi Arabia 1999

| Demographic variables | Total (%) (N=135) | Bulging (%) (N=43) | Otorrhea (%) (N=43) |
|-----------------------|-------------------|-------------------|-------------------|
| **Age in months:**    |                   |                   |                   |
| 0-12                  | 37 (27.4)         | 11 (25.6)         | 15 (34.9)         |
| >12-30               | 53 (39.3)         | 19 (44.2)         | 14 (32.6)         |
| >30                  | 45 (33.3)         | 13 (30.2)         | 14 (32.6)         |
| **Gender:**           |                   |                   |                   |
| Male                 | 84 (62.2)         | 28 (65.1)         | 25 (58.1)         |
| Female               | 51 (37.8)         | 15 (34.9)         | 18 (41.9)         |
| **Level of education of father:** |       |                   |                   |
| Illiterate           | 47 (34.3)         | 10 (23.3)         | 18 (41.9)*        |
| Elementary/Intermediate | 69 (51.5)       | 23 (53.5)         | 21 (48.8)         |
| Secondary/University | 19 (14.2)         | 10 (23.3)‡        | 4 (9.3)           |
| **Level of education of mother:** |       |                   |                   |
| Illiterate           | 91 (67.4)         | 26 (60.5)         | 28 (65.1)         |
| Elementary/Intermediate | 36 (26.6)       | 11 (25.6)         | 14 (32.6)         |
| Secondary/University | 8 (5.9)           | 6 (14.0)‡         | 1 (2.3)           |
| **Housing:**         |                   |                   |                   |
| House/villa          | 129 (95.6)        | 39 (90.7)         | 40 (93.0)         |
| Flat                 | 6 (4.4)           | 4 (9.3)           | 2 (7.0)           |

*As comparing frequencies of children with otorrhea to those with bulging of TM in illiterate fathers (X²=4.66, P<0.05)
‡Secondary/University father’s level of education vs illiterate (OR=4.00, 95%CI:1.11-14.76)
§Secondary/University mother’s level of education vs illiterate (OR=7.27, 95%CI:1.11-76.43)

23.3% of which were bilateral. The right ear was associated with more redness of the TM than the left ear (X² = 6.25, p<0.02). No statistically significant difference was detected in either ear with respect to other TM clinical signs.

Table 1 shows the distribution of the presenting symptoms in relation to clinical signs of AOM in these children. Redness of the TM was significantly positively associated with URTI, Earache, Irritability, and Sleeplessness, (p < 0.05). While
Table 3: The estimated risk of some clinical signs of children with AOM with respect to maternal and childhood variables, Riyadh, Saudi Arabia 1999

| Maternal and childhood variables | Total (%) (N=135) | Bulging (%) (N=43) | Otorrhea (%) (N=43) |
|---------------------------------|------------------|-------------------|-------------------|
| Breast feeding                  | 89 (66.9)        | 31 (73.8)         | 28 (66.7)         |
| Bottle feeding                  | 57 (42.2)        | 21 (48.8)         | 24 (55.8)*        |
| Pacifier use                    | 23 (17.0)        | 9 (20.9)          | 8 (18.6)          |
| Thumb sucking                   | 28 (20.7)        | 4 (9.3)†          | 13 (30.2)         |
| Household smoking               | 28 (20.7)        | 7 (10.3)          | 9 (20.9)          |
| Presence of siblings            | 15 (85.2)        | 38 (88.4)         | 36 (83.7)         |
| Previous episodes of AOM        | 67 (50.0)        | 21 (48.8)         | 25 (58.1)         |
| No. of children with one bedroom: |                  |                   |                   |
| <2                              | 55 (40.7)        | 22 (51.2)         | 18 (41.9)         |
| 3-4                             | 54 (40.0)        | 13 (30.2)         | 19 (44.2)         |
| >5                              | 26 (19.3)        | 8 (18.6)          | 6 (14.0)          |
| Other siblings with AOM         | 55 (40.7)        | 13 (30.2)         | 15 (34.8)         |
| History of allergic rhinitis    | 5 (3.7)          | 0 (0.0)           | 1 (2.3)           |

*Bottle feeding vs non-bottle feeding (OR=2.26, 95%CI:1.01-5.05)  
†Thumb sucking vs non-thumb sucking (OR=0.29,95%CI:0.07-0.94)

dullness of the TM was positively associated with URT, earache, sleeplessness, irritability and a history of impaired hearing (p< 0.05). On the other hand, otorrhea was negatively associated with irritability, sleeplessness and earache, (p<0.05).

The frequency distributions of some clinical signs of children with AOM according to demographic variables are presented in Table 2. Children whose fathers or mothers had secondary/university education showed 4 to 7 fold increased risk of having bulging eardrums in comparison with those who were illiterate (OR= 4.00, 95%CI:1.11-14.76) and (OR=7.27, 95% CI:1.11-76.43) respectively. Also the majority of children with illiterate fathers (38.1%) presented with otorrhea (X² =4.66, p< 0.05). No statistically significant associations were found with age, gender or housing.

Table 3 shows the frequency distribution of some clinical signs of AOM according to maternal and childhood variables. Fifty five point eight percent of the children with otorrhea, with a two fold increased risk (OR=2.26, 95%CI: 1.01 - 5.05) were bottle-fed. Thumb sucking had a negative association with bulging TM (OR=0.29, 95%CI: 0.07-0.94). Breast feeding, pacifier use, household smoking, presence of siblings, number of children in one bedroom, other siblings with AOM, age at first attack of AOM and history of allergic rhinitis did not show any statistically significant associations with the clinical signs (p > 0.05).

DISCUSSION

The results of this study showed a male preponderance which is in accordance with most studies. Only a few have not report any sex differences. Furthermore, the majority of children who presented with AOM were between 12-30 months, the age of first attack being ≤12 months. This finding is similar to most studies, which showed that children between (6-12 months) run the greatest risk of getting AOM. The findings on history, symptoms, and some physical signs were similar to those reported by other investigators. The rates 62%, 58% and 51% for fever, URTI and
earache respectively are similar to the rates reported by other investigators. Some studies even showed that the proportion presenting with fever ranged from 27% to 90%, earache 23% to 90% and URTI 20% to 76%. It is suggested that the simultaneous occurrence of earache with URTI is indicative of AOM, though its absence does not preclude it.\(^\text{18}\) Redness and bulging of TM and otorrhea were the most prevalent clinical signs. The former was detected in 76% of the children, a rate lower than those reported by other researchers.\(^\text{16}\) However, it should be noted that redness of the TM is not specific to AOM as it may present with a crying child, efforts to remove cerumen or caused by a viral URTI.\(^\text{19}\) A more accurate diagnosis is likely to be made when the eardrum of child suspected of having AOM is examined for bulging and not just redness or dullness. This is supported by findings in controlled studies on myringotomy in which it was found to have a very high specificity to AOM.\(^\text{20}\)

In the present study, 32% of the children were found to have bulging eardrums and similar were the rates of otorrhea. This is higher than what was previously reported.\(^\text{16, 22}\) This may indicate late presentation of patients with AOM, resulting in delayed initiation of treatment. A recent meta-analysis showed that antibiotic treatment reduced the rate of perforation and otorrhea of AOM by 50%.\(^\text{21}\) The findings also showed that early presentation of children with AOM was significantly associated with such symptoms as irritability, sleeplessness, earache and URTI. None of these symptoms were associated with bulging of the TM probably because of small sample size. In accordance with other studies\(^\text{24}\) it was found that redness of the TM was more prevalent in the right than the left ear.

Surrogates of poor outcome are important to identify as these enable doctors, with the help of parents, to modify some habits and patterns of behavior and direct antibiotic prescription more precisely to those in real need. Fathers’ level of education was significantly associated with otorrhea. Children with early presentation of AOM (bulging of the eardrums) were more likely to have parents of higher educational level, while those with late presentation (otorrhea) had illiterate fathers. This could be explained by the fact that better educated parents are more aware of the problems of delaying medical assistance and thus seek help early in an effort to reduce the severity and complications of the illness.

Bottle-feeding was reported to increase the risk for AOM.\(^\text{27}\) In our study it was found to be positively associated with otorrhea. Bottle-feeding on cow’s milk-based formulas has been reported to cause the so-called positional otitis media.\(^\text{27}\) It had been postulated that in young infants, there is reflux of milk through the Eustachian tube to middle ear cavity. The direct contact with cow’s milk might induce certain immunological events in the mucous membranes in the middle ear cavity in susceptible individuals. An early-onset otitis may predispose to recurrence through metaplastic mucosal change.\(^\text{7}\)

In the present study, thumb sucking in children with AOM was found to reduce the bulging of the TM. It is postulated that frequent thumb sucking in the absence of URTI leads to an increase in negative Eustachian tube pressure.\(^\text{25, 26}\) That in turn, decreases the middle ear cavity pressure, reducing TM bulging. Further research is needed to find out whether thumb sucking in children with AOM results in less susceptibility to perforation of TM and otorrhea.
LIMITATIONS OF THE STUDY
Comparative rates of signs and symptoms are difficult to interpret since designs vary in different studies and age specific data may not be similar.

The diagnosis of AOM in children in PHCCs remains challenging. With the diversity of criteria used in practice in specific criteria for the diagnosis have been difficult to validate or standardize. There is an emerging consensus that acute otitis media is over-diagnosed. This is attributable in part to poor sensitivity and specificity of symptoms in young children, and the difficulty of accurate diagnosis with an otoscope especially in an ill and uncooperative child.

CONCLUSIONS
It is necessary to have health education programs for illiterate parents so that their health awareness of the importance of early detection of any ear problem may improve. These health education programs should also emphasize the value and reasons for advocating breast-feeding rather than bottle-feeding. The importance of establishing standardized criteria and accurate diagnosis of ear pathology in primary care points to a need to establish guidelines for diagnosis and management.

More research and follow up studies using bigger sample size is required to identify other predictors of poor outcome, so that antibiotics could be targeted more precisely.

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