The Spectrum of Otitis Media in Family Practice

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Individual and family factors which relate to acute purulent otitis media were investigated in a family practice population. In a practice with more than 11,000 patients, 442 persons had 527 episodes of otitis media during a one-year period. More than 20 percent of the cases occurred in patients of age 15 years and over, but the case rate per year for this group was 11 cases per 1,000 as opposed to 109.7 cases per 1,000 for patients under the age of 15 years. Twenty percent of young children had two or more episodes during the year as compared with five percent for adults. Females had more multiple episodes than did males. The incidence of multiple cases in families is greater than would be expected if cases were distributed randomly ($P<0.05$). However, significantly fewer families with three or more children reported cases of otitis media as compared with smaller families ($P<0.05$).

Otitis media is an important health problem because of its frequency of occurrence and possible adverse consequences. Although the pathogenesis, causative organisms, associated co-illness factors, and therapy have received careful study, several facets of the disease have been inadequately explored. These include incidence relative to defined populations, presentation in adult patients, and family factors. This communication reports data from the patient population of the Rochester Family Medicine Medical Center which relates to these several factors.

Literature Review

Acute purulent otitis media is defined by the presence of purulent fluid in the middle ear.[1] Dysfunction and/or obstruction of the eustachian tube are thought to be the principal pathogenic mechanisms. Obstruction may be extrinsic from enlarged adenoids or intrinsic from allergy or infection. Functional obstruction may occur with increased eustachian tube compliance as seen with cleft palate or from nasal obstruction with reduced nasopharyngeal volume, which can result from either allergy or infection.[2] Streptococcus pneumoniae, Haemophilus influenzae, and beta hemolytic streptococci are the organisms most frequently cultured from infected ears, although in up to 44 percent of cases, no pathogenic agent can be identified.[3] The relative frequency of pathogens is age related, with H influenzae more common in young children beyond the sixth week of life. In the first six weeks of life, Escherichia coli, Klebsiella pneumoniae, and Staphylococcus aureus are the predominant organisms.[4] Attempts to isolate viruses and mycoplasmas from middle ear fluid aspirates are largely unsuccessful.[5] Amoxicillin, ampicillin, penicillin V, and erythromycin either alone, or the latter two in combination with sulfa

Presented in part at a Meeting of the World Organization of National Colleges, Academies and Academic Associations of General Practitioners/Family Physicians (WONCA), Montreux, Switzerland, May 14-19, 1978. From the Department of Family Medicine, State University of New York, Stony Brook; the Family Medicine Program, Hillsboro, North Carolina; and the University of Rochester-Highland Hospital, Family Medicine Program, Rochester, New York. Requests for reprints should be addressed to Dr. Jack Froom, Department of Family Medicine, Health Sciences Center, State University of New York at Stony Brook, Stony Brook, NY 11794.

0094-3509/80/040599-07$01.75

Table 1. Age/Sex Distribution of Patients with Otitis Media: 1975-1976 (in percent of total cases)

Age Group (Years)	Male N=221	Female N=221	Total N=442
<1	3.6	2.9	6.5
1-4	21.0	18.5	39.5
5-14	16.7	15.6	32.3
15-24	2.7	5.4	8.1
25-44	4.8	6.6	11.3
>44	1.1	0.9	2.0

Case Rates: <15 years=109.6/1,000 patients/yr
>15 years=11.0/1,000 patients/yr
All patients=37.6/1,000 patients/yr

drugs, are effective therapeutic agents depending upon the infecting organisms.[6-8] All antibiotic regimens are more effective than placebo.[9] Myringotomy does not hasten resolution of pathology or improve clinical response, but does relieve discomfort in a small group with severe pain.[10] Chemoprophylaxis can reduce the incidence of recurrent infection.[11,12]

The clinical diagnosis of otitis media is most often made by abnormal appearance of the tympanic membrane. The diagnostic value of specific abnormalities, however, such as redness, distortion of bony landmarks, and impaired mobility, is uncertain.[1] Symptoms of ear pain and fever are confirmatory evidence but appear to vary with the pathogenic organisms. Pneumococcus is more likely to cause severe pain and high fever, whereas infections caused by H influenzae are more likely to be bilateral.[13]

Bottle feeding and feeding infants in a reclined position,[14] allergy,[15] cleft palate,[16] and prematurity[4] predispose to infection. Eskimo and other Alaskan natives, Canadian Indians, and Swedish Lapps all have unusually high incidence of purulent otitis media.[17,18] Although reasons for excessive incidence in these populations are unknown, primitive and crowded housing, poor sanitary conditions, impaired access to medical care, recently increased prevalence of bottle feeding, and racial factors are thought to play a role.[18]

Recurrent or incompletely resolved infection can lead to hearing loss. In one study of children with no preceding history of chronic otitis media or loss of hearing, 12.2 percent had audiometrically demonstrated hearing impairment six months following an acute infection.[19] Hearing loss in children has been correlated with speech problems and reduced scholastic achievement.[20]

Otitis media accounted for over ten million visits (tenth most frequent diagnosis) to United States' office-based physicians during the year May 1973 through April 1974. Twenty-five and one half percent of visits were to general practitioners/family physicians.[21]

Method

Demographic data on all persons who received one or more diagnoses of otitis media during the period July 1, 1975, through June 30, 1976, were retrieved from a computerized diagnostic index.[22] Detailed analyses of the clinical course and management were made from a random sample of medical charts stratified by patient age (94 patients under age 15 and 73 patients age 15 years and over). The 94 patients were a subset of the total cases for the study year. Appropriateness of diagnosis and therapy (for the subset) was judged using a protocol developed by a group of family physicians, pediatricians, and otolaryngologists (Appendix).[23]

Results

From a practice population of over 11,000 patients, 442 persons had 527 episodes and 849 visits for acute purulent otitis media during a one-

Table 2. Percent of Multiple Episodes of Otitis Media by Age/Sex Groups (527 episodes)

	Number of Episodes		
	1	2	3 or more
	Percent of Patients		
Age Group			
<15 Years			
Male	82.3	15.1	2.7
Female	79.4	18.8	1.9
≥15 Years			
Male	97.5	2.5	—
Female	94.9	5.1	—

Table 3. Socioeconomic Distribution of Otitis Media Cases: Percentage Comparison of Monroe County and Family Practice Populations

SES*	Monroe County (N=711,917)	Family Practice (N=11,765)	Otitis Media (N=442)
I	14	12	10
II	33	24	19
III	37	45	48
IV	10	15	19
V	5	3	4

*SES=Socioeconomic status, SES I is highest

year period. The age and sex distribution of these patients is given in Table 1. Of interest is that 21.5 percent of affected persons were aged 15 years and over. This group, however, comprises 73.1 percent of the patient population and the case rate difference between the two age groups (under 15 years vs 15 years and over) is considerable (109.7 vs 11.0 cases per 1,000 per year).

Table 2 details recurrences during a one-year period. Approximately 20 percent of young children had two or more episodes during the year, but less than 5 percent of adults had recurrent attacks in the same period. Females had more multiple episodes than did males. In the study population there were 1.61 visits per episode. The socioeconomic distribution of otitis media patients in the population served by the Rochester Center as compared with that of Monroe County indicates only a slight trend toward increased incidence in patients living in census tracts designated as low in socioeconomic status (Table 3).

The relationship of family size to the incidence of otitis media is given in Table 4. Significantly fewer families with three or more children reported cases of otitis media ($P<0.05$). The percentage of families with two or more affected children is given in Table 5. The incidence of multiple cases in families is greater than would be expected if cases were distributed randomly ($P<0.05$).

A comparison of symptoms recorded for

Table 4. Relationship of Family Size to Distribution of Otitis Media

Number of Children in Family	Percent of Families with One or More Cases
1	32.6
2	31.1
3 or more	25.4*

*P<0.05

Table 5. Multiple Cases of Otitis Media in Families (total cases, July 1975-June 1976)

	Percent of Families (N=382)	Percent of Patients (N=442)
1 Case Families	86.1	74.4
2 Case Families	12.2	21.3
3 Case Families	1.3	3.4
4 Case Families	0.2	0.9

Expected Incidence 2.76% (2 or more cases in family)
Observed Incidence 6.38%* (2 or more cases in family)
*P<0.05

patients in three age groups (less than 1 year, 1 to 14 years, and 15 years and over) is presented in Table 6. Fever and gastrointestinal symptoms which are more evident objectively predominate in patients less than one year of age. The subjective symptoms of pain and diminished hearing are more frequent in the older groups. Table 7 contains a similar comparison for objective findings. No marked differences are noted except for fever which is more common in the less than one year group, and external canal inflammation, noted more frequently in adults.

Of 206 episodes examined by chart review using a protocol (Appendix), 83 percent had sufficient documentation to satisfy the diagnostic criteria in the protocol. Ninety-one percent of these episodes were treated with appropriate antibiotics. Decongestants were prescribed in 56 percent of cases.

Discussion

The incidence of acute purulent otitis media in North Americans has not been reported with precision because few health service groups can accurately define the patient populations served. A report of 28 physicians in 13 United Kingdom practices with more than 47,500 patients gives an annual incidence of 85.8 cases/1,000 for patients under age 15 years, and 5.3 cases/1,000 for those 15 years and older.[24] These rates are less than those in the Rochester Center patient population. The differences could be due to the different diagnostic criteria utilized by the two groups. The United Kingdom physicians did not follow any standard criteria, while the center physicians generally used the protocol guidelines (Appendix). Differences in climate, patient health-care-seeking behavior, and the ability to define the population at risk are additional possible explanations for the different rates. The English physicians also reported a somewhat lower incidence of multiple episodes during a one-year period than the present authors did: 12.7 percent vs 19.2 percent for children under age 15 years, and 2 percent vs 3.8 percent for those 15 years and over.

Although a predominance of severe cases of chronic otitis media has been reported in socially deprived families,[25] this study showed little effect of socioeconomic status (SES) on incidence. The low SES patients generally have free access to medical care which may explain the small effect of SES on infection rates.

The decreased incidence in families with three or more children is surprising. Although otitis media is probably not a contagious disease, attacks are often preceded by upper respiratory tract infections which are apt to be more frequent in larger households. The greater tendency for multiple cases in selected families, however, may imply a genetic component in the pathogenesis.

The finding of this study related to family factors and incidence must be interpreted with caution. It is difficult to accurately define patient populations in North American practices. Emergency Room visits for acute otitis media are frequent and the recorded incidence of otitis media for some study patients and families may, therefore, be incorrect. In addition, estimates of total patient population are subject to error.[26]

The incidence of otitis media in patients 15 years and over has generally not been appreciated because most reports concern the manifestations

Table 6. Symptoms of Otitis Media in 204 Episodes

Symptom	All Episodes n	All Episodes %	Age Groups in Percent <1 yr	Age Groups in Percent 1-14 yrs	Age Groups in Percent 15+ yrs
Pain	98	48	0	47	69
Fever	97	48	94	61	21
Rhinitis	48	24	18	25	23
Sore Throat	37	18	0	14	31
Ear Fullness	29	14	0	2	35
Vomiting	22	11	21	11	7
Diarrhea	17	8	18	8	4
Decreased Hearing	13	6	0	4	12

Table 7. Objective Findings in Otitis Media in 204 Episodes

Objective Findings	All Episodes n	All Episodes %	Age Groups in Percent <1 yr	Age Groups in Percent 1-14 yrs	Age Groups in Percent 15+ yrs
Redness of TM	153	75	74	82	65
Difference between TMs	90	44	41	41	48
Loss of landmarks	79	39	35	33	47
Abnormal mobility	64	31	35	32	29
Bulging TM	58	28	27	30	27
Dullness of TM	45	22	27	22	20
Fever	43	21	29	14	13
Toxic appearance	22	11	9	13	9
Inflammation of external canal	18	9	—	4	18
Drainage from middle ear	13	6	—	7	8
Rupture of TM	7	3	—	2	7

TM=Tympanic Membrane

in children. Although the age adjusted case rate is lower for adults than for children, the age distribution of most family practice populations is such that many adult patients with otitis media will be treated by family physicians. Adults present somewhat different symptoms than do children. They are less likely to experience fever but more apt to complain of pain, ear fullness, and decreased hearing. Young children frequently have gastrointestinal symptoms and are less able to complain of symptoms described by adults. The tympanic membrane abnormalities appear similar in all age groups. The increase in external ear canal inflammation seen in adults is of interest but unexplained.

The diagnostic and therapeutic dilemmas facing primary care physicians who treat otitis media have recently been described.[27] Although the usual diagnostic criteria utilized by physicians are of uncertain value, it is nevertheless necessary to establish a diagnosis and to employ rational therapeutic measures. Until more accurate diagnostic tools become available, a protocol for diagnosis and management which represents the best judgment of a group of physicians can be a useful device for family physicians.