

Prevalence of Otitis Media and Allied Diseases in Korea

— Results of a Nation-wide Survey, 1991 —

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A nation-wide survey was conducted to estimate the prevalence of otitis media and allied diseases through physical examination by otolaryngologic doctors from July to October, 1991. A sample study population was selected from a panel to be representative of the Korean population by multistage clustered and stratified random sampling method based on the National Census Data, 1990. Total number of subjects undertaken were 9,321, which were drawn from 2,899 households residing in 60 different areas throughout the country.

The overall prevalence of otitis media was 2.85% (3.10% of males and 2.61% of females). Prevalence of each subtype was as follows; acute otitis media, 0.02%; middle ear effusion, 0.60%; chronic otitis media, 2.19%, respectively.

The prevalence of otitis media did not vary by sex, nor by urban-rural difference. There was an increasing tendency of the prevalence of otitis media by age. However, the prevalence of both middle ear effusion and acute otitis media showed a decreasing pattern by age. Particularly noteworthy was a significant geographic variation in the prevalence of otitis media by provinces.

The prevalence rate of septal deviation was 21.93% and the presence of septal deviation was significantly related to that of otitis media ($p < 0.05$). The prevalence rates of nasal allergic symptoms, nasal polyposis and evident cleft palate were 1.14%, 1.00% and 0.07%, respectively. The presence of otitis media was significantly correlated with both nasal allergic symptoms ($P < 0.1$) and evident cleft palate ($P < 0.05$), but not with that of nasal polyposis.

Key Words: Otitis media, Prevalence, Septal deviation, Cleft palate.

INTRODUCTION

Otitis media is one of the most common inflammatory disorders in human beings. Personal activity in the hearing sense used to inevitably be lost due to a fundamental decrease in hearing acuity. Subjects with

otitis media not only have many difficulties in social and emotional adjustment, but also suffer from socioeconomic disadvantages. The positive association of otitis media to unhealthy conditions, unhygienic environments and poor economic conditions, therefore, has made the prevalence rate valuable as an index of social welfare in a community (Ling et al, 1974). There have been a few studies on the incidence of otitis media in a defined population, i.e., in restricted age/social groups. However, the nation-wide prevalence of otitis media had not been reported until our previous survey on otitis media conducted nation-wide in 1981; the prevalence of otitis media of 4.59% was estimated (Kim et al, 1981). The main purpose of this

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survey was to obtain a more updated nation-wide prevalence of otitis media and its allied diseases through direct physical examination by otolaryngologists.

MATERIALS AND METHODS

A nation-wide survey was conducted to estimate the prevalence of otitis media, as well as that of its allied diseases, through direct physical examination by otolaryngologists from July to October, 1991. The study population was drawn from a panel to be representative of the Korean population. sampling was done by multi-stage clustered-stratified random method based on the Population and Housing Census Report (National Bureau of Statistics, 1990). The provinces and enumeration districts used in this study are listed in figure 1. The total number of households targetted was 3,274 in 60 enumeration districts throughout the country. however, the real numbers of the target populaton were 10,054 subjects in 3,203 households. Of the target populaton were surveyed by direct physical examination, while 90.5% of the target households were

observed (Table 1). The actual number of subjects surveyed was 9,321 from 2,899 households.

A mobile team consisted of one otolaryngologist and two residents of the speciality. They visited every

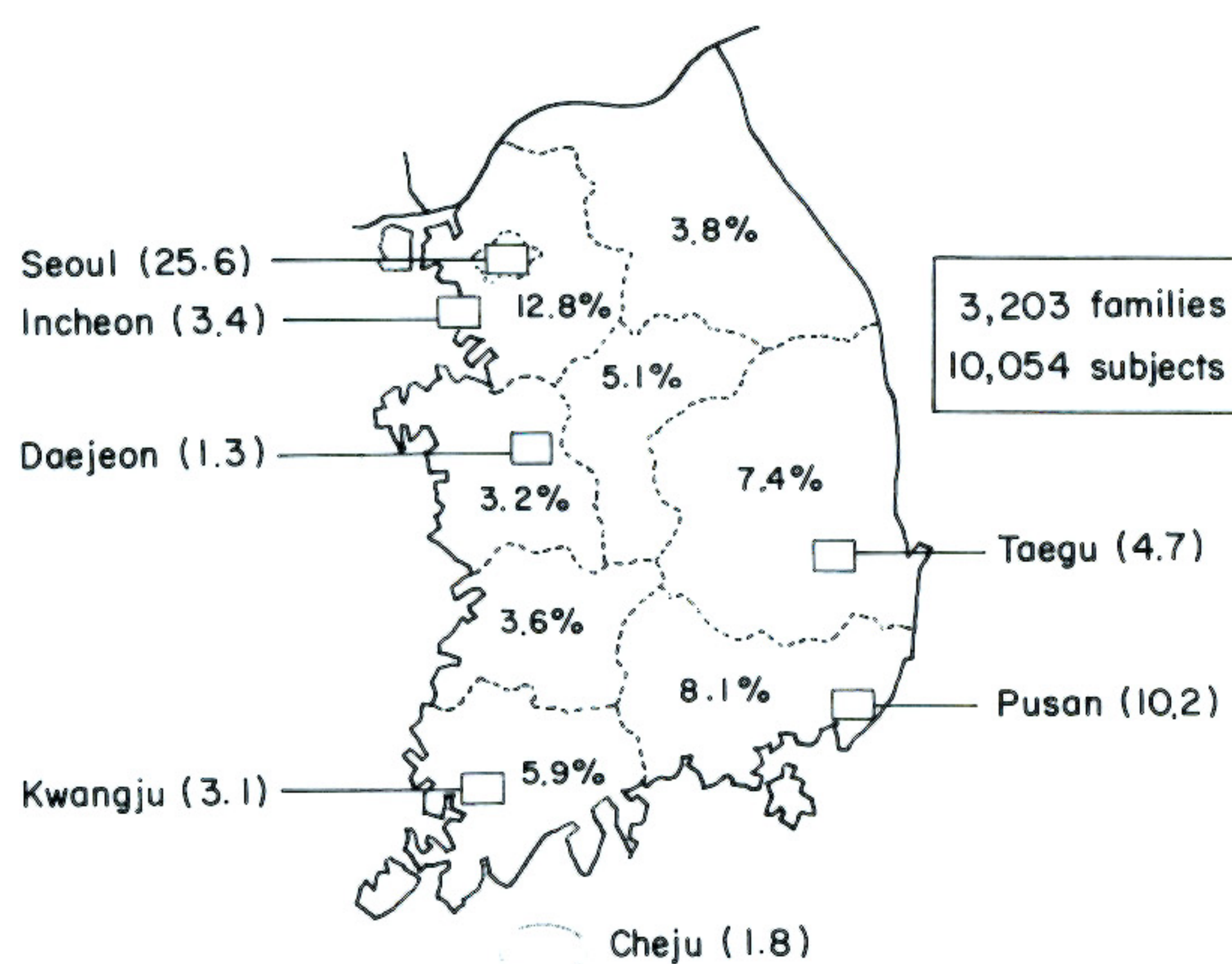


Fig. 1. Geographical areas and percentages of the population selected for a nation-wide survey to estimate the prevalence of otitis media and its allied diseases.

Table 1. Number of households and persons surveyed by sample areas

Sample areas	No. of households		No. of persons		Average No. of persons per household
	eligible	surveyed	eligible	examined	
Seoul	771	668	2,420	2,185	3.70
Pusan	356	332	1,127	1,036	3.35
Taegu	162	145	480	449	3.43
Incheon	92	81	290	264	3.50
Kwangju	115	95	320	304	3.40
Daejeon	54	44	138	104	3.10
Kyonggi	461	398	1,369	1,333	3.40
Kangwon	113	103	397	378	3.85
Chungbuk	156	139	507	451	3.60
Chungnam	102	90	287	265	3.25
Jeonbuk	114	111	387	374	3.55
Jeonnam	232	217	643	610	3.00
Kyungbuk	210	183	170	637	3.90
kyungnam	282	246	800	771	3.26
Cheju	54	47	178	160	3.80
Total	3,274	2,899	10,054	9,321	3.50

Total no. of eligible households: 3,274

Total no. of real households in eligible districts: 3,203

Total no. of surveyed households: 2,899

Total no. of real persons in eligible districts: 10,054

Total no. of surveyed persons: 9,321

Completeness of household survey: 90.5% (2,899/3,203)

Completeness of subject survey: 92.7% (9,321/10,054)

household targeted for this nation-wide survey to get medical information by direct physical examination, as well as for general information which might be related to otolaryngologic disorders. For the completeness of the visit, about 4.5 visits were required for each household. Background information about each family member was taken through a structured questionnaire during the medical examination. Medical examination of ears, nose and throat was done with some equipment, i.e., battery-supplied head-lights and battery type of pneumatic otoscope. Diagnosis of acute otitis media or middle ear effusion was confirmed through tuning fork tests and pneumatic otoscopic examination, while the diagnosis of chronic otitis media was relatively obvious from the physical examination.

Otitis media was classified into acute otitis media (AOM), serous otitis media (SOM), and chronic otitis media (COM). Chronic otitis media was further divided into non-cholesteatomatous and cholesteatomous type. Chronic adhesive otitis media and chronic perforated otitis media were included in the non-cholesteatomous type of chronic otitis media.

All the records from the field survey were then computerized and analyzed by the PC-SAS system (SAS Institute Inc., 1990). When calculating prevalence, actual number of subjects in any enumeration district, whether he/she might be a prevalent case or a normal subject, was corrected by weights in order to adjust the potential bias arising from differential success rate by districts.

RESULTS

Prevalence of otitis media

The overall prevalence estimate of otitis media was 2.85%, as shown in Table 2. A total of 3.10% of males and 2.61% of females have been clinically proven as cases of otitis media. But there was no significant difference between sex groups. The age distribution of prevalence of otitis media in male and female was similar to each other. There was a significant increasing trend of the prevalence with 5-year-interval age (Fig. 2). By geographic comparison, Incheon and Kyungbuk provinces were areas with the highest prevalence rate of otitis media; 4.35% and 4.56%, respectively, while Chunbuk showed the lowest prevalence of 1.05%. Although there seemed to be a slight difference of prevalence between some geographical regions, no statistical difference in prevalence between urban and rural areas was noted (Fig. 3).

There were only two subjects of AOM, resulting in an overall prevalence of 0.02%, but SOM was noticed

Table 2. Prevalence (%) of otitis media by age and sex estimated through a nation-wide survey in Korea, 1991

Age groups	Male	Female	Total
0- 4	1.09	1.41	1.24
5- 9	2.37	1.32	1.89
10-14	1.85	1.43	1.65
15-19	1.01	0.73	0.88
20-24	2.22	1.79	1.98
30-34	4.04	2.16	3.03
35-39	1.56	2.56	2.07
40-44	5.22	4.59	4.89
45-49	4.51	3.44	3.97
50-54	6.71	2.72	4.85
60-64	4.33	2.93	3.54
65-69	6.32	7.91	7.23
70-74	2.95	7.04	5.45
75-79	8.39	5.82	6.85
80-	4.22	3.60	3.74
P.R.*	3.10 (%)	2.61 (%)	2.85 (%)

*P.R.: Prevalence rate

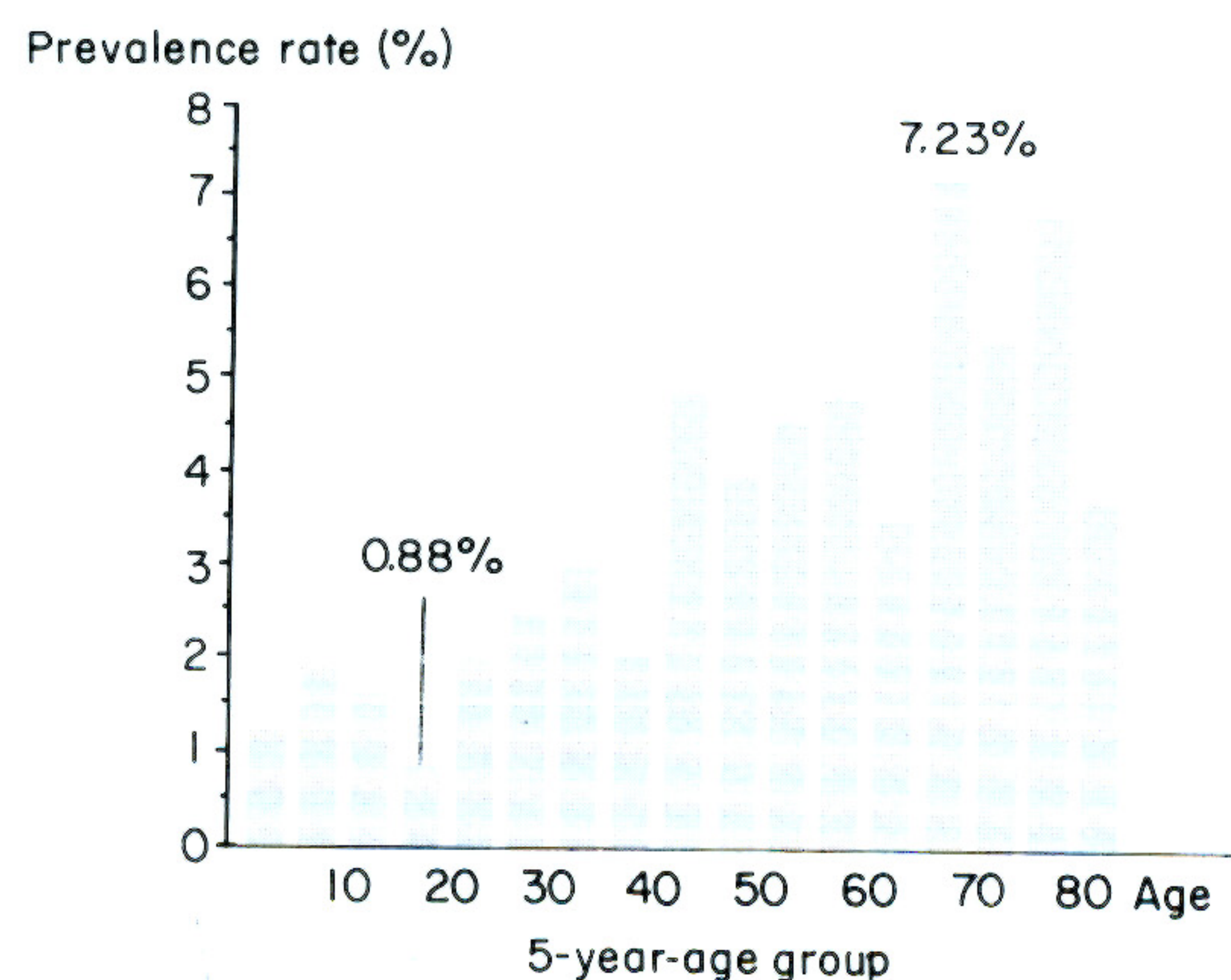


Fig. 2. Prevalence rates of otitis media according to 5-year-age groups.

in 56 subjects with a prevalence rate of 0.60%. While, the overall prevalence of COM was 2.19% (217 subjects); prevalences of chronic perforated otitis media (CPOM), chronic adhesive otitis media (CAOM), chronic otitis media with cholesteatoma (CHOLE) were 1.61%, 0.21%, and 0.50%, respectively (Table 3). The others were regarded as retracted or unclassified types. All kinds of COM, i.e., CPOM, CAOM and CHOLE, showed apparent increasing tendency of the prevalence with age. On the contrary, AOM and SOM were more prevalent among younger age groups under 15 (Table 3).

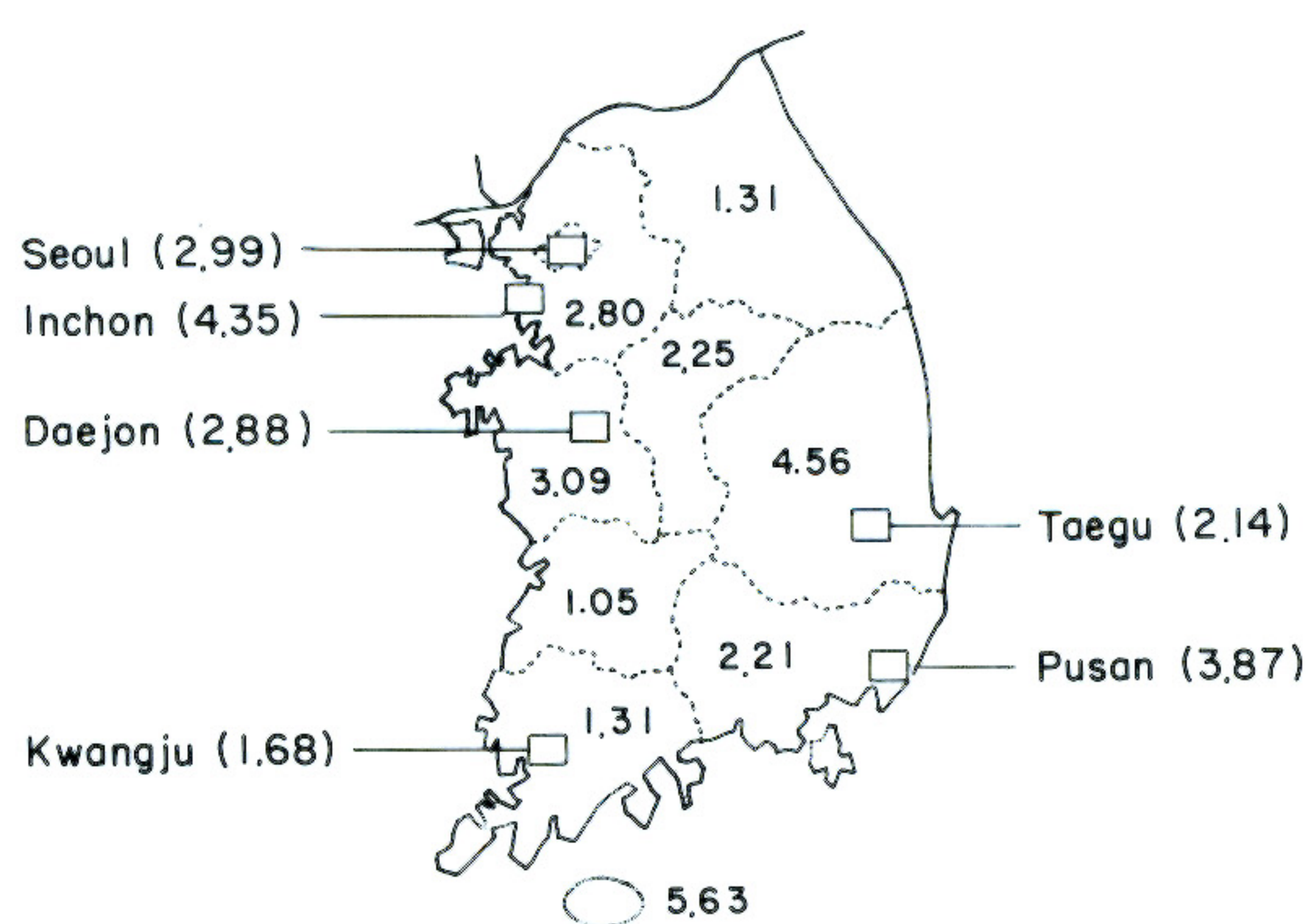
Table 3. Prevalence (%) of various types of otitis media by age groups estimated through a nation-wide survey in Korea, 1991

Age groups	AOM	SOM	Chronic Otitis Media (2.19%)		
			Perforated	Adhesion	Cholesteatomatous
0-15	0.08	1.22	0.15	0.04	0.11
16-34	0.00	0.33	1.18	0.19	0.56
35-54	0.00	0.37	2.45	0.23	0.73
55-	0.00	0.52	3.69	0.56	0.68
P.R.	0.02	0.60	1.61	0.21	0.50

AOM: acute otitis media

SOM: serous otitis media

P.R.: prevalence rate

**Fig. 3.** Distribution of geographical areas and prevalence rates (%) of otitis media.

Seoul (2.99) Incheon (4.35) Daejeon (2.88) Kwangju (1.68)
 Taegu (2.14) Pusan (3.87) 1.31 2.80 2.25 3.09 4.56 1.05 1.31
 2.21 5.63

Prevalence of otologic symptoms and signs

Hearing loss was the most common among otologic symptoms and signs (Table 5); a total of 4.5% of subjects examined complained of hearing loss, followed by tinnitus (1.9%), otorrhea (1.5%), ear fullness (0.7%), otalgia (0.6%) and vertigo (0.4%). Facial nerve paralysis was noted in 13 ears, indicating a prevalence of 0.2%. Congenital anomalies of the ear were noticed in 11 subjects with microtia (0.1%), 12 canal atresia (0.1%) and 47 preauricular fistulae (0.4%). condition of the external ear canal revealed 342 impacted cerumen (2.7%), 84 otomycosis (0.8%), and 70 external otitis (0.7%). The canals were cleared before examining tympanic membranes. Operated ears were noticed in 19 ears (0.2%) (Table 4).

Allied diseases to otitis media.

Deviated nasal septum was noticed in 21.39% of the general population; 12.31%, left-sided, 8.52%, right-sided, and 1.10%, S-shaped. In comparison with the septal deviation free group, otitis media was more prevalent in the septal deviation group ($p < 0.05$).

In subjects with allergic symptoms including nasal obstruction, sneezing and watery rhinorrhea, otitis media was found more prevalent in this group ($p < 0.1$).

Cleft anomalies were noticed in 7 subjects, 2 of them had evident cleft palate anomalies and both of them had otitis media.

DISCUSSION

Otitis media is an inflammation of the middle-ear cleft, and it was classified into acute, serous, mucoid and chronic otitis media by Paparella media (AOM), otitis media with effusion or serous otitis media (SOM) and chronic otitis media (COM). Because a differentiation of serous otitis media from mucoid otitis media was not clear with otoscopic examination only, both are included in SOM.

The medical justification for the detection of otitis media has already been well established. First, there is the fact that otitis media is almost inevitably accompanied by hearing loss. Ling (1974) established a causal relationship between otitis media with effusion and educational retardation. The second reason for otitis media is related to the social and emotional adjustment of hearing impaired subjects. A third additional reason for proposing the efficient detection of otitis media lies in the association of this disorder with poor health, poor environment and poor general welfare conditions. Harvey, as a result of his studies in Lon-

donderry and the surrounding countryside stated, "A factor in the causation of the condition appears to be poor living conditions and air pollution." Medically, educationally, psychologically and socially therefore, it seems highly desirable that otitis media should be discovered at the earliest possible opportunity so that treatment may be initiated.

The incidence of otitis media in restricted areas or special age groups has been reported by many authors, but a nation-wide prevalence study of otitis media in the whole population has not been attempted before the first survey in 1981 by the author et al..

The prevalence rate of otitis media will be affected by many factors like race residency, age, climate, so-

cioeconomic state, methods of study, etc. (Hayman et al, 1957; Johnson, 1967; Reed et al, 1967; Kaplan et al, 1973; Nelson et al, 1984). For example, high attack rates for otitis media have been previously documented among Northern Indian, Eskimo, and English children (Table 5). an extensive survey of 4,000 elementary school children in Pittsburgh (Eagles et al, 1963) reported the incidence of chronic otitis media to be 0.5%, whereas the frequency in the Navajo Indian is 15 times greater according to the studies of Johnson (1967). As with many infectious diseases, there is a strong relationship between otitis media and poor living conditions. In the studies of Reed and Struve (1967), the average Eskimos household consisted of

Table 4. Prevalence rates of otologic symptoms and signs.

Otologic symptoms	Prevalence (%)	Otologic symptoms	Prevalence (%)
Hearing, loss	4.5	Microtia	0.1
Tinnitus	1.9	Canal atresia	0.1
Otorrhea	1.5	Stenotic canal	0.1
Ear fullness	0.7	Preauricular fistula	0.4
Otalgia	0.6	Otomycosis	0.8
Vertigo	0.4	External otitis	0.7
Facial palsy history	0.2	Impacted cerumen	2.7
Meniere's symptoms	0.1	Chronic ear operation	0.2

Table 5. Prevalence rates of otitis media-worldwide reports

Nation	Author	Year	Age group of subjects	Numbers of subjects	PR(%)	Types of OM
England	Mawson	1963	London		2.6	chronic OM
			Lancashire		3.4	chronic OM
			Clydedale		5.9	chronic OM
Sweden	Mellbin	1962	children		1.0	chronic OM
Pittsburgh, US	Eagles	1963	3-17 yr	4,078	0.27	perf. COM
Egypt	Farid	1966	6-12 yr	3,860	4.5	OM
Indian, Navajo	Johnson	1967	6-12 yr	3,318	6.4	perf. OM
Guam	Eldridge	1970	8-19 yr	1,541	0.84	perf. COM
Alaskan Eskimo	Johnnott	1973	3-9 yr	urban 136	4.4	chronic OM
				rural 300	18.3	chronic OM
Eskimo	Kaplan	1973	children	422	41.0	perforated & scarred TM
Eskimo, Canada	Ratnesar	1976	Indian	550	2.30	chronic OM
			Caucasian	46,565	0.07	chronic OM
			Canadian Indian	1,075	1.58	chronic OM
Australia	Mc Cafferty	1977	below 14 yr	4,846	11.7	chronic OM
Navajo Indian	Nelson	1984	children	15,890	4.0	perf. OM
Korea	Kim et al	1981	whole age	4,855	4.6	Om
Korea	Kim et al	1991	whole age	9,321	2.85	OM
korea	Kim et al	1991	whole age	9,321	2.19	chronic OM

Table 6. Comparison of prevalences of otitis media from this survey to the results from the previous study conducted 1981

Study period	May-June, 1981	July-October, 1991
sample areas	23	60
No. of households	1,079	2,899
No. of subjects	4,855	9,321
method of estimation	unweighted	weighted
Prevalences (%)		
otitis media	4.59	2.85
acute otitis media	0.10	0.02
chronic otitis media	3.48	2.19
cholesteatoma	0.42	0.50

six persons residing in one or two small rooms and thirty-one percent of them had a hearing deficit of 26 decibels or more due to otitis media.

The prevalence rate of otitis media in the Korean population (1991) in this study was 2.85%. This figure is remarkably lower than the prevalence rate of 4.59% studied ten years prior to this (Kim et al, 1981). This low prevalence rate of otitis media in this study compared to that of ten years prior to this is partially due to a remarkable improvement in socioeconomic conditions with better nutrition and housing, and also it could reflect the seasonal difference of the study period (Table 6).

According to Bluestone (1978), the cumulative incidence of otitis media with effusion was significantly lower in school children than in preschool children, and this seems to be related to the age differences between the two populations. In our studies, the decreasing tendencies of acute or serous otitis media with aging were confirmed. It may be possible to correlate the epidemiology of otitis media with effusion and the maturation of the child's middle ear-Eustachian tube system in children, such as anatomical changes, or increased resistance to infection associated with physical growth and development of the immune system (Giebink et al, 1982).

A correlation of the presence of other otorhinolaryngologic diseases such as deviated nasal septum, nasal allergic rhinitis, nasal polyposis and cleft palate, and the prevalence of otitis media was studied by statistical analysis. a strong correlation was obtained in subjects with deviated nasal septum ($p < 0.05$), with allergic symptoms ($p < 0.1$), and with evident cleft palate ($p < 0.05$), however, no correlation was noted between nasal polyposis and otitis media. In the studies of Navajo Indians by Jaffe (1967), ninety children had a small cleft and 20% had ear diseases. In 16 children with a major cleft (i.e, three-fourths or total), 36%

had ear disease with high correlations.

Rach (1985) reported a strong correlation between otitis media with effusion and the presence of a common cold at the time of measurements.

In this study, many informative data concerning the risk factors of otitis media were evaluated and these results will be published later.

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