

The prevalence of middle ear diseases and the factors affecting this among adults in the area of Jazan

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Abstract:

Background: Otitis media (OM) is a group of complex infective and inflammatory conditions affecting the middle ear, with a variety of subtypes differing in presentation, associated complications, and treatment. OM is a leading cause of health care visits worldwide, and its complications are important causes of preventable hearing loss, particularly in the developing world [1].

Objectives: to assess the prevalence of middle ear diseases and the factors affecting this among adults in Jazan, Saudi Arabia.

Methods: The study is a cross-sectional study target the population in Jazan, Kingdom of Saudi Arabia.

Results: There were significant correlations between the prevalence of otitis media regarding the educational level and residence where An increased

prevalence was associated with post graduated education level ($P=0.019$) and urban residence ($P=0.001$). The statistical analysis showed no significant correlations regarding sex and income where the P-values were 0.870 and 0.668 respectively.

Conclusion: the prevalence of OM was higher among males. The prevalence of OM was increased among low education level population and also among low-income ones. There is a need to raise awareness of Jazan populations about the ear infection and how to avoid it.

Keywords:

Otitis media, Acute Otitis Media, Chronic Otitis Media

Introduction:

The ear has a complex structure concerned with the maintenance of equilibrium as well as hearing. An abnormality or disruption in the anatomical structures and function of the ear can result in ear diseases and may affect all the age groups [2]. Otitis media (OM) is an umbrella term for a group of complex infective and inflammatory conditions affecting the middle ear. 3]. There are various subtypes of OM. These include acute otitis media (AOM), otitis media effusion (OME), chronic suppurative otitis media (CSOM), mastoiditis and cholesteatoma[4]. A 2012 literature review suggested that the annual global incidence of AOM is 10.85%, comprising around 709 million cases per year, about half in under-5s. Incidence varies by a factor of ten or more between high-income and low-income countries. Of these, chronic suppurative OM develops in 4.76%. The authors estimated that 33 per 10 million die due to complications of OM, most in developing countries and most under 1 year of age [3]. Nation-wide epidemiological studies for middle ear inflammatory conditions are scarce in Kingdom of Saudi Arabia (KSA) [5]. In most cases, an allergy or upper respiratory tract infection causes congestion

and swelling of the nasal mucosa, nasopharynx, and eustachian tube. Obstruction at the eustachian tube isthmus (i.e., the narrowest portion) results in accumulation of middle ear secretions; secondary bacterial or viral infection of the effusion causes suppuration and features of acute otitis media [6]. The effusion may persist for weeks or months after the infection resolves [7]. Otitis media with effusion may occur spontaneously as a result of eustachian tube dysfunction or as an inflammatory response after acute otitis media [8].

Oral and topical pain killers are effective to treat the pain caused by otitis media. Oral agents include ibuprofen, paracetamol (acetaminophen), and opiates. Topical agents were shown to be effective include antipyrine and benzocaine ear drops [9]. Decongestants and antihistamines, either nasal or oral, are not recommended due to the lack of benefit and concerns regarding side effects [10].

Our study considered one of the first studies which concerned with the frequency of middle ear diseases and factors affecting the infection among the

adults in Jazan, Saudi Arabia. There were many studies which concerned with the prevalence of the definite type of otitis media especially in children were conducted in Saudi Arabia and different countries worldwide, some of these studies would discuss below.

In England 1992 Browning and Gatehouse reported that among the British population the prevalence of presumptive otosclerosis among adults was 2.1%, for healed OM 1.7% and Eustachian tube dysfunction 0.9%. This prevalence of otosclerosis was higher in those over 40 years, but only in those with air-bone gaps of 30 dB or higher were women more likely to have the condition than men, by a factor of three. At most, 20% of individuals with any of the above middle ear conditions will have had ear surgery [11].

Mukara et al., 2017 conducted a study which concerned with Prevalence of Middle Ear Infections and Associated Risk Factors in Children under 5 Years in Gasabo District of Kigali City, Rwanda and they reported that the prevalence of middle ear infections was 5.8%, of whom 4% had chronic suppurative otitis

media. A child was less likely to develop middle ear infections if they lived in an urban setting but more likely to develop middle ear infections if exposed to household smoke. Parents were unlikely to know that their child had an ear infection. Middle ear infection remains a public health problem in Rwanda, but many parents were not aware of its presence in the affected children. There is a need to raise awareness of parents about the ear infection and to promote early care seeking from qualified health workers [12].

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Humaid et al., in 2014 conducted a study which concerned with the prevalence and risk factors of Otitis Media with effusion in school children in Qassim Region of Saudi Arabia. they reported that Prevalence of OME in Qassim region reaches 7.5% in school children. Age less than eight years, family size more than four members in the household, mother education less than secondary school education, living in rural area and recurrent AOM are found to be predictors of OME in Qassim region. In this population of children, otoscopy and tympanometry should be used as screening tools for OME [13].

A study conducted in Riyadh, Saudi Arabia by El-Sayed and Zakzouk (1995) reported that the prevalence of Secretory otitis media (SOM) in children was found to be related to the age, the season and to the occurrence of the ear and upper respiratory tract infections. No correlation was found about sex, allergy or the socio-economic condition [14].

Methodology

Study Design

The study is a cross-sectional study conducted in Jazan, Kingdom of Saudi Arabia between October and November 2017. This design was selected because it is appropriate for the study objectives (a cross-sectional study is the best for prevalence), and it is also inexpensive, easy to carry out and fast without extensive follow-up when compared to other study designs.

Study Area

The study targets the population in Jazan, Kingdom of Saudi Arabia.

Study Population

The study population including the adult public participants who accepted to share in our questionnaire.

Sample Size

The study's sample size was calculated using the following formula for simple random sampling (proportion formula used for prevalence if the population is more than 20,000):

$$n = \frac{z^2 pq}{d^2}$$

Where:

- a) (p) is anticipated prevalence (proportion), and it was chosen to be 50% since there is no literature evidence for previous prevalence; the choice of 50% ensures that we have maximized our sample size.
- b) (z) is the normal distribution value (1.96) with 95% confidence and 5% error.
- c) (q) is the complement of the proportion ($1 - p$).
- d) (d) is delta, the error tolerance around the estimation.

Study Variables:

Independent variables. Socio-demographic characteristics such as sex, education level, income, residence and age of participants.

Dependent variable. Prevalence of middle ear disease, co-infection with chronic disease and seasonal allergy, the effect of environmental pollution, visiting doctors and middle air disease complications.

Data Collection

Data was collected using on line administered a structured questionnaire that was administered to adult public participants.

Study Instruments

A primary questionnaire was constructed to investigate the prevalence of middle ear diseases among Jazan's adult population and different factors affecting the incidence of the disease. The first part of questionnaire included five different questions which concerned with the demographic data (sex, education level, income, residence and age) and the second part contained 10 close-ended questions which concerned with prevalence of middle ear disease, co-infection with chronic disease and seasonal allergy, effect of environmental pollution, visiting doctors and middle air disease complications. The questionnaire was presented to participants in the Arabic language.

Data Entry

All questions (except the question concerned with age) are multi-choice where the participant would give the appropriate answer.

Statistical analysis:

Data were analyzed using SPSS software version 16, the simple descriptive analysis in the form of means and standard deviations were calculated for numerical data. Qualitative data were described using numbers and percent distribution, and chi-square was used as a test of significance to detect an association between the association of otitis media and studied variables with a significant level of less than 0.05.

Results:

Among the 430 participants, the weighted prevalence of middle ear diseases was 31.6%, while 48.6% of participants never suffered from middle ear diseases and 9.8% did not know their history of middle ear diseases.

The prevalence of middle ear diseases according to the general characteristics of the participants is described in Table 1. Age, sex, educational level, residence, and income. An increased prevalence was associated with the age of 28.63 ± 8.92 years, male sex (51.6%), post graduated education level (74.7%), urban residence (57.2%) and low-income participants (37.0%).

Table 1: Demographic characteristics of participants:

		N (430)	%
Sex	Female	208	48.4
	Male	222	51.6
Education level	Primary	6	1.4
	Secondary	94	21.9
	Postgraduate	321	74.7
	Intermediate	9	2.1
Income	1000-3000	159	37.0
	3001-5000	52	12.1
	5001-10000	89	20.7
	>10000	130	30.2
Residence	Rural	184	42.8
	Urban	246	57.2
Age	Mean \pm SD	28.63 \pm 8.92	

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Only 136 participants who previously suffered from middle ear diseases would complete the questionnaire. Most of them have neither chronic diseases (70.6%) nor seasonal allergy (58.8%). Mostly the pollution does not affect the incidence of middle ear diseases (64.0%). Most of the participants had ear pain (82.4%) as a primary symptom, 24.3% had a hearing defect, 22.1% had discharge, and 1.5% had Vertigo and drowsiness. 56.6% visited the physician within one month. 65.4% of participants thought that influenza and common cold is the main cause of otitis media. 59.6% had no complications. most of the participants (51.5%) recovered within two weeks (table 2).

Table 2: Characteristics of affected persons:

		N(136)	%
Q 7 having chronic diseases	No	96	70.6
	Don't know	13	9.6
	Yes	27	19.9
Q 8 . having seasonal allergy	No	80	58.8
	Don't know	7	5.1
	Yes	49	36.0
Q9 living in polluted environment	No	87	64.0
	Don't know	21	15.4
	Yes	28	20.6
Symptoms of diseases*	Ear pain	112	82.4
	Hearing defect	33	24.3
	Discharge	30	22.1
	Vertigo, drowsiness	2	1.5
When going to	Through week	48	35.3

physician	Through two week	11	8.1
	Through 1 month	77	56.6
Possible causes for otitis media	Influenza & common cold	89	65.4
	Other infections	25	18.4
	Other causes related to trauma, water	12	8.8
	Don't know	10	7.4
Suffering from complication	No	81	59.6
	Don't know	15	11.0
	Yes	40	29.4
Period consumed to	1-2 w	70	51.5
	2w-1 month	26	19.1
	1- Two month	13	9.6
	>2months	27	19.9

The relation between the prevalence of otitis media and demographic factors was described in table 3. There were significant correlations between prevalence of otitis media regarding the educational level, and residence, where An increased prevalence was associated with post, graduate education level ($P=0.019$) and urban residence ($P=0.001$). The statistical analysis showed no significant correlations regarding sex and income where the P-values were 0.870 and 0.668 respectively.

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Table 3: Relation of otitis media to demographic factors

N			Otitis media(136)	Free subjects (294)	P value
Sex	Female	N	65	143	0.870
		%	31.2%	68.8%	
	Male	N	71	151	
		%	32.0%	68.0%	
Education	Primary	N	5	1	0.019
		%	83.3%	16.7%	
	Secondary	N	35	59	
		%	37.2%	62.8%	
	Intermediate	N	2	7	
		%	22.2%	77.8%	

	Postgraduate		94	227	
			29.3%	70.7%	
Residence	Rural	N	43	141	0.001
		%	23.4%	76.6%	
	Urban	N	93	153	
		%	37.8%	62.2%	
Income	1000-3000	N	51	108	0.688
		%	32.1%	67.9%	
	3001-5000	N	14	38	
		%	26.9%	73.1%	
	5001-10000	N	32	57	
		%	36.0%	64.0%	
	>10000	N	39	91	

		%	30.0%	70.0%	
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The statistical analysis investigates significant correlations between the incidence of otitis media regarding the previous infection with chronic diseases ($P < 0.001$), seasonal allergy ($P < 0.001$), and environmental pollution ($P < 0.001$). Whereas the greater incidence of otitis media was observed within the participants with no chronic diseases, no seasonal allergy and also with in the participants who lived in non-polluted environment.

Table 4: Relation of otitis media to studied factors:

			Otitis media(136)	Free subjects (294)	P value
Chronic disease	yes	N	27	14	<0.001
		%	65.9%	34.1%	
	No, don't know	N	109	280	
		%	28.0%	72.0%	
Age allergy	yes	N	49	39	<0.001
		%	55.7%	44.3%	
	No, don't know	N	87	255	
		%	25.4%	74.6%	
Living in pollution	yes	N	28	18	<0.001
		%	60.9%	39.1%	
	No, don't know	N	108	276	

	know	%	28.1%	71.9%	
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Discussion:

This is one of the first studies to investigate the prevalence of middle ear infections among adults in Jazan. Our results reported that the prevalence of different types of otitis media was 31.6%. Other studies are concerned with the prevalence of specific types of otitis media especially among children. Humaidet al., reported that Prevalence of OME in Qassim region reaches 7.5% in school children [13]. Zakzouk et al., 2002 reported that the prevalence of AOM was (1.05%) among Saudi children [15]. El-Sayed and Zakzouk (1995) reported that the prevalence of Secretary otitis media (SOM) in the region of Riyadh, Saudi Arabia was 10.9% [14]. Further studies concerned with the prevalence of otitis media among Saudi adults was recommended.

The highest incidence of otitis media occurs between the ages of 6-24 months and then decreases with advancing age. However, the disease does occur in older children, teens, and adults [16]. The mean age of our participants was 28.63 ± 8.92 .

In most studies on the incidence of OM, there is a small but significant difference between males and females, with a higher incidence in males [17].

This results agreed with our results which reported that the prevalence of OM among male sex was *51.6%*.

Passive smoking and environmental pollution can induce inflammation of the mucosal surfaces of the nasopharynx, eustachian tube, and middle ear and might alter immune defenses of the respiratory tract, rendering them more vulnerable to viral and bacterial infection episode [18]. In analyzing the relationship between air pollution and health, Kim *et al.* [19] found that concentrations of sulfur dioxide in air samples were significantly associated with an increased incidence of OM. This results agreed with our results which

reported that there was a significant correlation between environmental pollution and increasing the incidence of OM ($P < 0.001$).

Mukara et al., (2017) [20] said that Education was the only risk factor that was significant in both bivariate and multivariate analysis. Children were less likely to have a middle ear infection if their parent or guardian was more educated compared to being uneducated. also Karunanayake et al., (2016) [21] and Czechowicz et al., (2010) [22] reported that protective effects of parental education. By comparing this results with our results which reported that significant correlations between the prevalence of otitis media regarding educational level where the prevalence of OM increased in Lower educational level.

Mukara et al., (2017) [20] said that the prevalence of OM was higher in urban (54.3%) than in rural with an agreement with our results which investigate a significant correlation between residence and prevalence of OM ($P = 0.019$) where it was higher in urban.

Conclusion:

Our study finally reported that the prevalence of OM was higher among males. The prevalence of OM was increased among low education level population and also among low-income ones. There is a need to raise awareness of Jazan populations about the ear infection and how to avoid it. Further studies about the prevalence of OM among adults in Saudi Arabia and also worldwide was recommended.

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