

## FREQUENCY AND FACTORS OF EAR INFECTION AMONG SWIMMERS, COTTON BUD AND HEADPHONE USERS

Sadaf Zia<sup>1</sup>, Hafiz Muhammad Tahir<sup>2</sup>, Kashaf Azeem<sup>3</sup>, Syed Omair Adil<sup>4</sup>, Aarzu Shehzad<sup>5</sup>, Muhammad Ali Shah<sup>6</sup>

<sup>1</sup>Assistant professor- Department of otolaryngology head & neck surgery, Dow International medical college, Dow University of Health Sciences

<sup>2</sup>Student Medical technology, Dow International medical college, Dow University of Health Sciences

<sup>3</sup>Student Medical technology, Dow International medical college, Dow University of Health Sciences

<sup>4</sup>Lecturer- Department of Research, Dow International medical college, Dow University of Health Sciences

<sup>5</sup>Student Medical technology, Dow International medical college, Dow University of Health Sciences

<sup>6</sup>Student Medical technology, Dow International medical college, Dow University of Health Sciences

### Abstract

**Background:** Ear has a self-cleansing mechanism. However, most individuals are not aware of the natural self-cleansing ear mechanism therefore, they acquire the habit of using cotton bud to clean the ear. We conducted this study to determine the complications and harmful effect with the frequent use of cotton bud, ear phone and swimming on external ear canal.

**Methods:** A descriptive observational study was conducted at the Outpatient Department of Dow University Hospital, OJHA campus, Karachi from December 2016 to December 2017. Information regarding head phone, cotton bud use and swimming along with ear infection side of infection, recent history of respiratory tract infection/trauma to ear canal, ear surgery and symptoms like pain, bleeding, itching, fever, hearing loss, pus discharge and whistling in ear were collected through a pre-structured questionnaire.

**Results:** Median age of the individuals was 36 (27-49) years. There were 243 (76.4%) males and 75 (23.6%) females. Ear infection was found in 176 (55.3%) patients. A total of 199 (62.57%) individuals used cotton buds for ear cleaning. Age (p-value 0.010), ear infection (p-value 0.011) and itching (p-value 0.003) were significantly associated with cotton bud use. Swimming status was found positive in 11 (3.45%) individuals. Age (p-value <0.001), gender (p-value 0.011), and marital status (p-value <0.001) were significantly associated with swimming. Headphone was used by 178 (55.97%). Ear infection (p-value 0.002), itching (p-value 0.009), and hearing loss (p-value 0.007) were significantly associated with headphone use.

**Conclusion:** Our study confirms the association of cotton bud in the development of Otitis Externa. Nonetheless, the association between headphones and Otitis Externa need to be further assessed through larger studies.

**Keywords:** Cotton bud, otitis externa, swimmer's ear, headphones

### Introduction

Ear has a self-cleansing mechanism in which membranes shed off from the tympanic membranes moves toward the hair bearing area of external auditory canal (1). Most individuals are not aware of the natural self-cleansing ear mechanism therefore, they acquire the habit of using cotton bud to clean the ear (2,3,4). Due to prolonged use of cotton bud, they get habitual; which leads to ear injuries including tympanic membrane perforation, otitis externa, and cerumen impaction (3,5,6,7). In addition to this, use of ear phones and/or swimming without using ear plugs creates a more negative impact on external auditory canal skin.

If the natural defenses are disrupted, the natural flora is replaced by the pathogenic microbes such as *Pseudomonas Aeruginosa* 38%, *Staphylococcus epidermidis* 9% and *S. Aureus* 8% (8). Other microbes which causes infection are anaerobic pathogens 4-25%, such as *Bacteroides* and *Pepto streptococci* and fungal infection 2-10% (8-11). The most common observed symptoms of infections are puritis, ear pain, hear loss and discharge (11,12). These discharges may be white, yellow, brown or grey (8). Fungal infections mostly cause ear itching, discomfort, discharge and a feeling of presence of something in the auditory tube, while in the bacterial infection pain is acute and severe (11,13). When the skin cerumen is disrupted either by excessive water exposure from swimming, any kind of ear trauma, device that enter the ear canal, risk of infections, allergic contact dermatitis and dermatological diseases become higher (9,14).

Though this topic has been presented in international literature but no organized research was available from Pakistan, therefore to document the presence of this habit in our population and the problems encountered due cotton buds; this study was conducted in a tertiary care teaching hospital.

We conducted this study with the aim to determine the complications and harmful effect with the frequent use of cotton bud, ear phone and swimming on external ear canal.

### Methodology

This observational study was conducted at the Outpatient Department of Dow University Hospital, OJHA campus, Karachi. It was conducted over one year from December 2016- December 2017. All patients attending Outpatient department of Dow University Hospital were asked to fill the performa after obtaining informed consent. The study was conducted according to the international standard for ethics. As this study did not have any intervention therefore an Ethical approval was not required.

All individuals above 18 years of age of either gender attending outpatient department were include whereas patients with any previous diabetes and any other immune compromise states, pediatric age group, post radiation to oral cavity and neck, history of dental problems were excluded from the study.

A pre-structured questionnaire was used for data collection. Information regarding the variables of head phone, cotton bud use and swimming along with ear infection side of infection, recent history of respiratory tract infection/trauma to ear canal, ear surgery and symptoms like pain, bleeding, itching, fever, hearing loss, pus and whistling in ear were collected. Since this is a questionnaire based survey, patients were asked based on history about their last ear infection symptoms, no ENT examination was required.

Statistical analysis was conducted using Statistical Package for Social Sciences (SPSS) version 21. Descriptive statistics was explored using median and interquartile range for age of the patients whereas frequency and percentages were calculated for categorical variables like gender, ear infection side of infection, recent history of respiratory tract infection/trauma to ear canal, ear surgery and symptoms like pain, bleeding, itching, fever, hearing loss, pus and whistling in ear. Mann-Whitney U test and chi-square test was applied. P-value <0.05 was taken as significant.

Cotton bud was defined as a small stick whose edges are covered with cotton wool use for cleaning purpose. External ear canal was defined as the tube of an outer ear.

Ear infection or Otitis externa was defined as the infection of an external ear which comprises of the pinna, external auditory meatus and external auditory canal leading to the tympanic membrane. The infection in this area is characterized by pain, discharge and itching and swelling of external auditory canal skin and sometimes pinna. When this infection starts in an ear is frequently moist because of swimming which aids bacterial growth and consequently infection, it is called a

swimmer's ear. The individuals using insert ear phones or head phones for listening to music privately from a laptop/ mp3 device were defined as Head phone users.

### Results

A total of 318 individuals were included. The median age of the individuals was 36 (27-49) years. There were 243 (76.4%) males and 75 (23.6%) females. Ear infection was found in 176 (55.3%) patients. Among these 176 patients, both side of the ears were affected in majority of the individuals (n=76, 43.2%) right side in 64 (36.4%) and left side in 36 (21%) individuals. Frequency of complications shows that ear pain was observed in majority (n=153, 48.1%) individuals followed by itching (n=112, 35.2%), whistling in ear (n=56, 17.6%) patients, fullness in ear (n=49, 15.4%), fever (n=45, 14.2%), pus (n=40, 12.6%), hearing loss (n=27, 8.5%), while bleeding was observed in 19 (6%) individuals. Recent history of respiratory tract infection (RTI) was observed in 112 (35.2%) individuals while history of ear surgery was observed in 10 (3.1%) individuals.

These individuals were asked about that whether ear cleaning is required; to this question 269 individuals replied in affirmative, 11 individuals do not think it is required and 38 were not sure about the answer to this question. A total 199 (62.57%) individuals used cotton buds for ear cleaning. One hundred and twelve (35.5%) cleaned their ears once a day, sixty (18.9%) used it twice a day, twenty-four (7.5%) were in the habit of using it three times a day.

Comparison of cotton bud with respect to general characteristics showed that age (p-value 0.010), ear infection (p-value 0.011) and itching (p-value 0.003) were significantly associated with cotton bud use whereas gender (p-value 0.211), side infected (p-value 0.903), pain (p-value 0.198), bleeding (p-value 0.981), fever (p-value 0.801), hearing loss (p-value 0.107), pus (p-value 0.206), whistling in ear (p-value 0.185), recent history of respiratory tract infection (p-value 0.151), history of trauma to ear canal (p-value 0.707), and ear surgery (p-value 0.864) were insignificantly associated with cotton bud use. (Table 1).

**Table 1: Comparison of cotton bud with respect to general characteristics of the patients (n=318)**

Variables	Total	Cotton Bud		p-value
		Yes (n=199)	No (n=119)	
Age, mean	36 (27-49)	35 (26-46)	40 (31-51)	0.010 <sup>†</sup>
Gender				
Male	170	101 (59.4)	69 (40.6)	0.211 <sup>‡</sup>
Female	148	98 (66.2)	50 (33.8)	
Ear Infection				
Yes	176	121 (68.8)	55 (31.3)	0.011 <sup>‡</sup>
No	142	78 (54.9)	64 (45.1)	
Side infected (n=176)				
Left	36	19 (52.8)	17 (47.2)	0.903 <sup>‡</sup>
Right	64	33 (51.6)	31 (48.4)	
Both	76	37 (48.7)	39 (51.3)	
Symptoms observed				
Pain	153	107 (69.9)	46 (30.1)	0.198 <sup>*</sup>
bleeding	19	13 (68.4)	6 (31.6)	0.981 <sup>†</sup>
itching	112	85 (75.9)	27 (24.1)	0.003 <sup>‡</sup>
Observed fever	45	30 (66.7)	15 (33.3)	0.801 <sup>†</sup>
Observed hearing loss	27	22 (81.5)	5 (18.5)	0.107 <sup>†</sup>
Pus	40	24 (60)	16 (40)	0.206 <sup>†</sup>
Observed whistling in ear	56	42 (75)	14 (25)	0.185 <sup>†</sup>
Recent history of RTI				
Yes	112	76 (67.9)	36 (32.1)	0.151 <sup>‡</sup>
No	206	123 (59.7)	83 (40.3)	
History of trauma to ear canal				
Yes	32	21 (65.6)	11 (34.4)	0.707 <sup>‡</sup>
No	286	178 (62.2)	108 (37.8)	
Ear surgery				
Yes	10	6 (60)	4 (40)	0.864 <sup>‡</sup>
No	308	193 (62.7)	115 (37.3)	

RTI: Respiratory Tract Infection

<sup>†</sup>Mann-whitney U test applied, <sup>‡</sup>Chi-square test applied, p-value <0.05 was taken as significant

Swimming status was found positive in 11 (3.45%) individuals. Comparison of swimmer with respect to general characteristics showed that age (p-value <0.001), gender (p-value 0.011), and marital status (p-value <0.001) were significantly associated with swimming whereas ear infection (p-value 0.573), side infected (p-value 0.837), pain (p-value 0.295), bleeding (p-value 0.761), fever (p-value 0.853), hearing loss (p-value 0.322), pus (p-value 0.143), itching (p-value 0.703), whistling in ear (p-value 0.065), recent history of respiratory tract infection (p-value 0.362), history of trauma to ear canal (p-value 0.362), and ear surgery (p-value 0.364) were insignificantly associated

with swimming. (Table 2).

**Table 2: Comparison of swimmer with respect to general characteristics of the patients (n=318)**

Variables	Total	Swimmer		p-value
		Yes (n=11)	No (n=307)	
Age, mean	36 (27-49)	25 (20-30)	37 (28-49)	<0.001
<b>Gender</b>				
Male	170	10 (5.9)	160 (94.1)	0.011 <sup>†</sup>
Female	148	1 (0.7)	147 (99.3)	
<b>Marital Status</b>				
Married	243	2 (0.8)	241 (99.2)	<0.001 <sup>†</sup>
Unmarried	75	9 (12)	66 (88)	
<b>Ear Infection</b>				
Yes	176	7 (4.0)	169 (96.0)	0.573 <sup>‡</sup>
No	142	4 (2.8)	138 (97.2)	
<b>Side infected (n=176)</b>				
Left	36	2 (5.6)	34 (94.4)	0.837 <sup>‡</sup>
Right	64	2 (3.1)	62 (96.9)	
Both	76	3 (3.9)	73 (96.1)	
<b>Symptoms observed</b>				
Pain	153	7 (4.6)	146 (95.4)	0.295 <sup>‡</sup>
bleeding	19	1 (5.3)	18 (94.7)	0.761 <sup>‡</sup>
itching	112	4 (3.6)	108 (96.4)	0.703 <sup>‡</sup>
Observed fever	45	2 (4.4)	43 (95.6)	0.853 <sup>‡</sup>
Observed hearing loss	27	2 (7.4)	25 (92.6)	0.322 <sup>‡</sup>
Pus	40	0 (0)	40 (100)	0.143 <sup>‡</sup>
Observed whistling in ear	56	0 (0)	56 (100)	0.065 <sup>‡</sup>
<b>Recent history of RTI</b>				
Yes	112	4 (3.6)	108 (96.4)	0.936 <sup>‡</sup>
No	206	7 (3.4)	199 (96.6)	
<b>History of trauma to ear canal</b>				
Yes	32	2 (6.2)	30 (93.8)	0.362 <sup>‡</sup>
No	286	9 (3.1)	277 (96.9)	
<b>Ear surgery</b>				
Yes	10	7 (70.0)	3 (30.0)	0.364 <sup>‡</sup>
No	308	171 (55.5)	137 (44.5)	

Pain radiated (p-value 0.666), site towards pain radiated (p-value 0.086)

<sup>†</sup>Mann-whitney U test applied, <sup>‡</sup>Chi-square test applied, p-value <0.05 was taken as significant

Headphone was used by 178 (55.97%). Comparison of headphone users with respect to general characteristics showed that ear infection (p-value 0.002), itching (p-value 0.009), and hearing loss (p-value 0.007) were significantly associated with headphone use whereas age (p-value 0.360), gender (p-value 0.186), marital status (p-value 0.422), pain (p-value 0.272), bleeding (p-value 0.335), fever (p-value 0.896), pus (p-value 0.341), whistling in ear (p-value 0.058), recent history of respiratory tract infection (p-value 0.209), history of trauma to ear canal (p-value 0.433), though reported more than in the general population but the p-value were not significant (Table 3).

**Table 3: Comparison of headphone users with respect to general characteristics of the patients (n=318)**

Variables	Total	Headphone User		p-value
		Yes (n=178)	No (n=140)	
Age, mean	36 (27-49)	36 (27-46)	37 (28-50)	0.360 <sup>‡</sup>
<b>Gender</b>				
Male	170	101 (59.4)	69 (40.6)	0.186 <sup>‡</sup>
Female	148	77 (52)	71 (48)	
<b>Marital Status</b>				
Married	243	133 (54.7)	110 (45.3)	0.422 <sup>‡</sup>
Unmarried	75	45 (60)	30 (40)	
<b>Ear Infection</b>				
Yes	176	112 (63.6)	64 (36.4)	0.002 <sup>‡</sup>
No	142	66 (46.5)	76 (53.5)	
<b>Symptoms observed</b>				
Pain	153	95 (62.1)	58 (37.9)	0.272 <sup>‡</sup>
bleeding	19	14 (73.7)	5 (26.3)	0.335 <sup>‡</sup>
itching	112	63 (56.3)	49 (43.8)	0.009 <sup>‡</sup>
Observed fever	45	29 (64.4)	16 (35.6)	0.896 <sup>‡</sup>
Observed hearing loss	27	11 (40.7)	16 (59.3)	0.007 <sup>‡</sup>
Pus	40	28 (70)	12 (30)	0.341 <sup>‡</sup>
Observed whistling in ear	56	30 (53.6)	26 (46.4)	0.058 <sup>‡</sup>
<b>Pain radiated</b>				
Yes	114	69 (60.5)	45 (39.5)	0.245 <sup>‡</sup>
No	62	43 (69.4)	19 (30.6)	
<b>Recent history of RTI</b>				
Yes	112	68 (60.7)	44 (39.3)	0.209 <sup>‡</sup>
No	206	110 (53.4)	96 (46.6)	
<b>History of trauma to ear canal</b>				
Yes	32	20 (62.5)	12 (37.5)	0.433 <sup>‡</sup>
No	286	158 (55.2)	128 (44.8)	
<b>Ear surgery</b>				
Yes	10	7 (70)	3 (30)	0.364 <sup>‡</sup>
No	308	171 (55.5)	137 (44.5)	

Site towards pain radiated (p-value 0.796), side infected (p-value 0.522)

<sup>†</sup>Mann-whitney U test applied, <sup>‡</sup>Chi-square test applied, p-value <0.05 was taken as significant

## Discussion

The findings of this study have shown that almost half of the patients were affected by ear pain. The pathologies such as otitis externa is one

of the commonest pathologies presenting to our outpatient department of ear, nose and throat clinics. It is stated that the pain caused by otitis externa can be agonized making the patient to seek a medical opinion urgently; sometimes within hours of onset (15-17).

In this study, loss of hearing is reported in small number of individuals. However, contrary to our findings, hearing loss was seen in almost 90% patients with otitis media in a study (15).

Age was the only factor which was significantly associated with cotton bud use and swimming in our study (18). However, surprisingly no difference in the mean age was observed among ear phone users and non-users. In particular, individuals with younger age group more frequently used cotton bud as compared to older individuals. In addition to this, ear infection was also found significantly associated with cotton bud use in this study. These findings also matched with previous studies as well. (15,16,19)

Though, hearing loss, whistling in ear, pain and bleeding were higher among cotton bud users but these factors were insignificantly associated with cotton bud use in our study. Itching was the only factor significantly associated with cotton bud use in this study. However study by Musa TS et al do not report it as an important symptom (20). Among head phone users, itching and hearing loss were two significant symptomatic factors observed in this study.

The swimming has been reported in some studies to increase the possibility of having infection 2-4 times more as compared to non-swimmers (17). However, no significant association of ear infection with swimming was observed in this study. This contrary finding may be due to the reason that swimming is not a popular sport in Pakistan despite belonging to a temperate climate region.

Other than cotton buds ear phones can also be a cause of mechanical ear trauma which in turn may lead to ear infection. In our study, the association of head phone use and infection in majority of the patients. However, in a study from Malaysia, insignificant association of ear infection was reported the prolonged use of ear phones. (21) The reason of high infection rate in our study could be due to the hot and humid climate of our country. Moreover, the cleaning practices of headphones needs to be assessed. We were not able to find any other similar study for comparison.

In several studies it is reported that most of the individuals were not aware of the risk factors of cotton buds. (3,22-24) A study reported that the awareness regarding unnecessary usage of cotton bud is much effective to prevent otomycosis. (25)

Another study on hazards of ear buds revealed that peoples use ear buds to remove ear wax or to absorb fluid discharging from ear canal, as they are not aware of numerous pathologies which are curable risk factors regarding with frequent use of ear buds. Moreover, they stated that awareness should be created among general population as it can cause deafness and other infections (26). These findings are also supported by this study as well.

The findings of this study could be observed in the light of limitation that this was a descriptive cross-sectional study and participants were enrolled from outpatient department of our institute. Further analytical studies are recommended that can enroll patients from at-risk population. These at-risk population may include those individuals who are using headphone as part of their occupation and frequent swimmers. As far as use of cotton buds are concerned, general population particularly females are more frequent users. Though, in this study, we have informed the participants regarding the negative consequences of cotton bud, but no organized awareness session or pamphlet was arranged. There is a dire need of arrangement of awareness program in this regard as well. Lastly, in this study, self-reported infection was observed. microbiological conformities of Otitis Externa would increase the reliability of self reported cases of Otitis Externa.

## Conclusion

Our study confirm and endorses the association of cotton bud and headphone use in Otitis Externa. However the association of headphones and Otitis Externa need to be assessed further with more studies on this subject. Awareness need to be created about the hazards of ear cleaning practices and its association with the ear infections.

## Limitations

A larger, multi-center study would in establishing the actual presentage of population using cotton buds. A bacterial culture confirmation or an ENT examination would add to the authenticity of the history given by the individuals.

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