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EVALUATION OF NECROTIZING OTITIS MEDIA IN PATIENTS WITH DIABETES MELLITUS USING CLINICAL MICROBIOLOGY

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ABSTRACT

Background: Necrotizing otitis externa (NOE), a highly serious condition, can develop from otitis externa, an inflammatory infection of the external ear canal. Nevertheless, there is a dearth of published data regarding NOE in India.

Aim: Assessing the clinic-microbiological profile of individuals with necrotizing otitis media in individuals with diabetes mellitus (DM) was the goal of the current investigation.

Methods: Sixty participants with a confirmed diagnosis of otitis externa and diabetes mellitus were evaluated in this study. The microbiological profile and clinical picture of each included participant were evaluated based on the samples that were taken.

Results: Out of the 60 participants evaluated for the study, 36 were men and 24 were women with diabetes mellitus and otitis externa, according to the findings. The study participants were 60.51±9.6 years old on average. Otorrhea, severe nocturnal otalgia, and external auditory canal edema were observed in every study participant. While pseudomonas sp. was found in the pus culture of 26 individuals, no growth was observed in eight cultures. Additionally, ten participants had modest conductive hearing loss. According to CT (computed tomography) results, two of the 60 participants exhibited facial nerve involvement that resulted in facial nerve palsy, while the other two showed facial nerve palsy with glossopharyngeal nerve damage.

Conclusion: The current study comes to the conclusion that necrotizing otitis externa is prevalent in people with diabetes mellitus, primarily in people between the ages of 60 and 80. Pseudomonas species was the most prevalent cultivated bacteria observed among survey participants.

Keywords: pseudomonas, pus, necrotizing otitis externa, diabetes mellitus, and otitis externa

INTRODUCTION

Otitis externa, commonly referred to as swimmer's ear or tropical ear, is a condition that involves infection and inflammation of the external ear canal. Necrotizing otitis externa, or NOE, is a highly severe disease process that can vary from moderate inflammation to otitis externa.[1]

NOE is brought on by a rupture in the external ear canal's cerumen, or skin's protective layer, which is typically observed in warmer and more humid environments. Otitis externa is classified into three clinical stages: pre-inflammatory, acute-inflammatory, and chronic. Moisture in the ear canal or local damage are indicators of the pre-inflammatory stage. The glands are obliterated by the edematous skin. The ear is more vulnerable to additional trauma because of this obliteration. There are three levels of acute inflammatory otitis externa: mild, moderate, and severe. The

canal is erythematous and edematous during the moderate acute inflammatory stage, which also causes the formation of clear, odorless secretions.[2]

Increased discomfort, edema, and seropurulent secretions are symptoms of moderate acute inflammatory otitis externa. A lumen obscured by debris and draining fluids is a feature of severe inflammatory OE, which is extremely painful. It typically coexists with periauricular edema and adenopathy. External necrotizing otitis is the term used when the infection spreads to the surrounding tissues. A single episode lasting longer than four weeks or four or more episodes in a year is considered chronic otitis externa.[3]

One of the most important risk factors for many bacterial infections is diabetes. A potentially fatal infection of the external ear canal, the base of the skull, and the soft tissues that surround it called necrotizing otitis externa.

In 1838, osteomyelitis in the temporal bone was first identified as a cause of necrotizing otitis externa. Acute skull base osteomyelitis in diabetics with purulent discharge and auricular necrosis has been documented in the literature. 4 When Bacillus Pyocyaneus, also called Pseudomonas aeruginosa, was originally described, the term "malignant" was used to better convey the condition's dire prognosis. To argue that necrotizing otitis externa is not a tumor, however, very few research in the literature to date have utilized the terms necrotizing or invasive otitis externa.

Infections caused by fungi that affect the middle ear, eardrum, auditory canal, and ear canal are commonly referred to as otomycosis. An external auditory canal infection that spreads to the base of the skull and mastoid cells is called invasive necrotizing otitis externa. However, there is a dearth of literature data regarding NOE.5 in the Indian context. Assessing the clinic-microbiological profile of individuals with necrotizing otitis media who also had diabetes mellitus (DM) was the goal of the current investigation.

MATERIALS AND METHODS

The goal of the current prospective observational clinical investigation was to evaluate the clinic-microbiological profile of individuals with diabetes mellitus (DM) who had necrotizing otitis media. The study participants came from the Institute's ENT Department. Prior to participation, all individuals gave their written and verbal informed consent.

All participants who presented to the Institute throughout the designated study period and had been diagnosed with diabetes mellitus and otitis externa were evaluated. Clinical findings were used to diagnose otitis externa, and radiographic and clinical findings were used to diagnose necrotizing otitis externa based on obligatory/major and occasional/minor diagnostic criteria. If all of the main criteria were met, necrotizing otitis externa was identified.

Gender, age, comorbidities, and cranial nerve involvement were evaluated in the study participants using the Brackman score for facial nerve grading. The study also evaluated important laboratory test results, such as blood glucose levels, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), white blood cell count (WBC), and glycated hemoglobin (HbA1c) levels. When appropriate, high-resolution computed tomography, or HRCT, is one of the imaging methods that have been employed. Diabetes-afflicted study participants were evaluated according to their medical histories. A microscopic inspection and external auditory canal cleaning were performed on each individual. Cultures were gathered from every subject.

All patients received topical and systemic antibiotic therapy, with adjustments made based on the histology and swab culture results. All patients received oral antibiotics for a minimum of six weeks after being released from the hospital. The Student t-test, ANOVA (analysis of variance), Mann-Whitney U test, Chi-square test, and SPSS (Statistical Package for the Social Sciences) software version 24.0 (IBM Corp., Armonk, NY, USA) were used to statistically evaluate the gathered data for descriptive measures. The Pearson correlation coefficient was used to assess correlation between several factors. The results were displayed as mean, standard deviation, frequency, and percentages. We considered a p-value of less than 0.05.

RESULTS

The goal of the current prospective observational clinical investigation was to evaluate the clinic-microbiological profile of individuals with diabetes mellitus (DM) who had necrotizing otitis media. 60 participants with a confirmed diagnosis of otitis externa and diabetes mellitus were evaluated in this study. In the current study, there were 40% (n=24) females and 60% (n=36) males. 20% (n=12), 26.66% (n=16), 33.33% (n=20), and 0 patients in the age groups of 41-50, 51-60, 61-70, 71-80, and 81-90 years, respectively, did not participate in the study. It was observed that 13.33% (n=8) of the study individuals had no growth in their pus culture.

Pseudomonas species were the most common organisms found in 43.33% (n=26) of the study participants, followed by staphylococcus species (16.66%) (n=10), streptococcus and candida species (10.6%; n=6), and Klebsiella species (6.66%; n=4), in that order (Table 2).

The findings of the study indicated that 83.33% (n=50) of the study participants had normal hearing on pure tone audiometry, while 16.66% (n=10) of the participants had mild conductive hearing loss (CHL) (Table 3). The mean blood glucose, HbA1C, CRP (C-reactive protein), WBC (white blood cells), and ESR (erythrocyte sedimentation rate) of the study participants were 174.87±40.06, 7.34±1.22, 44.384±18.92, 7545±1001, and 71.064±19.17, respectively, according to Table 4.

DISCUSSION

60 participants with a confirmed diagnosis of otitis externa and diabetes mellitus were evaluated in this study. In the current study, there were 40% (n=24) females and 60% (n=36) males. 20% (n=12), 26.66% (n=16), 33.33% (n=20), and 0 patients in the age groups of 41-50, 51-60, 61-70, 71-80, and 81-90 years, respectively, did not participate in the study. These findings were similar to those of Chen JC et al. study and Kaya İ et al. study, in which the authors evaluated participants with demographic information similar to the current study who had diabetes mellitus and otitis externa, respectively.

According to the study's findings, 13.33% (n=8) of the study participants had no development in their pus cultures. Among the study participants, the most common organisms were pseudomonas species, which were observed in 43.33% (n=26), followed by staphylococcus species (16.66%) (n=10), streptococcus and candida species (10.6%; n=6), and Klebsiella species (6.66%; n=4). These findings were in line with those of Rubin Grandis J et al. (2004) and Ravikumar A et al, whose works reported pus culture data that was similar to the current study's findings.

Study participants' PTA (pure tone audiometry) revealed that 83.33% (n=50) had normal hearing on pure tone audiometry, whereas 16.66% (n=10) had mild CHL (conductive hearing loss). These results were consistent with those of Rajput MS et al. (2010) and Stern Shavit S et al, who also reported PTA (pure tone audiometry) results comparable to the current study in their separate investigations.

According to the study findings, the mean blood glucose, HbA1C, CRP (C-reactive protein), WBC (white blood cells), and ESR (erythrocyte sedimentation rate) of the study participants were, respectively, 174.87±40.06, 7.34±1.22, 44.384±18.92, 7545±1001, and 71.064±19.17.

These findings were consistent with those of Yang TH et al. and Guerrero-Espejo A et al, whose laboratory data from their respective investigations were similar to the current study's findings.

CONCLUSIONS

Considering its limitations, the present study concludes that necrotizing otitis externa is common in subjects with diabetes mellitus mainly in subjects aged 60-80 years. The most common cultured microorganism seen in study subjects was the Pseudomonas species. However, the study followed a lesser number of subjects over a shorter period. Hence, further clinical studies with larger sample sizes and longer follow-ups are needed to attain a definitive conclusion.

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S. No	Characteristics	Number (n)	Percentage (%)
1.	**Gender**		
a)	Males	36	60
b)	Females	24	40
2.	**Age range (years)**		
a)	21-30	0	0
b)	31-40	0	0
c)	41-50	12	20
d)	51-60	16	26.66
e)	61-70	20	33.33
f)	71-80	12	20
g)	81-90	0	0

Table 1: Demographic data of study subjects at baseline

S. No	Organism growth	Number (n)	Percentage (%)
1.	**No growth**	8	13.33
2.	**Klebsiella sp.**	4	6.66
3.	**Candida sp.**	6	10
4.	**Streptococcus sp.**	6	10
5.	**Staphylococcus sp.**	10	16.66
6.	**Pseudomonas sp.**	26	43.33

Table 2: Pus culture reports in the study subjects

S. No	PTA (Pure tone audiometry) test	Number (n)	Percentage (%)
1.	**Mild CHL (conductive hearing loss)**	10	16.66
2.	**Normal hearing**	50	83.33

Table 3: Hearing evaluation in the study subjects

S. No	Parameter	Minimum	Maximum	Mean ± S. D
1.	**Laboratory investigations**			
a)	Blood glucose	134.79	214.95	174.87±40.06
b)	HbA1c	6.10	8.4	7.34±1.22
c)	CRP	25.43	63.31	44.384±18.92
d)	WBC	6541	8547	7545±1001
e)	ESR	51.85	90.24	71.064±19.17

Table 4: Laboratory data on study subjects