ORIGINAL RESEARCH

Assessment of ear in COPD patients: An observational study

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ABSTRACT
Background: Chronic obstructive pulmonary disease (COPD) is a complex condition that frequently occurs alongside other comorbidities, which can significantly influence patient outcomes. Hence; the present study was conducted for assessing ear in COPD patients. **Materials & methods:** A total of 100 COPD patients were enrolled in the present study. Another set 100 subjects were included as controls. Complete demographic and clinical details of the patients was obtained. A Performa was made and complete Spirometric details of all the patients was recorded separately. Ear assessment was done in all the patients. All included participants attended one hearing testing session. Pure-tone threshold audiometry was conducted in sound-isolated rooms or booths using a clinical audiometer. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software. **Results:** A total of 100 COPD patients and 100 controls were enrolled. Mean age of the patients of COPD group and control group was 46.5 years and 48.7 years respectively. There were 56 males and 44 females in COPD group and there were 61 males and 39 females in the control group. While comparing the auditory findings among controls and COPD patients, significant results were obtained. **Conclusion:** Alterations in ear function, without accompanying hearing loss, are frequently observed in patients with COPD when compared to healthy controls.
Key words: Chronic obstructive pulmonary disease, Ear

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INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a complex condition that frequently occurs alongside other comorbidities, which can significantly influence patient outcomes. Some of these comorbidities develop independently of COPD, while others may be interrelated, sharing common risk factors or exacerbating each other's severity.[1, 2] Although various risk factors contribute to the onset of COPD, cigarette smoking remains the most extensively researched. Numerous studies have highlighted the considerable impact of smoking on hearing loss. Previous investigations have explored how chronic hypoxemia resulting from COPD affects the auditory capabilities of affected individuals. Findings indicated a statistically significant difference in auditory measures between COPD patients and healthy controls; however, overall hearing impairment has not been demonstrated to be clinically significant in this population. Additionally, in stable COPD patients with mild to moderate airflow limitation, subtle abnormalities in brainstem auditory evoked potentials have been noted.[4, 5]Hence; the present study was conducted for assessing ear in COPD patients.

MATERIALS & METHODS

A total of 100 COPD patients were enrolled in the present study. Another set 100 subjects were included as controls. Complete demographic and clinical details of the patients was obtained. A Performa was made and complete Spirometric details of all the patients was recorded separately. Ear assessment was done in all the patients. All included participants attended one hearing testing session. Pure-tone threshold audiometry was conducted in sound-isolated rooms or booths using a clinical audiometer. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software. Univariate assessment was done for evaluation of level of significance.

RESULTS

A total of 100 COPD patients and 100 controls were enrolled. Mean age of the patients of COPD group

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and control group was 46.5 years and 48.7 years respectively. There were 56 males and 44 females in COPD group and there were 61 males and 39 females in the control group. While comparing the auditory findings among controls and COPD patients, significant results were obtained.

Table 1: Demographic data

Variable	COPD	Controls
Mean age (years)	46.5	48.7
Males	56	61
Females	44	39

Table 2: Audiometry comparison

Audiometry comparison		COPD	Controls	p-value
Low frequency tone (Hz)	250	28.6	5.6	0.001*
	500	28.9	6.7	0.000*
	1000	32.5	5.9	0.003*
High frequency tone (Hz)	2000	28.9	13.5	0.000*
	4000	43.6	11.8	0.004*
	8000	448	12.9	0.000*

DISCUSSION

Chronic obstructive pulmonary disease (COPD) is a disease state characterized by airflow limitation that is not fully reversible. The airflow limitation is usually progressive and associated with an abnormal inflammatory response of the lung to noxious particles or gases. Prolonged I–V interpeak latency on the right side and prolonged III–V latency on the left side.COPD is presently regarded as multi-system disorder. It is associated with peripheral neuropathy, motor neuron involvement, encephalopathy and derangement of cognitive function. Brain-stem auditory evoked potentials (BAEP) are the potentials recorded from the ear and vertex in response to a brief auditory stimulation to assess the conduction through auditory nerve, cochlea and hearing pathway in brain.[6- 9]Hence; the present study was conducted for assessing ear in COPD patients.

A total of 100 COPD patients and 100 controls were enrolled. Mean age of the patients of COPD group and control group was 46.5 years and 48.7 years respectively. There were 56 males and 44 females in COPD group and there were 61 males and 39 females in the control group. While comparing the auditory findings among controls and COPD patients, significant results were obtained. Dayem AMA et al. conducted an audiological evaluation of patients with Chronic Obstructive Pulmonary Disease (COPD) to explore the impact of smoking and its potential relationship with the severity of the condition. In their study, they assessed 100 male COPD patients with an average age of 52.66±6.84 years. Additionally, a control group consisting of 25 healthy male nonsmokers with a mean age of 45.5±6.75 years was included. An experienced audiologist performed tympanometry and pure-tone audiometry across frequencies ranging from 250 to 8000 Hz for both COPD patients and control participants. The results indicated that tympanometry type C was found in 30 COPD patients' right ears and in 28 patients' left ears. Significant differences were noted in both low and high-frequency tone audiometry between the COPD patients and the control group ($P<0.05$). Furthermore, both low and high-frequency tone audiometry showed a significant inverse correlation with the partial pressure of oxygen and the forced expiratory volume in the first second, while a direct correlation was observed with the annual exacerbation rate of COPD. In conclusion, alterations in auditory function, rather than outright hearing loss, are prevalent among COPD patients. These audiological changes appear to be influenced by the extent of airway obstruction and hypoxia, as well as the frequency of annual COPD exacerbations, but are not affected by smoking.[10]

A recent study indicated a statistically significant difference in all audiological measures when comparing the control group to a subgroup of COPD patients identified as presumptive hypoxic (with partial oxygen tensions, PO2, below 75 mmHg). Additionally, there was a correlation between PO2 levels and the variations noted in all audiological assessments.[11]Kamenski G et al aimed to determine whether chronic obstructive pulmonary disease (COPD) is a significant and clinically relevant risk factor for hearing impairment in a general practice context. They recruited consecutive patients over the age of 35 with a COPD diagnosis who visited one of 12 solo practitioners during 2009 and 2010. Participants who consented were matched 1:1 with control subjects based on age, sex, hypertension, diabetes, coronary heart disease, and chronic heart failure. Hearing impairment was evaluated through pure tone audiometry, responses to three questions regarding self-perceived hearing issues, the whispered voice test, and the Hearing Inventory for the Elderly, Screening Version (HHIE-S) score. A total of 194 patients (97 pairs of cases and controls) with a mean age of 65.5 (SD 10.2) were assessed. Univariate conditional logistic regression revealed significant differences in mean bone conduction hearing loss and total HHIE-S scores; however, in the multiple conditional regression model, only smoking

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($p<0.0001$) was found to be significant. The findings of this study do not support the hypothesis of a link between COPD and hearing impairment, which, if established, could have improved the management of COPD patients.[12]

CONCLUSION

Alterations in ear function, without accompanying hearing loss, are frequently observed in patients with COPD when compared to healthy controls.

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