International Journal of Otorhinolaryngology and Head and Neck Surgery
Muniraju M et al. Int J Otorhinolaryngol Head Neck Surg. 2025 Apr;11(2):126-130
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937

DOI: https://dx.doi.org/10.18203/issn.2454-5929.ijohns20250790

Original Research Article

A study on videostroboscopic changes and voice analysis in professional voice users

Muniraju Munianjanappa, Chaithanya Munikrishna*

Department of Otorhinolaryngology, Dr. B.R. Ambedkar Medical College and Hospital, Bengaluru, Karnataka, India

Received: 26 October 2024
Accepted: 12 February 2025

***Correspondence:**
Dr. Chaithanya Munikrishna,
E-mail: chaitanyan044@gmail.com

ABSTRACT

Background: The primary source of sound used when speaking is the larynx. Phonation is the creation of sound via vibrating of vocal cords. Evaluation techniques that take into account the needs of professional singers are necessary to determine the state of their vocal health. Stroboscopy is a technique that uses fast light flashes at a frequency that is either slightly higher or lower than the patient's vocal cord vibrations to shift a series of still photographs such that the patient appears to be moving continuously. To determine the videostroboscopic changes and voice analysis in professional voice users.
Methods: This prospective study was carried out from July 2022 to December 2023 in the otorhinolaryngology department of a tertiary health care centre in Bengaluru, Karnataka. In all, thirty people made up the study. A thorough history and clinical examination were recorded using a pre-tested questionnaire after gaining everyone's agreement.
Results: Stroboscopy revealed that 80% of cases had no symmetry, 10% had no mucosal wave, 26.7% had inadequate glottic closure, 16.7% had irregular closure and 56.0% had no periodicity. 13.3% of people had a severe voice handicap index and there was a strong correlation ($p<0.05$) between the voice handicap index and occupation.
Conclusions: The study found that there was a strong correlation between the subjects' work and their voice handicap index. Though females are more prone for voice impairment, in my study males experienced more impairment.

Keywords: Professional voice users, Videostroboscopy, Voice handicap index

INTRODUCTION

The voice plays a crucial role in the special capacity of human spoken communication. Evaluation techniques that are considerate of the needs of professional voice users and singers are necessary to determine the state of their vocal health. About 25% of those in employment believe that voice is an essential tool for their jobs.[1] Although dysphonia was not given much attention until recently, it is now recognized as a serious disturbance with implications for an individual's social and professional life.[2] In modern laryngology practice, videostroboscopy is an essential diagnostic tool for determining the presence of vocal illness. The introduction of the videostroboscope into ENT practice has resulted in a substantial revolution in the evaluation of vocal cord disorders.[3,4] After the examination is over, a thorough study of the examination results can be achieved by watching the recording in slow motion or frame-by-frame. Therefore, a vocal fold anomaly that was overlooked by indirect or flexible laryngoscopic examinations can frequently be clarified by videostroboscopy. Videostroboscopy is therefore a possibility for any patient presenting with vocal abnormalities for whom the diagnosis is uncertain. The therapeutic application of videostroboscopy during the past few decades has yielded a wealth of information regarding vocal fold vibration, which can be used in the assessment of patients with voice disorders. Hence this

study was undertaken to study the videostroboscopic changes and voice analysis among voice professionals.

To determine the videostroboscopic changes and voice analysis in professional voice users.

METHODS

Study design

This was a prospective study.

Study place

The study was conducted among patients attending Department of Otorhinolaryngology of a tertiary health center, Bengaluru, Karnataka.

Study period

The study period was from July 2022 to December 2023

Inclusion criteria

Subjects>18 years and<60 years of either gender. Professional voice users. Consented subjects

Exclusion criteria

Subjects <18 years and >60 years. Non- professional voice users. Unwilling subjects. Patients with coronary artery disease. Patients with respiratory distress. Patients with malignant looking lesions.

Sample size

Since the prevalence of dysphonia among voice professionals is 44%, it is used as basis for the present study sample size estimation.[5]

N =1.96×1.96×pq/L2 (absolute precision)

P: Prevalence, Q: 1- prevalence, L: Allowable error, p=44%=0.44, q=0.56(1-p), L=15%=0.15, N=1.96×1.96×0.44×0.56/0.15×0.15=0.9465/ 0.0225=42

The minimum sample size required for the study was 42 with the above formula. During the study 12 subjects dropped out during the study period and the total sample was 30 subjects.

Study methods

A Study proforma was used to collect the patient's details and findings. History was taken from subjects. Important history regarding symptoms was taken. Videostroboscopic was conducted for all the subjects and ratings were noted with regard to, symmetry, mucosal wave on the focal fold, glottic closure.

Statistical analysis

The collected data was analysed using SPSS v 26. A p value of 0.05 was considered statistically significant for the statistical tests performed.

RESULTS

The study consisted of 66.7% males and 33.3% females with the mean age being 39.03±10.2 years and the various occupations of the subjects (Table 1).

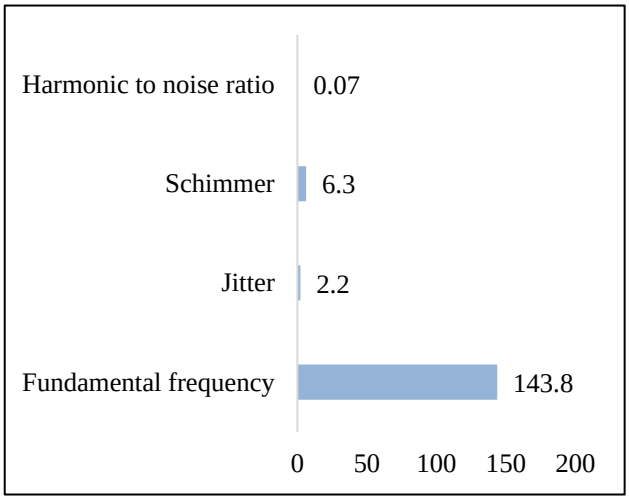

Figure 1: Acoustic voice parameters findings.

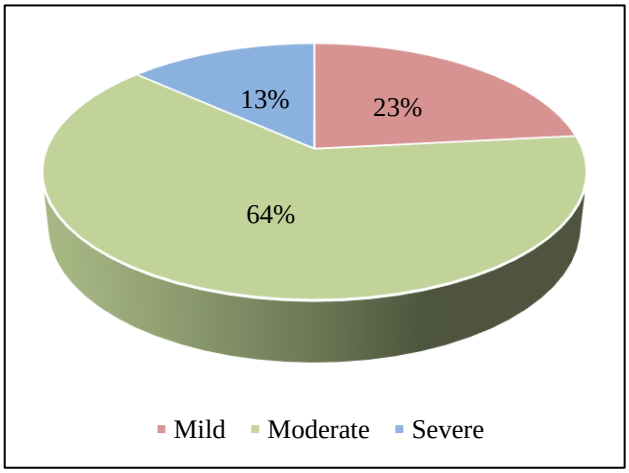

Figure 2: Outcome based on voice handicap index (VHI).

The results of stroboscopy are displayed (Table 2), where symmetry was found in 20% of cases and lacking in 80%. 10% had no mucosal wave, 10% had little left, right and bilateral waves, 20% had small left and bilateral waves and 6.7% had larger right and bilateral waves. The percentage of cases with incomplete, complete and irregular glottic closures was 26.7%, 23.3% and 16.7%, respectively. Anterior gap and hour glass were 6.7% and 3.3% and spindle gap and variable were 3.3%. There was periodicity in 43.3% of cases and not at all in 56.7%.

The mean acoustic fundamental frequency was 143.8±33.2, jitter was 2.2±2.5, Schimmer was 6.3±3.2 and harmonic to noise ratio was 0.07±0.13 (Figure 1). The voice handicap index (VHI) was mild in 23.3%, moderate in 63.3% and severe in 13.3% (Figure 2).

The association between occupation and voice handicap index were a significant association obtained between them which was statistically significant (p<0.05) (Table 3).

Table 1: Demographic data of the subjects.

Variable	Frequency/ mean	%
Age (in years)	39.03±10.2 years	
Gender		
Males	20	66.7
Females	10	33.3
Occupation		
Clergy, priest/ pastor	8	26.7
Teacher	7	23.3
Singer	6	20
Sale person	3	10
Broadcaster	2	6.7
Sarpanch	2	6.
Lawyer	1	3.3
Vendor	1	3.3

Table 2: Stroboscopy findings.

Stroboscopy	Frequency	%
Symmetry		
Present	6	20
Absent	24	80
Mucosal wave		
Normal	7	23.3
Absent	3	10
Left small	3	10
Right small	6	20
Right greater	1	3.3
Bilateral small	8	26.7
Bilateral greater	2	6.7
Glottic closure		
Incomplete	8	26.7
Complete	7	23.3
Irregular	5	16.7
Anterior gap	2	6.7
Hour glass	2	6.7
Spindle gap	1	3.3
Variable	1	3.3
Periodicity		
Present	13	43.3
Absent	17	56.7

Table 3: Association between occupation and VHI.

Occupation VHI	Mean	SD	95% CI		P value
			Lower	Upper	
Mild	6.86	0.37	6.51	7.21	<0.05*
Moderate	3.63	0.2	2.65	4.6	
Severe	4.7	2.5	0.7	8.7	

*Level of significance: p<0.05

DISCUSSION

The mean age in the study was 39.03±10.2 years with 77.3% between 25-44 years and majority of them being males. The present findings were comparable with studied by Fortes FSG et al and close to the study by Liliana et al, where the mean age was 36.5±12.1 years and 31 years respectively.[6,7] On a contrary the later author reported majority were females whereas Chandala C et al, reported a male predominance.[8]

The present study findings differed to a study by Liliana et al, in which majority (89.4%) were singers. The present study findings were comparable to a study by Fortes FSG et al, in which 45% were sales person, 39% were professors, 25% each were singers and telemarketing operators respectively, 13% were receptionists and 3% were pastor.[6,7] The present study findings concurred with a study by Sasindran et al, in which 17.5% were teachers and 15% were labourers/vendors.[9] The present study findings were consistent with a study by Chandala et al, in which 40% of participants were teachers.[8]

The current research reported on stroboscopy symmetry was present in 20%, mucosal wave was absent in 10%, left, right and bilateral was small in 10%, 20% and 26.7% respectively. Right and bilateral mucosal wave was greater in 3.3% and 6.7% respectively. The glottic closure was incomplete in 26.7%, complete in 23.3%, irregular in 16.7%, anterior gap and hour glass in 6.7% each and spindle gap and variable in 3.3% each respectively. Periodicity was present in 43.3% and absent in 56.7%.

The results of this investigation were in agreement with a study conducted by Sasindran et al, in which the hourglass pattern was the most frequently observed form of glottic closure pattern. Complete closure, posterior glottis closure and irregular glottis closure were the next most prevalent patterns. Only 15% of the cases had symmetry, whereas 85% of the cases had asymmetry. Vocal cysts frequently exhibited no mucosal waves, whereas polyps had normal or enlarged mucosal waves. In over 85% of the instances, the vocal cord's vibration was irregular or aperiodic.

The results of this investigation were in line with a study by Thomas et al, in which the most prevalent diseases found on stroboscopy were asymmetry, absence of a mucosal wave and uneven closure of the glottic region.[10] The results of this investigation were comparable to those of a study by Bakhsh et al, which found similar results regarding asymmetric vocal fold position, reduced amplitude, irregular periodicity, edge bowing, loss of mucosal wave and inadequate closure of the glottic gap.[11] Similar results on stroboscopy of the glottis, spindle-shaped glottis, cord bowing and partial vocal cord closure were also noted by Banjara et al. There was a lot of asymmetries.[12] Other significant findings included decreased amplitude, mucosal wave and loss of periodicity. The mean acoustic fundamental frequency was 143.8±33.2, jitter was 2.2±2.5, Schimmer was 6.3±3.2 and harmonic to noise ratio was 0.07±0.13. the findings concurred with a study by Sasindran et al, in which decrease in amplitude was noted in 70% of cases.[9]

Alexander et al, reported the mean jitter among males was 2.5 and among females was 2.05, mean Shimmer among males was 0.99 and among females was 0.86 mean HNR was 10.99 and 12.8 among males and females respectively.[13] Hippargekar et al, showed among cases mean jitter was 0.89, mean shimmer was 6.1 and mean HNR was 14.8.[14] The present study findings concurred with a study by Sasindran et al, in which mean pre-operative VHI total score was 48.5±3.8 and the present study voice handicap index (VHI) was mild in 23.3%, moderate in 63.3% and severe in 13.3%.[9]

In the present study, there was statistically significant association between occupation and voice handicap index ($p<0.05$). The present study findings were similar to a study by Liliana et al, Chandala et al and Krishnan et al, in which there was significant association between VHI and singers, significantly higher incidence of severe VHI as compared to non- professional voice users and laryngeal structural changes were significantly higher among professional voice users.[7,8,15]

CONCLUSION

Though females are more prone for voice impairment, my study concluded males were affected more and voice handicap index was severe and on comparison with the occupation of the subjects a significant association was present.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Muniraju M, Chaithanya M. A study on videostroboscopic changes and voice analysis in professional voice users. Int J Otorhinolaryngol Head Neck Surg 2025;11:126-30.