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Original Research Article

Perceptual and acoustic voice analysis in participants with post thyroidectomy

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ABSTRACT

Background: Voice changes are common concern for participants who underwent thyroidectomy, even when the laryngeal nerves are preserved. To understand these changes, a comprehensive voice assessment is necessary, which involves a multidisciplinary team of professionals in evaluating and treating participants with post-thyroidectomy. The study aimed to assess and compare perceptual and acoustic voice analysis in healthy and participants with post-thyroidectomy.
Methods: It was an analytical cross-sectional study. A total of 40 participants, aged 20 and 55 years were included in Group I and Group II. VHI-H, and MDVP were used for the study which provides insights into various parameters of voice. The collected data was entered into an Excel sheet, and statistical analysis was performed with SPSS version 27.
Results: Statistical analysis revealed a significant difference in perceptual evaluation of voice in participants with post-thyroidectomy when compared with healthy participants ($p<0.05$). Statistically significant difference was also observed in the acoustic voice parameters in participants with post-thyroidectomy and healthy participants ($p<0.05$). Significant positive correlation was found among VHI-H as well as most MDVP parameters.
Conclusions: Post-thyroidectomy can significantly alter both perceptual and acoustic voice parameters. The significant correlation further underscores the importance of incorporating both perceptual and acoustic evaluations in clinical voice assessment. These insights support the importance of routine voice monitoring in participants with post-thyroidectomy to ensure timely identification and management of voice problems, ultimately improving patient care and their QOL.

Keywords: Voice, Thyroidectomy, Voice handicap index Hindi, Multidimensional voice program

INTRODUCTION

Voice plays a vital role in public health by allowing individuals to articulate their concerns, advocate for their rights, and gain access to healthcare services.[1] It is a complex and multi-dimensional phenomenon, encompassing not only the physical sound production but also the social, cultural, and emotional dimensions of human communication. The vocal folds generate the acoustic signal, and the vocal tract modifies it, which enables speaking, singing, and other vocal activities.[2] Normal voice is characterized when the quality is clear, pitch and loudness are appropriate based on the individual's age, gender, and situation, effortless production without strain, pain, or fatigue, and the ability to meet the speaker's occupational, social, and emotional vocal needs to their satisfaction.[3] Physiological changes like hormonal changes, particularly during puberty, menopause, or due to thyroid disorders, can alter voice characteristics.[4] Thyroidectomy is the surgical procedure used to remove either all or a portion of the thyroid gland. It is typically recommended for conditions that include thyroid cancer, hyperthyroidism, or large goiters.[5] Based on the studies, 25 % to 87 % of patients develop voice difficulties following thyroidectomy, making post-thyroidectomy voice issues as a commonly reported concern.[6,7] Thyroidectomy can result in respiratory difficulties, change in voice quality, swallowing challenges, and ineffective or silent coughing. Voice changes following thyroidectomy can vary in severity. Mild cases may involve hoarseness or vocal fatigue, while severe cases can lead to dysphonia or aphonia.[8] Globally thyroidectomy ranks as the most commonly performed procedure in general and endocrine surgical units.[9] A higher prevalence of colloid goiter in the northern states of India (24.5%) compared to the southern states (12.5%). The prevalence was 7.2% in men and 21.8% in women.[10] Females are particularly at higher risk of voice changes in post thyroidectomy who has larger thyroid nodules, previous surgical history, and those having history of gastroesophageal reflux disease.[11,12] Voice alteration is a common concern that patients experience post-thyroidectomy. Approximately 30% to 80% of patients complain of voice changes after thyroid surgery.[13] Voice impairments often persist long after surgery, prompting some researchers to refer to this condition as “post-thyroidectomy syndrome”. To ensure optimal patient recovery and outcomes following thyroidectomy, multidisciplinary collaboration among surgeons, endocrinologists, otolaryngologist, and speech-language pathologists can help address these challenges effectively.

Compared to global literature, there is a limited number of Indian studies that examine vocal outcomes in participants with post-thyroidectomy. However, recent years have seen an increased awareness and academic interest in post-thyroidectomy voice changes among various professionals, including speech language pathologists. To enhance clinical relevance, there is a growing need for region-specific, evidence-based studies that incorporate both perceptual and acoustic voice evaluation methods. As India is a vast country, many voice parameters may vary according to language, dialect, ethnic background, and sociocultural norms. These regional and linguistic variations play a critical role in defining the normative values.

Understanding these challenges requires a dual approach that combines both perceptual analysis and acoustic analysis of voice. These methods together address the clinical, functional, and patient-reported dimensions of voice disorders. The study aimed to assess and compare perceptual and acoustic voice analysis in healthy and participants with post-thyroidectomy. Objectives included were to assess and compare perceptual voice parameters in healthy and participants with post thyroidectomy, to assess and compare acoustic voice parameters in healthy and participants with post thyroidectomy and to correlate the perceptual and acoustic voice parameters in participants with post thyroidectomy.

METHODS

This analytical cross-sectional study was conducted at the Sri Aurobindo Institute of Speech and Hearing, Sri Aurobindo University in Indore, Madhya Pradesh, spanning from September 2024 to July 2025. Convenience sampling was used for data collection. A total of 40 participants were enrolled in the study, aged between 20 and 55 years. Group I (20 healthy participants), group II (20 participants with post-thyroidectomy).

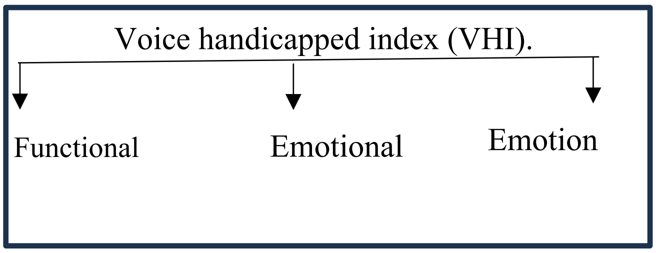

Figure 1: Perceptual voice analysis for the present study.

Inclusion and exclusion criteria

Participants should be in the age range of 20 to 55 years for both groups. Participants with post-thyroidectomy, after 15 days of surgery, were included in the study. Participants who understood Hindi language were included in the study. Participants who had given their consent were included. Individuals aged less than 20 years and more than 55 years were excluded. Healthy participants should not have any preexisting vocal and neurological disorder. Participants who do not understand the Hindi language were excluded. Participants who had not given their consent were excluded from the study.

Informed Consent was taken from the participants, and they were fully informed of the purpose of the study. The confidentiality of all participants was ensured throughout the study process. A detailed case history form, which is used in the speech and language department (SAISH), consisting of demographic data, medical history, was used. This study used Voice handicap index Hindi (VHI-H), which is a perceptual evaluation tool, capturing the participant’s self-reported impact of voice changes, consists of 3 domains: physical, functional, and emotional. The total score of the VHI-H questionnaire is 120. The severity ranges from mild (0-30), moderate (31-60), and severe (60-120).

Multidimensional voice program (MDVP) provides acoustic insights into various parameters of voice, parameters included in this study were average fundamental frequency, frequency perturbation measurements, amplitude perturbation measurements, noise and tremor.

Participants were instructed to phonate /a/ and recordings were conducted in a quiet environment using calibrated equipment. Best voice sample recording based on acoustic voice analysis was used for the research. The collected data were entered into an Excel sheet, and statistical analysis was done using SPSS version 27.

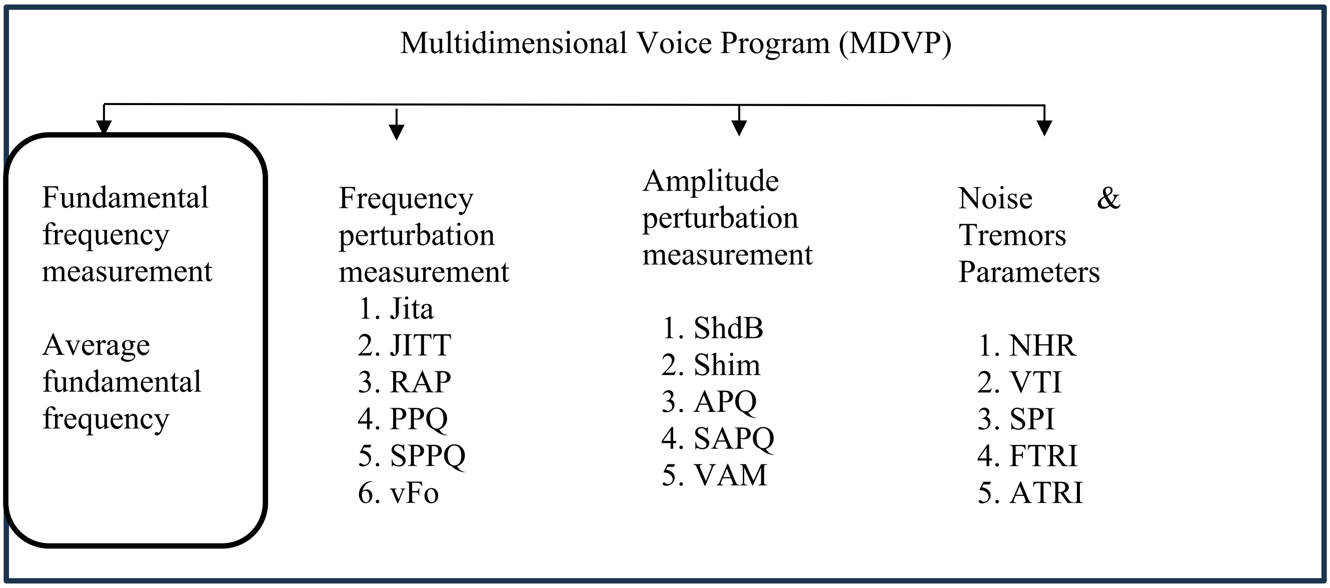

Figure 2: Acoustic voice analysis for the present study.

RESULTS

A comprehensive and structured statistical process was employed to assess and compare perceptual voice parameters in group I and group II which beginning with the Shapiro-Wilk test to assess normality distribution.

Table 1: Test of normality for perceptual voice analysis in group I and group II.

	Shapiro-Wilk		
Groups	**Statistics**	**DF**	**P value**
Group I	0.00	5	0.000
Group II	0.981	5	0.938

Table 1 represents result of normality for perceptual voice analysis, tables 2 and 3 represent the result of normality for acoustic voice analysis in group I and group II whose result indicates that the data meet the assumption of normality, as the p value of Shapiro-Wilk is >0.05. Since the p value is greater than the significance level ($p>0.05$), a parametric test was applied, i.e. t test., to compare perceptual and acoustic voice parameters in group I and group II. Descriptive statistics for perceptual voice analysis were calculated using the VHI-H.

Based on the availability of data, the demographic data highlights that out of 40 participants, group I included 20 healthy participants (13 females, 7 males), while group II had 20 participants with post-thyroidectomy (19 females, 1 male). As shown in table 4, descriptive statistics was calculated i.e. mean, standard deviation, minimum, and maximum scores, providing insight into the data's overall distribution. Since the data was normally distributed, an independent t-test was used to compare the group I and group II. The perceptual voice analysis by VHI-H revealed a significant difference in the functional, emotional, and physical scores between healthy and participants with post-thyroidectomy ($p<0.05$). To assess and compare acoustic voice parameters in healthy and participants with post-thyroidectomy, as shown in table 5, descriptive statistics and t-test were used which revealed significant differences ($p<0.05$) between group I and group II in F0 and frequency perturbation measurements including JITT, RAP, PPQ, SPPQ, and vF0. Table 6 represent significant differences ($p<0.05$) between group I group II for amplitude perturbation parameters including Shim, APQ, SAPQ, and VAM. Table 7 indicates, descriptive statistics and t-test result for acoustic analysis (noise and tremors), which showed statistically significant differences in NHR and VTI between group I and group II ($p<0.05$). Variables in group II (participants with post-thyroidectomy) satisfied the assumptions of normality, so Pearson's correlation test was conducted to correlate perceptual (VHI-H) and acoustic (MDVP) parameters in participants with post-thyroidectomy.

Table 8 indicates, result of Pearson correlation between VHI-H and acoustic voice parameters (frequency measurement and frequency perturbation measurement) in group II. A significant positive correlation was found between the Voice handicap index (VHI-H) and most MDVP parameters (JITT, RAP, PPQ, SPPQ, vF0) in post-thyroidectomy patients, indicating that subjective voice handicap is strongly associated with frequency and amplitude perturbations. However, no significant correlation was observed between VHI-H and F0. As shown in table 9 in group II significant and positive correlation was found between VHI and most MDVP parameters, ie. SHDB, SHIM, SAPQ, VAM, except for APQ, which did not show significant associations (p> 0.05). Table 10 represents, a significant positive correlation between VHI-H scores and MDVP parameters (FTRI, ATRI), except for NHR, VTI, and SPI, which showed no significant association (p>0.05) for group II.

Table 2: Test of normality for acoustic voice analysis in group I.

		Shapiro-Wilk		
MDVP parameters		**Statistics**	**DF**	**P**
Fundamental frequency information measurement	F0	0.909	5	0.459
Frequency perturbation measurements	JITA	0.973	5	0.897
	JITT	0.823	5	0.124
	RAP	0.820	5	0.118
	PPQ	0.814	5	0.105
	SPPQ	0.927	5	0.579
	VF0	0.854	5	0.209
Amplitude perturbation measurements	SHDB	0.961	5	0.816
	SHIM	0.963	5	0.827
	APQ	0.888	5	0.347
	SAPQ	0.922	5	0.541
	VAM	0.959	5	0.800
Noise and tremors parameters	NHR	0.974	5	0.898
	VTI	0.990	5	0.980
	SPI	0.814	5	0.105
	FTRI	0.824	5	0.124
	ATRI	0.836	5	0.154

Note: Table 2 represent DF=Definite difference, þ=Probability value, F0=Average fundamental frequency, JITA=Absolute Jitter, JITT= Jitter percent, RAP=Relative average perturbation, PPQ=Pitch perturbation quotient, SPPQ=Smoothed pitch perturbation quotient, vF0 =Fundamental frequency variation, SHDB=Shimmer ISN dB, SHIM=Shimmer percentage, APQ=Amplitude perturbation quotient, SAPQ=Smoothed amplitude perturbation quotient, VAM=Peak-to-peak amplitude variation, NHR=Noise to harmonic ratio, VTI= Voice turbulence index, SPI=Soft phonation index, FTRI=F0-Tremor intensity index, ATRI=Amplitude tremor intensity index for healthy participants (group I).

Table 3: Test of normality for acoustic voice analysis in group II.

		Shapiro-Wilk		
MDVP parameters		**Statistics**	**DF**	**P**
Fundamental frequency information measurement	F0	0.963	5	0.831
Frequency perturbation measurements	JITA	0.788	5	0.065
	JITT	0.884	5	0.329
	RAP	0.884	5	0.328
	PPQ	0.899	5	0.406
	SPPQ	0.822	5	0.121
	VF0	0.923	5	0.548
Amplitude perturbation measurements	SHDB	0.898	5	0.399
	SHIM	0.917	5	0.513
	APQ	0.885	5	0.334
	SAPQ	0.979	5	0.929
	VAM	0.889	5	0.352
Noise and tremors parameters	NHR	0.913	5	0.488
	VTI	0.625	5	0.001
	SPI	0.947	5	0.718
	FTRI	0.940	5	0.667
	ATRI	0.894	5	0.375

Note: Table 3 represent DF=Degrees of freedom, þ=Probability value, F0=Average fundamental frequency, JITA=Absolute Jitter, JITT= Jitter percent, RAP=Relative average perturbation, PPQ=Pitch perturbation quotient, SPPQ=Smoothed pitch perturbation quotient, vF0= Fundamental frequency variation, SHDB=Shimmer in dB, SHIM=Shimmer percentage, APQ=Amplitude perturbation quotient, SAPQ= Smoothed amplitude perturbation quotient, VAM=Peak-to-peak amplitude variation, NHR=Noise to harmonic ratio, VTI=Voice turbulence index, SPI= soft phonation index, FTRI= F0- tremor intensity index, ATRI= amplitude tremor intensity index for participants with post-thyroidectomy (group II).

Table 4: Descriptive statistics and results of t-test for perceptual analysis between group I and group II.

VHI-H		Descriptive statistics				T test		
Domains/total	**Groups**	**Mean**	**SD**	**Min**	**Max**	**T**	**DF**	**P**
Functional	Group I	0.00	0.00	0.00	0.00	3.20	38	0.003
	Group II	5.60	7.81	0.00	29.00			
Emotional	Group I	0.00	0.00	0.00	0.00	2.36	38	0.02
	Group II	5.2	9.83	0.00	30.00			
Physical	Group I	0.00	0.00	0.00	0.00	4.30	38	0.00
	Group II	7.45	7.63	1.00	38.00			
Total score	Group I	0.00	0.00	0.00	0.00	3.26	38	0.002
	Group II	7.45	25.01	0.00	97.00			

Note: The table represents mean, SD=Standard deviation for each variable, VHI-H=Voice handicap index Hindi, functional, physical, emotional domain, T=Test statistic, DF=Degree of freedom, P=Probability value for healthy participants (group I) and participants with post-thyroidectomy (group II).

Table 5: Descriptive statistics and results of t-test for acoustic analysis (frequency measurement and frequency perturbation measurement) between group I and group II.

MDVP parameters		Descriptive statistics					T test		
		Groups	**Mean**	**SD**	**Min**	**Max**	**T**	**DF**	**P**
Frequency measurement	F0	Group I	195.07	20.52	99.66	258.62	2.49	38	0.02
		Group II	212.73	39.29	143.74	259.68			
Frequency preturbation measurement	JITA	Group I	30.29	17.05	8.80	80.02	2.16	38	0.06
		Group II	81.80	117.38	10.43	544.74			
	JITT	Group I	0.54	0.23	0.21	1.03	2.21	38	0.03
		Group II	1.66	2.26	0.27	10.41			
	RAP	Group I	0.33	0.14	0.13	0.63	2.24	38	0.03
		Group II	1.00	1.34	0.16	6.16			
	PPQ	Group I	0.31	0.13	0.13	0.60	2.16	38	0.04
		Group II	0.97	1.34	0.15	6.22			
	SPPQ	Group I	0.42	0.12	0.21	0.63	2.27	37	0.03
		Group II	1.08	1.26	0.26	5.99			
	VF0	Group I	0.81	0.22	0.48	1.18	2.18	37	0.03
		Group II	2.04	2.50	0.57	11.12			

Note: The table represent Mean, SD= Standard deviation, minimum, maximum, T=Test statistic, DF=Degree of freedom, P=Probability value, F0=Average fundamental frequency, JITA=Absolute Jitter, JITT=Jitter percent, RAP=Relative average perturbation, PPQ=Pitch perturbation quotient, SPPQ=Smoothed pitch perturbation quotient, vF0=Fundamental frequency variation for healthy participants (group I) and participants with post-thyroidectomy (group II).

Table 6: Descriptive statistics and results of t-test for acoustic analysis (amplitude perturbation measurement) between group I and group II.

MDVP parameters		Descriptive statistics					T test		
		Groups	**Mean**	**SD**	**Min**	**Max**	**T**	**DF**	**P**
Amplitude perturbation measurement	SHDB	Group I	0.27	0.16	0.13	0.94	1.90	38	0.065
		Group II	0.38	0.19	0.18	0.98			
	SHIM	Group I	2.70	0.67	1.45	3.82	3.41	38	0.002
		Group II	4.21	1.86	2.00	8.38			
	APQ	Group I	1.96	0.46	1.17	2.73	3.79	38	0.001
		Group II	3.15	1.31	1.47	5.85			
	SAPQ	Group I	2.83	0.59	1.50	4.32	4.17	37	0.000
		Group II	4.42	1.56	2.26	7.67			
	VAM	Group I	6.22	1.59	3.01	8.25	3.09	37	0.004
		Group II	12.81	9.36	1.47	45.72			

Note: Table 6 represents Mean, SD=Standard deviation, SHDB=Shimmer in dB, SHIM=Shimmer percentage, APQ=Amplitude perturbation quotient, SAPQ=Smoothed amplitude perturbation quotient, VAM=Peak-to-peak amplitude variation of healthy participants (group I) and participants with post-thyroidectomy (group II).

Table 7: Descriptive statistics and results of t-test for acoustic analysis (noise and tremors) between group I and group II.

MDVP parameters		Descriptive statistics					T test		
		Groups	Mean	SD	Min	Max	T	DF	P
Noise and tremors	NHR	Group I	0.12	0.01	0.08	0.15	1.22	38	0.027
		Group II	1.66	0.56	0.08	2.21			
	VTI	Group I	0.04	0.01	0.03	0.06	3.08	38	0.030
		Group II	1.65	1.46	0.02	6.62			
	SPI	Group I	9.64	3.98	1.33	17.58	1.04	38	0.300
		Group II	11.23	5.49	4.16	24.83			
	FTRI	Group I	0.25	0.15	0.03	0.52	1.30	37	0.200
		Group II	0.49	0.75	0.07	3.35			
	ATRI	Group I	2.51	3.22	0.51	3.94	0.68	37	0.500
		Group II	1.77	1.20	0.00	9.88			

Note: Table 7 represents Mean, SD=Standard deviation, NHR=Noise to harmonic ratio, VTI=Voice turbulence index, SPI=Soft phonation index, FTRI=F0-Tremor intensity index, ATRI=Amplitude tremor intensity index for healthy participants (group I) and participants with post-thyroidectomy (group II).

Table 8: Result of Pearson correlation between VHI-H and acoustic voice parameters (frequency measurement and frequency perturbation measurement) in group II.

		VHI F		VHI P		VHI E		VHI Total	
		R	P value	R	P value	R	P value	R	P value
Frequency measurement	F0	0.04	0.86	0.32	0.86	0.89	0.94	0.01	0.95
Frequency preturbation measurement	JITA	0.70	0.00	0.72	0.00	0.76	0.00	0.74	0.00
	JITT	0.71	0.00	0.74	0.00	0.77	0.00	0.75	0.00
	RAP	0.71	0.00	0.74	0.00	0.77	0.00	0.75	0.00
	PPQ	0.71	0.00	0.74	0.00	0.77	0.00	0.75	0.00
	SPPQ	0.73	0.00	0.75	0.00	0.79	0.00	0.77	0.00
	VF0	0.76	0.00	0.77	0.00	0.83	0.00	0.80	0.00

Note: The table 8 represents P=Probability value, Pearson correlation between functional, physical, and emotional domains of voice handicap index Hindi, total voice handicap index, and acoustic voice parameters, i.e., F0=Average fundamental frequency, JITA= Absolute Jitter, JITT=Jitter percent, RAP=Relative average perturbation, PPQ=Pitch perturbation quotient, SPPQ=Smoothed pitch perturbation quotient, vF0=Fundamental frequency variation index for participants with post-thyroidectomy (group II).

Table 9: Result of Pearson correlation between VHI-H and acoustic voice parameters (amplitude perturbation measurement) in group II.

		VHI F		VHI P		VHI E		VHI Total	
		R	P value	R	P value	R	P value	R	P value
Amplitude perturbation measurement	**SHDB**	0.55	0.01	0.59	0.00	0.64	0.002	0.611	0.004
	SHIM	0.41	0.06	0.46	0.03	0.49	0.027	0.475	0.034
	APQ	0.31	0.18	0.31	0.18	0.40	0.081	0.360	0.119
	SAPQ	0.42	0.05	0.44	0.05	0.49	0.028	0.474	0.035
	VAM	0.76	0.00	0.74	0.00	0.81	0.000	0.794	0.000

Note: The table 9 represents P value=Probability, Pearson correlation between functional, physical, and emotional domains of voice handicap index Hindi, total voice handicap index, and acoustic voice parameters, i.e., SHDB=Shimmer in dB, SHIM=Shimmer percentage, APQ=Amplitude perturbation quotient, SAPQ=Smoothed amplitude perturbation quotient, VAM=Peak-to-peak amplitude variation. index for participants with post-thyroidectomy (group II).

Table 10: Result of Pearson correlation between VHI-H and acoustic voice parameters (noise and tremor) in group II.

		VHI F		VHI P		VHI E		VHI Total	
		R	P value	R	P value	R	P value	R	P value
Noise and tremors	NHR	0.03	0.88	0.05	0.80	0.00	0.99	0.04	0.86
	VTI	0.07	0.74	0.16	0.47	0.12	0.60	0.15	0.50

Continued.

		VHI F		VHI P		VHI E		VHI Total	
	SPI	0.03	0.87	0.11	0.64	0.03	0.89	0.06	0.77
	FTRI	0.82	0.00	0.82	0.00	0.91	0.00	0.87	0.00
	ATRI	0.71	0.02	0.72	0.01	0.75	0.01	0.75	0.01

Note: The table represents P value=Probability, Pearson correlation between functional, physical, and emotional domains of voice handicap index Hindi, total voice handicap index, and acoustic voice parameters, i.e., NHR=Noise to harmonic ratio, VTI=Voice turbulence index, SPI=Soft phonation index, FTRI=F0-Tremor intensity index, ATRI=Amplitude tremor intensity index for participants with post-thyroidectomy (group II).

DISCUSSION

Several studies have reported significant increases in VHI scores after thyroidectomy with the most pronounced deterioration occurring within the first 2 weeks postoperatively.[13-17] The physical domain showed the most prominent change, which reflects the presence of vocal symptoms such as strain, fatigue, and breathiness, followed by the functional domain indicating difficulties in daily voice-related tasks.[16-18] The emotional domain shows more modest but statistically significant increases, suggesting psychological distress related to voice changes.[18] These findings support VHI as an effective screening tool for monitoring voice outcomes following post thyroidectomy which supports our study. Many researchers have documented significant voice changes after thyroidectomy including increased F0, jitter, shimmer, and noise-to-harmonic ratio following thyroidectomy.[19-22] In contrast some studies reported decreased F0 values in the early postoperative period.[8]

A slight increase in jitter was observed at 1-month post-thyroidectomy.[23] These collective findings suggest that thyroidectomy significantly impacts voice quality through alterations in fundamental frequency and perturbation measures. For amplitude perturbation our findings align with several studies reporting increased shimmer and amplitude perturbation post-thyroidectomy, who observed significant increases in shimmer during the early postoperative period.[6,21,23] Slight increases in shimmer percent and SAPQ at 1.25 months post-surgery, overall, the results suggest that thyroidectomy significantly affects amplitude-related voice parameters, with transient increases in perturbation measures indicating vocal dysfunction.[24] Our finding for noise and tremor aligns with existing literature where several studies.[21,25,26,27,28] Consistently reported significant postoperative increases in NHR and VTI following thyroidectomy. No significant changes in FTRI or ATRI was found.[26] While some studies noted these changes were temporary, and others found non-significant differences, the overall evidence supports that thyroidectomy significantly impacts noise-related voice parameters.[8,23]

For correlation, findings align with previous studies, including a weak negative correlation between F0 and VHI, as well as a positive correlation between jitter % and VHI functional and physical domains.[29,30] As our study, similar results for shimmer % revealing that subjective and objective parameters were associated with the diagnosis of postoperative patients after thyroid surgery, found a positive moderate correlation between shimmer (%) and functional and VHI scores.[30] Quality of life worsened after thyroidectomy.[30] Two weeks after thyroidectomy, shimmer and shimmer dB showed moderate to strong correlations with total VHI and its functional, physical, and emotional components, while NHR correlated moderately with emotional VHI.[31] No correlation between VHI scores and MDVP parameters such as mean fundamental frequency and NHR.[32] The relationship between subjective (VHI) and acoustic (MDVP) measures is uncertain.[33] A study reported no correlation between VHI subgroups and objective voice parameters, suggesting potential cultural differences in subjective assessments.[34] Phonetic structures, microphone type, ambient noise, and analysis systems may contribute to discrepancies between subjective and objective voice measurements.[35,36]

Limitations of the study are its small sample size. Factors like regional differences, cultural backgrounds, and different languages could influence baseline voice characteristics and the perception of an individual on voice changes after thyroidectomy. The study included participants with post-thyroidectomy outcomes after 2 weeks due to time constraints, which was a relatively shorter duration. Despite these limitations, the strength of the present study lies in its comprehensive evaluation of both perceptual and acoustic voice parameters, which revealed meaningful differences between healthy individuals and participants with post thyroidectomy.

The study could be extended for preoperative and postoperative voice evaluation after 1month, 3 months of thyroidectomy. Perceptual evaluation included in this study is VHI-H, so other clinician-based auditory perceptual evaluations could be used. Further studies should aim to include larger and more diverse populations to ensure that results are applicable across different populations, offering a deeper and more inclusive understanding of voice changes following thyroidectomy. The study could also be included based on the impact of surgical incision, thyroid volume, which could lead to voice changes.

Incorporating thyroidectomy into the research context supports a more holistic view of how voice can be affected post-thyroidectomy. The integration of thyroidectomy fosters a holistic approach to understanding voice changes in participants with post-thyroidectomy.

CONCLUSION

Thyroidectomy is the most frequently performed endocrine surgery worldwide. There are limited number of Indian studies that have assessed perceptual and acoustic voice parameters in participants with post-thyroidectomy. The present study revealed that post-thyroidectomy can significantly alter both perceptual and acoustic voice parameters. For perceptual evaluation of voice, a significant difference was found in participants with post-thyroidectomy in all VHI-H domains, notable changes were also seen in various MDVP parameters. The significant correlation between subjective and objective measures further underscores the importance of incorporating both perceptual and acoustic evaluations in clinical voice assessment. These insights support the importance of routine voice monitoring through perceptual and acoustic measures in participants with post-thyroidectomy to ensure timely identification and management of voice problems, ultimately improving patient care and their quality of life. The study's finding has potential clinical impact that may contribute to the development of diagnostic tools and therapeutic interventions, ultimately enhancing patient care and treatment strategies for participants with post-thyroidectomy.

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REFERENCES

1. WHO. Voice and public health: A review of the literature. Geneva: World Health Organization, 2024. Available at: https://www.who.int/. Accessed on 19 February 2026.
2. Kent RD. The acoustic analysis of speech. 2nd ed. San Diego: Singular Publishing Group; 2022.
3. Ferrand CT. Voice disorders: Scope of theory and practice. 1st ed. Boston: Pearson Higher Ed; 2011.
4. Sataloff RT. Professional Voice: The Science and Art of Clinical Care. 4th ed. San Diego: Plural Publishing; 2017.
5. Biello A, Kinberg EC, Wirtz ED. Thyroidectomy. Treasure Island (FL): StatPearls Publishing; 2022.
6. Sinagra DL, Montesinos MR, Tacchi VA. Voice changes after thyroidectomy without recurrent laryngeal nerve injury. J Am Coll Surg. 2004;199(4):556-60.
7. Lombardi CP, Raffaelli M, De Crea C, D'Alatri L, Maccora D, Marchese MR, et al. Long-term outcome of functional post-thyroidectomy voice and swallowing symptoms. Surgery. 2009;146(6):1174-81.
8. Soylu L, Ozbas S, Uslu HY, Kocak S. The evaluation of the causes of subjective voice disturbances after thyroid surgery. Am J Surg. 2007;194(3):317-22.
9. Tarallo M, Crocetti D, Gurrado A, Iorio O, Iossa A, Caruso D, et al. Achieving the learning curve in total thyroidectomy: a prospective evaluation on resident's training by CUSUM and KPSS analysis. Ann R Coll Surg Engl. 2022;104(6):414-20.
10. Kumar S. Prevalence of colloid goiter in rural areas of India. Indian J Endocrinol Metab. 2019;23(3):341-6.
11. Park JO, Bae JS, Lee SH, Shim MR, Hwang YS, Joo YH, et al. Multivariate analysis of risk factors in the development of a lower-pitched voice after thyroidectomy. Ann Otol Rhinol Laryngol. 2017;126(3):171-6.
12. Vetshev PS, Yankin PL, Zhivotov VA, Poddubniy EI, Drozhzhin AY, Prokhorov VD. Risk factors and prognosis of voice disorders after surgical treatment of thyroid and parathyroid diseases. Khirurgiia (Mosk). 2019;(4):15-21.
13. Ryu CH, Park B, Ryu J, Ryu YM, Jo SA, Lee YJ, et al. Development and evaluation of a Korean version of a thyroid-specific quality-of-life questionnaire scale in thyroid cancer patients. Cancer Res Treat. 2018;50(2):405-15.
14. Choi Y, Keum BR, Kim JE, Lee JS, Hong SM, Park IS, et al. Early Assessment of Voice Problems in Post-Thyroidectomy Syndrome Using Cepstral Analysis. Diagnostics (Basel). 2024;14(1):111.
15. Sõber L, Lepner U, Kirsimägi Ü, Puksa L, Kasenõmm P. Voice and swallowing disorders after thyroid surgery. J Voice. 2024;38(5):1254.e11-1254.20.
16. Kletzien H, Macdonald CL, Orne J. Comparison between patient-perceived voice changes and quantitative voice measures in the first postoperative year after thyroidectomy: A secondary analysis of a randomized clinical trial. JAMA Otolaryngol Head Neck Surg. 2018;144(11):995-1003.
17. Henry LR, Helou LB, Solomon NP, Howard RS, Gurevich-Uvena J, Coppit G, et al. Functional voice outcomes after thyroidectomy: An assessment of the Dysphonia Severity Index (DSI) after thyroidectomy. Surgery. 2010;147(6):861-70.
18. Stojadinovic A, Henry LR, Howard RS, Gurevich-Uvena J, Makashay MJ, Coppit GL, et al. Prospective trial of voice outcomes after thyroidectomy: Evaluation of patient-reported and clinician-determined voice assessments in identifying postthyroidectomy dysphonia. Surgery. 2008;143(6):732-42.
19. Chung EJ, Park MW, Cho JG, Baek SK, Kwon SY, Woo JS, et al. A prospective 1-year comparative study of endoscopic thyroidectomy via a retroauricular approach versus conventional open

thyroidectomy at a single institution. Ann Surg Oncol. 2015;22(11):3729-35.
20. Kaur J. Impact of Thyroid Surgery on Voice: A Prospective Study. Indian J Otolaryngol Head Neck Surg. 2022;74(S3):5094-7.
21. Lang BHH, Wong CKH, Ma EPM. A systematic review and meta-analysis on acoustic voice parameters after uncomplicated thyroidectomy. Laryngoscope. 2016;126(2):528-37.
22. Kim SY, Kim GJ, Lee DH, Bae JS, Lee SH, Kim JS, et al. Analysis of voice changes after thyroidectomy using the thyroidectomy-related voice and symptom questionnaire. Auris Nasus Larynx. 2021;48(5):963-72.
23. Santosh M, Rajashekhar B. Perceptual and Acoustic Analysis of Voice in Individuals with Total Thyriodectomy: Pre-Post Surgery Comparison. Indian J Otolaryngol Head Neck Surg. 2011;63(1):32-9.
24. Chun BJ, Bae JS, Chae BJ, Hwang YS, Shim MR, Sun DI. Early postoperative vocal function evaluation after thyroidectomy using thyroidectomy related voice questionnaire. World J Surg. 2012;36(10):2503-8.
25. Akyildiz S, Ogut F, Akyildiz M, Engin EZ. A Multivariate Analysis of Objective Voice Changes After Thyroidectomy Without Laryngeal Nerve Injury. Arch Otolaryngol Head Neck Surg. 2008;134(6):596-602.
26. Sharma N, Kp N, Kv R. Analysis of Voice Changes after Thyroid Surgery and Their Impact on Quality of Life. Int J Thyroid Res. 2021;2(1):1005.
27. Netto IP, Fae A, Vartanian JG, Barros APB, Correia LM, Toledo RN. Voice and vocal self-assessment after thyroidectomy. Head Neck. 2006;28(12):1106-14.
28. Schindler A, Mozzanica F, Vedrody M, Maruzzi P, Ottaviani F. Correlation Between the Voice Handicap Index and Voice Measurements in Four Groups of Patients with Dysphonia. Otolaryngol Head Neck Surg. 2009;141(6):762-9.
29. Bian Y, Wang J, Zhang H, Yin X, Zhang Y. Correlation of acoustic voice analysis and Voice Handicap Index in patients with postoperative unilateral vocal cord paralysis after thyroid surgery. Braz J Med Biol Res. 2024;57:e13528.
30. Heikkinen M, Penttilä E, Qvarnström M, Mäkinen K, Löppönen H, Kärkkäinen JM. Patient Self-Assessment and Acoustic Voice Analysis in Screening of Postoperative Vocal Fold Paresis and Paralysis. Scand J Surg. 2021;110(4):609-15.
31. Birkent E, Taşlı H, Tadıhan Özkan E. Correlation Between the Voice Handicap Index and the Multidimensional Voice Program. J Acad Res Med. 2023;13(3):118-22.
32. Baken RJ, Orlikoff RF. Clinical measurement of speech and voice. 2nd ed. San Diego: Singular Publishing Group; 2000.
33. Ziwei Y, Zheng P, Pin D. Multiparameter Voice Assessment for Voice Disorder Patients: A Correlation Analysis Between Objective and Subjective Parameters. J Voice. 2014;28(6):770-4.
34. Hunter G, Kebede H. Formant frequencies of British English vowels produced by native speakers of Farsi. In: Proceedings of the Acoustics 2012 Nantes Conference; 2012 Apr 23-27; Nantes, France. Nantes: Société Française d'Acoustique and Institute of Acoustics; 2012:3919-24.
35. Hall M. Phonological characteristics of Farsi speakers of English and L1 Australian English speakers' perceptions of proficiency. Perth: Curtin University; 2007.

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