CHARACTERISTICS OF CLIENTS WITH VOICE DISORDERS AT AIISH: AN EX POST FACTO STUDY

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CERTIFICATE

This is to certify that this dissertation entitled— "Characteristics of Clients with Voice Disorders at AIISH: An Ex Post Facto Study" is a bonafide work submitted in part fulfillment for degree of Master of Science (Speech-Language Pathology) of the student Registration Number: 19SLP031. This has been carried out under the guidance of a faculty of this institute and has not been submitted earlier to any other University for award of any other Diploma or Degree.

Mysuru,
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CERTIFICATE

This is to certify that this dissertation entitled— "**Characteristics of Clients with Voice Disorders at AIISH: An Ex Post Facto Study**" has been prepared under my supervision and guidance. It is also being certified that this dissertation has not been submitted earlier to any other University for the award of any other Diploma or Degree.

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DECLARATION

This is to certify that this dissertation entitled — "**Characteristics of Clients with Voice Disorders at AIISH: An Ex Post Facto Study**" is the result of my own study under the guidance of Dr. R. Rajasudhakar, Associate Professor, Department of Speech-Language Sciences, All India Institute of Speech and Hearing, Manasagangothri, Mysuru-570006 and has not been submitted earlier to any other University for award of any other Diploma or Degree.

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Chapter I

INTRODUCTION

A person is said to have dysphonia, when the perceptual quality of voice does not match his or her demographic and environmental characteristics. The dysphonia occurs when the voice deviates from the normal range of pitch, loudness or quality. It depends on the vocal needs of the individual. The occupation those demands frequent use of voice will extend the need for a better voice. It acts as a factor for the effect of dysphonia in the individual. The evaluation and treatment of voice disorders by Speech-Language Pathologists has started in the 1930s. The individual's self-awareness and acceptance of dysphonia are vital for effective management (Stemple, Roy and Klaben, 2020). The self-recognition of voice disorders will help the individuals to seek professional help for correcting the voice. Since dysphonia depends on the characteristics such as age, gender, cultural and geographical background, it is important to consider the above variables in the assessment and management of voice disorders.

Epidemiological studies are essential for estimating the prevalence of disorders in a population to pave the path for better clinical management. It can also enlighten the prevention measures. The prevalence studies can be done in a specific population or a broad group, such as national-level databases. The studies regarding the prevalence of voice disorders have been ubiquitous in the last decade. The prevalence studies in a specific population, especially in various occupations, has been published from different parts of India and other countries. Even though most of these articles pointed to almost the same or similar results to some extent, one can observe discrepancies across the country and period of research done. A significant set of studies have published in professional voice users. The prevalence of voice disorders in specific and

general populations has a vital role in identifying the causes and consequences of dysphonia that can lead to better diagnosis, treatment, and prevention. The prevalence of voice disorders among treatment-seeking individuals is affected by age and gender, and occupation (Cohen et al., 2012; Van Houtte, Van Lierde, D'Haeseleer, & Claeys, 2009).

The voice disorders are tended to occur in 3-9% of the US population (Ramig &Verdolini, 1998; Roy, Merrill, Gray, & Smith, 2005). Among the extensive database, the point prevalence of dysphonia in treatment-seeking population in the US is only 0.98% (Cohen, Kim, Roy, Asche, & Courey, 2012) which implicated that the number of people approaching for treatment is significantly less than the actual prevalence. After analysing the 2012 National Health Interview Survey in the US, the result shows 179+/-0.5 million reported voice problems (mean age 49.1 years). Females reported more voice problems than males, and infectious laryngitis was the most common diagnosis (Bhattacharyya, 2014).

According to the cross-sectional study done by Roy et al., (2005), the lifetime prevalence of voice disorders in 1,326 people through a telephonic survey was 29.9 % in Iowa and Utah. As per the study done by Lyberg-Ahlander and collaborates (2019), the prevalence of voice disorder is 16.9% in the general population. Among that women and people above 65 years reported significantly more voice problems. The highest prevalence was observed in teaching professionals. In 2017, Benninger, Holy, Bryson, and Milstein found that there was a gradual increase in the total number of voice disorders reported between 2008 and 2012 period. Even though the need to raise awareness is still critical because of the evidence stating the number of treatment-seeking population to professionals is lesser than the populations with self-reported dysphonia.

A study describing specific characteristics of the treatment-seeking population in a voice clinic helps to create detailed data according to age, gender, occupation, symptoms, and diagnosis. This will be useful for further steps to encourage prevention and provide treatment for the large population who ignore the same. The study on characteristics of the treatment-seeking population in a clinic can pave the way to identify causes and consequences, develop awareness protocols, and prevent the disorder by identifying the population hesistant to approach the treatment.

The retrospective investigation for 5 years (January 2004 to December 2008) done by Van Houtte and colleagues (2009) revealed that in 885 patients consulted with dysphonia in the University hospital of Ghent (Belgium), functional voice disorders were most frequently diagnosed. Voice pathology was observed most commonly in females than in males. In 2016, Remacle and her colleagues retrospectively analysed the characteristics of 1074 patients consulted in a voice clinic in Belgium. The result of their studies revealed 7 out of 10 were females with predominant age of 54 and males at the age of 9 years. The overall age range of patients in their study was 4 to 93 years. More than half of the patients were working professionals, while 11.2 % were unemployed, 15.4 % were students, and 19.9 % were retired in their study. Regarding the diagnoses, nodules were the most common pathology, authors reported.

De Bodt and colleagues (2016) studied the voice patient load retrospectively in Belgium. They reported a significantly higher incidence of dysphonia in females than males, and mild to moderate hoarse voice quality was predominant in them. Watts et al. (2017) analysed the characteristics of a treatment-seeking population from a private voice clinic in Texas for over 28 months. Among 216 case files reviewed in their study, there were 153 females and 63 males reported with voice complaints. The most common voice diagnosis in females was 'mid membranous lesion, the authors reported.

Even though many epidemiological studies have conducted in India on dysphonia, the studies to estimate the characteristics of the treatment-seeking population was very few. Most of the epidemiological studies were focused on a specific occupation or age group, which can't generalise into the general and treatment-seeking population.

A retrospective study was done by Dodderi et al. (2018), in the department of Speech-Language Pathology of a tertiary hospital in Mangalore. The data was from a period of 11 years (1 January 2007 to 31 January 2018). The result revealed a 24.7% of prevalence of dysphonia with more predominantly in males. The authors also reported a higher prevalence of vocal nodule and hoarse voice quality. Rameshkumar et al. (2016) retrospectively analysed subjects with hoarseness of voice in a tertiary care hospital in Kerala. The authors reported that the prevalence of hoarseness was maximum (41%) and males were affected more than females. Further, the authors concluded that the major cause of hoarseness in the population was vocal nodule.

Need for the Study

A very many studies have been done on epidemiology of communication disorders and hearing impairment and intellectual disability occupied most places. Epidemiology studies on speech disorders are limited and more so voice pathology studies. Majority of the published voice epidemiology data are from Western countries and it is meaningless to generalise it to the Indian context, hence the need for the study arised.

The study on characteristics of clients visiting to a voice clinic can effectively give a clear idea of various aspects of the population. It can be used for effective diagnosis, treatment, and prevalence of voice disorders. The present study focuses on identifying characteristics of patients approached in the voice clinic of an apex

government institute for Speech & Hearing at Mysuru (All India Institute Speech and Hearing, Mysore) from January 2019 to December 2019. The data can reveal the most common voice disorder and its causes. These data can be utilized for developing effective treatment and prevention strategies for voice disorders.

Aim of the Study

The study aimed to analyse the patient's characteristics who consulted a voice clinic at an apex government institute for Speech & Hearing at Mysuru (AIISH) from January 2019 to December 2019.

Objectives of the Study

- To identify and segregate the patients with voice complaints according to age, gender, registered place of residence, occupation and onset of dysphonia.
- To determine the percent of the most common voice pathology among gender [males Vs females] and different age groups [children Vs teenagers Vs adult Vs geriatrics]
- To determine the percent of the most common voice pathology among different occupations.

Chapter II

REVIEW OF LITERATURE

An abnormal pitch, loudness, and/or vocal quality consecutive to disordered laryngeal, respiratory, and/or vocal tract functioning characterised as a voice disorder. Voice disorders range from mild hoarseness to complete voice loss which can reduce the intelligibility of oral communication (Ramig & Verdolini, 1998).

Even though several studies have taken place to identify the prevalence of voice disorders in the last decade, most of them were focusing on a particular age group or occupation. The studies focused on estimating the prevalence of voice disorders in the general population was very limited (De Bodt et al., 2016). Among them, the majority was held in the USA. The epidemiological studies of dysphonia in the general population mostly done with an existing large data basis obtained from surveys and medical claim records. Some of them are done by retrospectively analysing the data of patients visited in one or more clinical setups. The epidemiological studies on dysphonia can help to improve clinical practices. Studying the characteristics of voice disorders will help find the possible causes that will help for the prevention of dysphonia. The prevalence of dysphonia in each gender, age, occupation and other categories will help to provide education and prevention programs to a target population as per their needs.

2.1. Prevalence Studies with Large Existing Databases and Surveys

In 2005, Roy, Merrill, Gray, and Smith estimated the prevalence of voice disorders using the data of 'teachers' and 'non-teachers' groups collected for a previous study. The data was collected through a telephone interview with both school teachers and the general population in Utah and Iowa. The general population was selected by randomly dialling the telephone numbers. In the current study, a sample of randomly selected teachers was included in the general population. The survey questionnaire included a specific question asking about the deviation in the voice. The further questions included were voice activities during work time and nonworking time, other medical conditions, symptoms, sociodemographic characteristics and work disruption.

Among 1,326 participants, 39.6% were males, and 60.4% were females. The age range was from 20 to 66 years. Among the total participants, 32.6% of females and 25.7% of males experienced a voice problem before. The total prevalence of dysphonia was currently 29.9% in females, and 6.6% in males as reported by the authors. When 21.5% reported a chronic problem, 78.5% reported it is acute. 5.9% consulted a professional help. 50% approached a singing/acting teacher, 34.6% consulted a physician, 24.4% consulted a speech-language pathologist and the remaining 6.4% reported "someone else". The frequency of vocal behaviours found significantly related to sex and education, where age had no effect. Vocal behaviours such as talking, talking loudly or quietly, singing, coughing and clearing throat showed higher mean scores in participants who reported a voice problem. Vocal behaviours like throat clearing, talking, coughing and loud talking showed statistically significant association. Cold and sinus infections had significantly higher occurrence in people who reported voice disorders than other health conditions. The authors also reported that cold and sinus conditions caused a reduction in voice activities. There was an independent association

of “self-reported” recurrent upper respiratory tract infections, esophageal refluxes, and chemical exposure with risk of having voice disorders. Among the participants, 84.7% reported exposure to the chemicals. The risk of voice disorders increased with an increase in chemical exposure. The laryngeal irritants such as alcohol and smoking had a significant effect when only combined with oesophageal reflux. 2.9% of the total population reported a positive family history. Among them, 42.1% reported a history of voice disorder. 4 participants reported they changed occupation due to the voice problem, where 13 expressed they wanted to change their current occupation. Authors further reported that 4.3% of participants scale down their activities at job activities due to voice disorders. The self-reported data used in the study can contain participant errors. The authors suggest that future studies can be done for estimating the societal cost.

Cohen et al. (2012) retrospectively analysed patients with dysphonia in US claim database between January 1, 2004 and December 31, 2008. The study aimed to detect dysphonia's prevalence, determine the cause and its relation with age and gender, difference of diagnosis made by the professionals (primary care physicians and otolaryngologists), and different comorbid conditions. The patients were classified according to the diagnosis based on ICD-9. The data also classified according to the geographical region, age and sex. The data included 536,943 individuals with dysphonia among the 55 million total population, approximately. The overall prevalence rate of dysphonia was 0.98% with 1.2% in females and 0.74% in males. More dysphonia patients were reported from urban area (85%) than rural. Authors reported no relation found with geographical location and diagnosis. Individuals within 50 to 59 years of age range were dominated in total population, as well as in males and females. The higher prevalence rate of voice disorders was observed in individuals

above 70 years of age in both genders. Other than 0 to 9 and >70 years age categories, females were dominating than males. Majority of the diagnosis was made by primary care physicians (48%) than otolaryngologists (33.5%) and others. The number of patients consulting PCPs was decreasing with age while it was increasing for otolaryngologist. Majority of the paediatric patients consulted PCPs. PCPs most commonly saw the comorbid conditions associated with dysphonia. Most common diagnosis included acute laryngitis, nonspecific dysphonia, benign vocal fold lesions, and chronic laryngitis. Among them, acute laryngitis was diagnosed most likely by PCPs, and others by otolaryngologists. Nonspecific dysphonia was diagnosed mostly in younger and elder (>70) population and had a higher prevalence in females. Chronic laryngitis, benign vocal fold lesions, laryngeal cancers and paralysis were most common in males. The prevalence of laryngeal cancers reported to increase from age 40 to elders. The authors suggest that future studies can be done to estimate the outcome of clinical management longitudinally.

Bhattacharyya (2014) analysed the data obtained from The National Health Interview Survey (NHIS), conducted by the National Center for Healthcare Statistics of the Centers for Disease Control. It was a self-reported health survey conducted among United state residents by trained census bureau interviewers via face-to-face interviews. The questionnaire used included a specific question asking about the problems or difficulties with voice during the preceding 12 months. The interview also focused on the diagnosis, professional consultation, treatment taken, and days lost from work due to voice problem.

The authors found that 17.9 +/- 0.5 million adults had voice problem in the last 12 months. The prevalence was 7.6%, that is, 1 in 13 adults had voice problems annually in the United States. 52.3% +/- 1.2% of them reported the problem persisted

more than one week. The females were reported to have more voice problem (62.9% +/- 1.2%), and the total mean age was 49.1 years. The prevalence of voice problems found to be increasing with age. 10 % of them consulted a professional specifically for their voice problem. Most of them consulted a family physician or general practitioner (35.9% +/- 5.2%), where 24.0% +/- 4.7% consulted an otolaryngologist and 19.5% +/- 4.2% consulted a speech-language pathologist. 40.3% +/- 1.8% reported specific diagnosis related to dysphonia. 42.1% of participants reported “something else” as the cause for the voice disorder. The majority of the participants reported infectious etiologies and laryngitis followed by allergies and gastroesophageal reflux diseases, respectively. Laryngitis due to cold was the most common diagnosis (17.9%), where laryngitis due to vocal abuse was reported by 6.2% of participants. 52% of participants responded to their voice problem as a “small problem”. 22% reported it as a moderate problem, where only 5% reported it as a very big problem. 25.4% reported that they missed 1 to 3 working days due to an existing voice problem, and also 17.5% missed 4 to 6 working days fom attending job. Although, the authors reported that the data might have “recall errors” by the participants since it is self-reported data.

In 2017, Benninger, Holy, Bryson, and Milstein retrospectively analysed existing data bases including Truven Health MarketScan Commercial Claims and Encounter Database (Truven Health Analytics, Ann Arbor, MI), and MarketScan Medicare database. The data was taken longitudinally from different years from 2008 to 2012 and used to analyse the compound annual growth. They separately analysed the data of each calendar years.

The authors found that there was a gradual increase in the total number of voice disorders reported was found from 2008 to 2012. It was associated with increase in the total population of the USA. The prevalence of dysphonia was found as 1% among total

population. The most diagnosed dysphonia was acute laryngitis (54%). ‘General dysphonia’ (22%) and chronic laryngitis (6%) were also significantly high, whereas the other diagnosis was significantly less. The average age of different diagnosis shows that the malignant neoplasms were common in elder population (66.16 years), on the other hand acute laryngitis was common in younger age group (19.53 years). Average age of laryngeal spams was 42.58 years, and other diagnosis was between 50 and 60 years. The growth of diagnosis except malignant neoplasms (1.0%) was higher than the population growth of US. The authors suggest that the possible cause of this (except for acute laryngitis) can be the overall demographic trends. The increase in the acute laryngitis can be due to change in diagnostic practices and growth in recognition of role of laryngopharyngeal reflexes. Among all patients with voice disorders, 30% were from the service industry, where as 50% of patients with malignant neoplasms were from the manufacturing industry. This suggested that the possible reason for patients with malignant neoplasms who were from manufacturing industry had higher exposure to chemicals. The voice demands in service industry was the reason for occurrence of dysphonia in them. The benign neoplasms were reported among 3% of the population and 1.3 times likely in the service industry. 85% of them had laryngeal papilloma that was reported as higher in paediatric patients. The authors reported some limitations such as the possibility of error in physician coding, as well as the data base included absolute values without error ranges.

Lyberg-Ahlander, Rydell, Fredlund, Magnusson, and Wilen (2018) found the prevalence of voice disorders among the individuals participated in the Public Health Cohort in Stockholm county, Sweden. The participants were randomly selected from every municipalities and city district area of Stockholm. But the response rate was different across the regions. The survey was done in 2002, 2006, 2010 and 2014. A

single question on voice problem was included in the survey in 2010. The question was decided by considering Swedish Voice Handicap index and a screening questionnaire for Finnish teacher students. The question was tested among a control group, and participants with voice problem which revealed a significant difference between them.

74351 participants were responded for the question. 16.9% was the overall prevalence. 15.5% had small extend and 1.4% had greater extend of voice problem. The prevalence of voice problems in males and females was 15.5% and 18%, respectively. Females had more prevalence than men up to the age of retirement, and later no difference was found. 65-84 years and above 85 years aged subjects had more prevalence of voice problem than other age groups. It implies self-perceived voice problems are more in the elderly population. Voice disorders were more prevalent in teachers and service professionals among the wide range of professionals participated in the survey. There was a significant correlation between smokers and voice disorders, reported in the study. Social-economic index and voice disorders had no significant correlation. Authors also highlighted a significant correlation between hearing loss and dysphonia. Self-perception of the quality of life had a significant correlation with voice problems.

The studies reveal that the prevalence of voice disorders varies with age, gender, occupation, and lifestyle. Voice disorders are more prevalent in females than males. The diagnosis varies with different age groups. The severity and frequency of dysphonia can also change with these characteristics. The socio-economic and psychological factors also play a role in the severity and impact of voice problems. The studies from an extensive database give a valid result that can be generalised in a vast population. It can further help in the prevention and clinical approach to voice problems.

2.2. Retrospective Analysis of Treatment Seeking Western Population

Van Houtte, Van Lierde, D'Haeseleer, and Claeys (2009) retrospectively reviewed 882 patients visited in the department of ENT of University hospital in Ghent from January 2004 to December 2008 with the complaint of voice problems. The data included details of patients visited for first time to the department in the speculated time period and undergone flexible endoscopy and stroboscopy. The number of patients with premalignant or malignant pathologies was underestimated in the study because further assessment and treatment were done in a different department. The authors analysed the data according to age, gender, pathology, profession, treatment, and primary diagnosis. The authors classified diagnosis factor into 12 categories.

The most common diagnosis reported to be was functional dysphonia (absence of structural or neurological pathologies with an anterior-posterior contraction, a supraglottic lateral contraction, or an insufficient posterior glottis) that was 30% of entire data. Further, it was reported that 15% was 'vocal fold nodule' and 9% of LPRD (laryngopharyngeal reflux disorders) diagnosis. The dysphonia was most frequent in working-age groups (25-64 years). It was less frequent in the elderly group and children up to the age of 14. The most common diagnosis in children (0-14 years) was vocal fold nodule, where functional voice disorders remained in all other age groups from 15 to above 65. The prevalence of vocal fold paralysis reported to be increase as a factor of 'age'. In the overall data, female patients dominated (63.8%) over males (36.2%). Psychogenic dysphonia and Reinke's edema were the most common diagnosis in females, where premalignant and malignant lesions were most common among males. The number of females observed decreased from the age group of 25-44 years and finally became equal with males in the elderly population. Authors found that gastroesophageal reflux disorders and laryngitis, vocal fold nodules, polyps and cysts,

vocal fold paralysis, functional voice disorders, laryngeal papillomatosis, and presbyphonia were not significantly related to gender. The non-professional voice was more in the working-class population (52%) followed by professional voice users (41%) and 'unemployed and disabled' (7%). Teachers were most common in professional voice users (56%) followed by elite voice users, including singers and actors (16%). Functional voice disorders (41%), 'vocal fold nodules and hypertrophy' (15%), and 'GERD, laryngitis and inflammation' (11%) were most common pathologies observed in professional voice users, where functional dysphonia (24.3%) GERD and laryngitis (10.6%) and vocal fold paralysis (10.6%) were common in non-professional voice users. Females were reported to have prevalent over males in dysphonia among professional voice users. The authors highlighted the attention needed for teaching professional in vocal health.

Martins, do Amaral, Tavares, Martins, Gonçalves, and Dias (2016) analysed 11 years patient's data from 2004 to 2014 who visited in the Botucatu Medical ambulatory School, Brazil. All of the patients undergone videostroboscopy and evaluation by a speech-language pathologist. The details of the prominent laryngeal diagnosis, age, gender, profession, symptoms, and smoking behaviours were collected and taken for evaluation.

2019 patients included in the study after excluding 324 patients due to the incomplete details. Among 2019 patients, 786 were males, and 1233 were females. The dominant age range was 40 to 50 years (64%), followed by 19 to 39 years and above 60. The females were dominating in all of these age groups. The children (1 to 18 years) were only 18% of the population, where boys dominated. 275 patients reported as smokers, where 35 were ex-smokers. Domestic employees were predominant in professionals (28.57%), followed by students, teachers and retirees. 33.53% of the total

population exhibited vocal overuse. 26.5% and 24.61% reported having gastroesophageal symptoms and nasosinusal symptoms respectively. The predominant diagnosis was functional dysphonia/normal and vocal nodule. The vocal nodule was the most common diagnosis in children, where boys were dominating in 1 to 12 years, and girls were dominating from 12 to 18 years. Functional dysphonia was dominating in adults. The vocal nodule was significantly higher in adult females than the male population. Presbyphonia was the most common diagnosis in the elderly population (greater than 60 years). Acid laryngitis, Reinke's edema and vocal polyp were also frequently observed after functional dysphonia and nodule in the total population. Acute laryngitis, psychogenic dysphonia, vocal fold granulomas and, laryngeal papillomatous were a less frequent diagnosis. The authors considered only one diagnosis by excluding other uncertain diagnosis. The exclusion of laryngeal cancers, patients treated in emergency wards had a chance to influence the overall results.

Remacle, Petitfils, Finck and Morsomme (2016) analysed 1079 patients who visited the ambulatory voice clinic in the Department of Otolaryngology of Lie`ge University Hospital, Belgium. The authors retrospectively analysed the patients according to age, gender, diagnosis, and occupational status visited from January 1st, 2019 to December 31st, 2019. The results of perceptual evaluation (GRBAS), self-evaluation (Voice Handicap Index), aerodynamic measurement, acoustic evaluation, and laryngeal examination (videolaryngostroboscopy or nasofibroscopic examination) from the case files were considered in the study.

The authors reported that the prevalence of voice disorders was 69.6 % in females and 30.1 % in males. The mode age revealed patients most likely to consult at the age of 44 years in females whereas at 9 years for males. 53.5 % of the population were workers with a mean age of 41.6 years, and the rest included 19.9 % retirees, 15.4

% students, and 11.2 % unemployed individuals. Among the working population, 41% were professional voice users. Among students, 44.6 % were post-secondary students, 36.7 % primary school pupil, 16.9 % secondary school students, and 1.8% preschool pupil. Females were prominent in each occupation. In the female goup, 61.4 % were students, 71.9 % were working individuals, 63.7 % were retired, and 82.6 % were unemployed individuals. The vocal nodule was the most common diagnosis (16.9%) in total population and found more common in workers. It was followed by laryngeal mobility disorders that were 16.4% in total population and the most common diagnosis found in retirees. The third common diagnosis was the normal laryngeal exam (10.4 %). It followed by functional dysphonia, edema of one or both vocal folds, polyps, pathology succeeding laryngopharyngeal reflex, cysts, Reinke's edema, sulcus vocalis, vocal fold atrophy, infections, pathologies due to the ageing of the larynx, and pseudocysts. The chi-square test revealed the occupation and diagnosis are related. The residual analysis revealed retirees diagnosed significantly more with presbyphonia, vocal fold atrophy and laryngeal mobility disorders, and students with vocal nodule. The mobility disorders were increasing with "age" as a factor. The exclusion of laryngeal cancers resulted in higher prevalence of voice problems in females than males. In contrast to the previous studies quoted, the females were predominant in children. The laryngo-oesophageal reflex disorders were found in 5.4% of patients. Thyroid problems were observed to increase with age in females. The authors reported confusions rose between vocal fold cyst and sulcus vocalis has happened during stroboscopic analysis. The prevalence found to be more among female workers in the entire population, and it revealed the importance of prevention measures in females. The inter and intra-judge reliability was not checked in the study.

De Bodt et al. (2016) retrospectively analysed data collected from three voice centres in three different cities of Belgium from April 1997 to August 2012. The analysis was done according to age, gender, Dysphonia severity index (DSI), Voice Handicap Index (VHI), Grade from GRBAS scale, and diagnosis. It was done on the basis of laryngoscopy, perceptual evaluation, voice handicap scale, and acoustic evaluation. The authors broadly classified diagnosis into structural and non-structural disorders. Authors reported that the structural pathologies were significantly higher than non-structural pathologies–from chi-square analysis. The authors classified the factor "diagnosis" into 24 different categories. Among the diagnosis vocal fold nodule, functional voice disorders (hyper functional or muscle tension dysphonia) and vocal fold paralysis were more frequently found. The mean DSI, VHI, and G score of GRBAS were -0.6, 32 and 2, respectively. The number of females with voice disorders was significantly higher than men. The mean G score and DSI value were reported to be higher in men while females reported to have higher mean VHI score.

The total age range of clients in the data base was from 2 to 91 years and authors classified the as below 12 years, 12 to 18 years, 18 to 65 years and above 65 years. The majority were included in the 18 to 65 years followed by >65 years, then, below 12 and 12 to 18 years. Non-structural pathologies were prevalent in all age range expect for 18 to 65 years which showed no significant difference. The chi-square analysis revealed significant relation of age with gender, psychosocial impact, degree of dysphonia and DSI. Patients with Functional voice disorders reported to have the highest mean DSI, whereas subjects with vocal fold paralysis revealed the lowest mean DSI. Vocal fold nodules were prominent in the age group below 12 years while functional voice disorders were higher in 18 to 65 years group. in the study, vocal fold paralysis was prominent in patients above 65 years and found that increasing in age increases the

occurrence of voice pathologies. Vocal fold paralysis had the highest mean VHI score and mean G score (degree of dysphonia). The authors concluded that vocal fold nodule was the most frequent diagnosis. The females were most vulnerable for voice disorders and had the highest prevalence of vocal fold nodule. Women had the highest psychosocial impact than men, whereas men showed poor vocal quality than women. This can be a possible reason for female patients more likely to report dysphonia than men.

Watts and Knickerbocker (2019) analysed the data retrospectively from a private community voice clinic of Texas. The data including age, gender, diagnosis, perceptual quality using Consensus Auditory Perceptual Evaluation of Voice (CAPE-V), and voice handicap index (VHI) scores were obtained from case files of consecutive 28 months. The data was analysed according to the. The study aimed to identify the frequency of various voice pathologies and its association with age and gender, perceptual and voice handicap across the pathologies and understand how VHI differ from the perceptual analysis in diagnosing voice pathology. The authors classified voice disorders according to the International Classification of Diseases, 9th and 10th Revisions (ICD-9 and ICD-10). The authors categorised total population into nine categories. The nine categories were benign midmembranous lesions, unilateral vocal fold paralysis (UVFP), atrophy or bowing associated with presbylaryngis, nonspecific dysphonia, vocal cord dysfunction (VCD), MTD, paresis, transgender patients and others.

There was a total of 216 patients visited the clinic, where 71% of them were females and 29% were males. The mean age of both males and females was 50 years, and patients frequently visited the clinic was above the age of 50 years. The most diagnosed category was ‘others’ that included reflux laryngitis, chronic cough, bilateral

paralysis or paresis, leukoplakia, and polypoid degeneration. It was followed by benign midmembranous lesion and nonspecific dysphonia. The most frequent diagnosis in females was benign midmembranous lesion where as in males it was 'other etiologies'. The VHI scores were significantly higher in transgenders when compared to other categories. The transgender patients and UVFP mean VHI scores fell into severe handicap and for others categories (except VCD) fell into moderate handicap. The mean VHI score in VCD fell in mild handicap. The CAPE-V score was significantly higher in UVFP, followed by MTD. The ANOVA revealed there is a significant effect of VHI and CAPE-V scores in the diagnosis of voice pathology. The post hoc analysis showed transgender patients and UVFP had significantly higher handicap while UVFP manifested significantly higher severity of dysphonia. The results showed, even though transgender patients had a significantly higher handicap, they showed the lowest severity of dysphonia. This reflects a discrepancy between the self-evaluation of voice and the perceptual evaluation by professional. The author concluded that the results would pave a path for better knowledge about various voice pathologies. The possible causes for dysphonia were not considered in the study, such as smoking habits and vocal abusive behaviours. The study could not report the findings on occupations of individuals visited with dysphonia.

2.3. Indian Studies

The present study literature survey revealed that the epidemiological data on voice disorders in the general population, are from western population and such studies in Indian context are minimal. Large portions of the prevalence study on dysphonia focused on a specific age group or occupation has taken place in India (Dodderi et al., 2018). However, some epidemiological studies of communication disorders reveal the prevalence of voice disorders in certain regions of India.

2.3.1 Survey Studies.

The survey conducted by students of All India Institute of Speech and Hearing, Mysore (AIISH) in 2013 on Mandya district of Karnataka revealed that 6.07% of 15,441 participants were at risk for communication disorders. Among them, 70.80% reported speech and language disorders. Among that, 2.9% of females and 2.9% of males reported voice disorders (Konadath et al., 2013). From the survey study conducted in six islands of Lakshadweep by NSS volunteers of AIISH in 2016, 3.63% (819 individuals among 22,558) of participants were at the risk of communication disorders. Out of 165 individuals visited the camp, only 136 (82.42%) were identified with speech and language disorder. 6.62% (9 individuals) of these participants reported a voice disorder. 2 of them were females, and 7 were males. Eight of them were included in the paediatric category (Konadath et al., 2017). The survey conducted in Sinor Taluq, Vadodara district, Gujarat State of India by the NSS volunteers of AIISH revealed a 0.79% prevalence of speech and language disorders among the total population of 28,954. It included 14 individuals with voice disorders (5 males and 9 females). 4 paediatric, 7 adults, and 3 geriatric individuals reported voice problem. In the further screening of individuals (second phase of the study), 6 out of 128 individuals reported voice disorders, including two paediatric, one adult, and three geriatric (Sinha et al., 2017). A similar survey conducted in 10 towns of Andaman and Nicobar Islands by NSS volunteers of AIISH and the survey revealed 2092 participants among 49495 were at risk of communication disorders. Out of that, 1056 individuals had speech and language-related problems. The prevalence of voice disorders was found as 0.11 in males and 0.05 in females. In the camp, conducted after a survey for 1056 referred patients, 291 individuals reported. Among 291, only four individuals (6.4% among 62

individuals reported with speech disorders) reported with voice disorders. Among them, 2 individuals reported laryngectomy (Konadath et al., 2020).

The details of patients visited in JSS Institute of Speech and Hearing, Dharwad, Karnataka, from January 2015 to July 2018 and in a camp conducted in Bijapur, Karnataka, in January and June 2018 was retrospectively analysed (Jijo et al., 2020). 2064 individuals among the total population of 2110 were diagnosed with a communication disorder. Among 2064 individuals, 1.35% diagnosed with a voice disorder (28 individuals). The authors identified the risk factors for communication disorders in general and not as specific for voice disorders.

The survey studies taken place in India was focused on communication disorders in general. So, the studies failed to assess the characteristics of voice patients in the study of the region happened. There is a need for literature for analysing the detailed attributes of voice patients in India for effective prevention and intervention. Studies focusing on voice disorders but specific occupations and age groups have taken place in various parts of India.

2.3.2. Specific Population.

Devadas et al. (2016) studied the prevalence and risk factors in priests from Kerala state, India. The authors used questionnaire to collect the self-reported voice problems from priests. The mean age of participants was 49.1 years. 47.8% of priests responded that they had voice problems during their entire carrier. 17.8% reported that the problem was frequent during the carrier. The priests had vocal symptoms such as throat clearing, and asthma/allergies had a significantly higher frequency of voice disorders. The authors suggested future studies can be done for identifying the effectiveness of vocal education programs in priests.

A cross-sectional survey was done among 140 Hindu priests in Udupi and Mangalore districts of Karnataka. The authors found that 53 out of 124 priests (43%) had voice problems (Devadas et al., 2019). The risk factors reported include length of work experience, voice modifications during chanting, sore throat, and chanting during throat infections. 72% of them reported that dysphonia arises once in 6 months. 47% reported sudden onset of dysphonia, where others reported it is gradual.

A cross-sectional survey study using a self-reported questionnaire among 1082 primary school teachers of the Mysore district of Karnataka state revealed that 17.4% of prevalence of voice disorders (Devadas et al., 2017). They also reported that the prolonged use of voice for hours was the significant risk factor for voice problem followed by sore throat, and vocal strains. A similar study was conducted in Chennai on 384 school teachers. The authors reported that 37.5% reported having voice problems (Sathyanarayan et al., 2019). The voice problem was more prevalent among 31 to 40 years and above 50 years of age. The majority of the participants reported to have vocal fatigue as the symptom, followed by pitch or loudness changes, vocal strain, voice breaks, and combinations. Another study was conducted on school teachers of 28 schools in Kochi, a city in India. The authors reported that the prevalence of dysphonia "at present" was 45.4%. The prevalence of voice problems in the past year of study and the entire teaching carrier of teachers was 52.8% and 70.1%, respectively (Menon et al., 2021).

A cross-sectional survey done among 190 Carnatic singers in and around Bangalore and Mysore districts of Karnataka by Devadas (2020). Authors found that 35% of career and 23% of point prevalence of dysphonia in the study. The risk factors found to have a significant association with dysphonia and those were clenching of teeth, frequent cold, hearing problems, profession-related stress, and regular intake of

medications (Devadas et al., 2020). Dodderi et al. (2021) studied vocal tiredness in 37 beet boxers and compared it with 40 non-singers and 40 untrained singers. The result revealed that untrained singers had significant vocal fatigue followed by beatboxers and non-singers. The Vocal Fatigue Inventory result showed that 72.5% among untrained singers and 48.6% of beatboxers reported to have vocal fatigue symptoms.

All of these studies showed the prevalence of voice disorders in different populations and occupations. It could record different characteristics of dysphonia. Nevertheless, studies focusing on the general population and prevalence under them in the Indian context is sparse. The studies showing characteristics of the public and treatment-seeking population in terms of voice and its related issues need to be explored. Unfortunately, India lacks such studies focusing on the characteristics of voice disorders in treatment-seeking and general populations.

2.3.3. Retrospective Studies on Treatment Seeking Population in India

Dodderi, Philip, & Mutum (2018) analysed the data of patients retrospectively who visited in Speech-Language Pathology department of a tertiary care hospital of Mangalore, India from 2007 to 2018. The prevalence of voice disorders among total 4765 patients visited the department with communication disorders was 21.4% (1020 out of 4765). The hyper-functional voice disorders (77%) were more prevalent than hypofunctional. The highly prevalent pathology was vocal fold nodule followed by vocal fold paralysis, laryngectomy and sulcus vocalis. The women were dominating in adults, where men dominated in children and older adults. Patient's age ranged from 5 years to 76 years. Hoarse voice quality (67%) was dominating over other perceptual quality of voice. The study concluded about the importance of vocal hygiene. The increased prevalence of hyper functional disorders implies the importance of vocal hygiene awareness among the public. The increased prevalence of laryngectomy

patients emphasises the importance of the oncologist in the management of voice pathologies. 6.37% of laryngeal cancer patients undergone laryngectomy as per the present study. It points to the importance of extending the knowledge about the management of patients undergone laryngectomy. The authors also highlighted the vulnerability of females to voice disorders.

The prevalence of hoarseness and characteristics was estimated from the patients who visited the Otolaryngology department of a tertiary care hospital in Kerala from March 2014 until August 2015 (Rameshkumar & Rosmi, 2016). Total 99 patients visited in the department implies a prevalence of 48%. The number of males was slightly higher than females, that is 51 and 48 respectively. The gender ratio was 1:1. The incidence of vocal fold nodule was higher than other pathologies followed by vocal polyps. The nodule was more elevated in females, where the polyp was higher in females. There was no significant association between diagnosis and gender. The predominant age group was 50 to 79 years, where 10 to 29 had less prevalence. The incidence of vocal nodule and polyp significantly differed from each other. The polyp was higher in the age group 50 to 79, where the nodule was higher in 10 to 29 years. The third most etiology of hoarseness was laryngeal cancer, and those were higher in males. The total incidence was 14% and higher in 50 to 69 years. Smoking and alcoholism had a positive correlation with laryngeal cancers. The authors reported that thyroid surgery was the primary cause of vocal cord paralysis. The study lacks a good number of patients and a longer duration.

It is hard to compare western data with the Indian population due to geographical and socioeconomic changes, cultural diversity and limited accessibility to health services (Dodderi et al., 2018). So, there is a high demand for epidemiological studies of dysphonia in treatment-seeking populations and the general population in

India rather than focusing on specific occupation or age groups. Since it is one of the best ways to record the characteristics of voice disorders, it can enrich the preventive strategies and clinical management of voice disorders.

Chapter III

METHODS

Material

The information is collected from the existing database of voice clinic of All India Institute of Speech and Hearing (AIISH), Mysuru. The details of patients who evaluated at the voice clinic has taken from the voice clinic's register from January 2019 to December 2019. Voice clinic patient's case file were collected from the Medical record section of the Department of Clinical Services (DCS).

Procedure

After obtaining permissions from the concerned authority, the relevant case files have obtained from the record section of Department of Clinical Services of AIISH. The Microsoft Excel sheet was used to systematically segregate and tabulate the data obtained from case files.

Analysis

The information collected from case files were analysed into the following parameters;

1) ***Age and gender***

The clients were segregated according to their age and gender. Also, patients were grouped by gender as males and females; and based on age into following three age groups.

i. Children (<12 years)

ii. Teenagers (13-18 years)

iii. Adults (19-65 years)

iv. Geriatrics (>65 years)

2) Diagnosis

A list of all possible diagnosis was made, and the number of clients diagnosed in each category were tabulated and calculated across the age groups and gender. By a thorough literature survey, the possible diagnosis of common vocal pathologies was categorised as;

a. Organic. Voice disorders that are physiological in nature and result from alterations in respiratory, laryngeal, or vocal tract mechanisms were considered.

i. Structural. Physical changes in the voice mechanism (e.g., alterations in vocal fold tissues such as edema or vocal nodules; structural changes in the larynx due to aging) were included.

ii. Neurogenic. Central or peripheral nervous system innervation to the larynx that affect functioning of the vocal mechanism were under this category, example;

1. Vocal tremor,
2. Spasmodic dysphonia, or
3. Paralysis of vocal folds

b. Functional. Voice disorders that result from improper or inefficient use of the vocal mechanism when the physical structure is normal. e.g.,

- Vocal fatigue
- Muscle tension dysphonia or aphonia
- Diplophonia
- Ventricular phonation

c. **Psychogenic.** Voice disorders which are caused by a psychological disorder/distress/issues.

   i. Conversion dysphonia or aphonia

   ii. Puberphonia (Mutational falsetto)

3) Onset

The subjects were further categorized into the following categories according to the onset of the problem.

i. On or during 2019

ii. Before 2019

4) Occupation

The parameter ‘occupation’ was categorised in to;

a. Student

b. Professional voice user

c. Non-professional voice user

d. Unemployed

e. Retired

5) Recommendations

The data were categorized according to further recommendations made after diagnosis into following categories;

i. Regular follow-up

ii. Voice therapy

iii. Medical treatment (including medications)

iv. Surgical management

v. Other recommendations

vi. Combinations of two or more recommendations.

6) Residential Place

The clients were categorized according to their residential location as;

i. Within Mysore
ii. Outside Mysore and within Karnataka
iii. Other states in India
iv. Outside India

7) Smoking

The patients were further categorized according to smoking habit as;

i. Smokers
ii. Non-smokers
iii. Passive smokers
iv. Ex-smokers

8) Toxic Exposure

The patients were categorised according to the history of exposure to pollutants and toxic substances into two groups as;

i. No exposure to chemicals or toxins
ii. Exposed to chemicals/toxins

Statistical Analysis

The frequency and the percentage of each parameter were calculated by using IBM Statistical Package for Social Sciences (SPSS) software (Version 20). The cross-table analysis was performed to find any relationship exist between diagnosis and age, gender, occupation, smoking habit, and toxic exposure. The Chi-square analysis was done for identifying the correlation between diagnosis and toxic exposure and another variable gender. The Chi-square analysis could not be done for other parameters due to small expected values.

Chapter IV

RESULTS

The present study found a total of 489 patients who visited the Voice Clinic of DCS, AIISH, from 1st January to 31st December 2019. Out of 489 patients, the case files of 459 patients were found in the medical record section. The rest 22 case files were found as missing, and 6 case numbers were found as wrongly entered. 2 case files were excluded because the file has previous year evaluation details. 374 among 459 patients were new registrations, and 85 were follow-up evaluations.

4.1. Age and Gender Wise Distribution

The result revealed that there were 289 males and 170 females among the 459 patients visited. The age range of 19 to 65 years (Adults) was higher than other age categories. It was followed by above 65 years (Geriatric), 12 to 18 years, and below 12 years of age. The percentage of patients in each age category is listed in Table 4.1. The mean age was 41.42 years (SD: 19.54 years). Figure 4.1 shows the voice pathologies complaints were more in males compared to females.

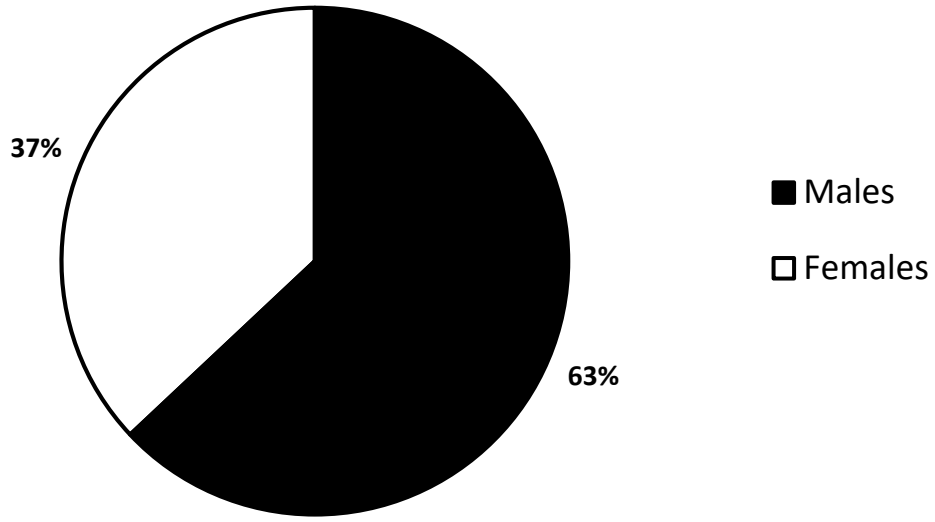
Table 4.1

Age-Wise Distribution of Patients

Age group (in years)	Frequency	Percent (%)
Children (<12)	32	7.0
Teenagers (12 to 18)	40	8.7
Adults (19 to 65)	330	71.9
Geriatric (>65)	57	12.4
Total	459	100.0

Figure 4.1

Gender Wise Distribution of Patients Using Pie Chart



4.2. Diagnosis

Out of 459 cases, the most common diagnosis made was structural voice disorders (280 patients; 61%). It was followed by neurogenic voice disorders (62 patients; 13.5%), then functional voice disorders (60 patients; 13.1%), and psychogenic voice disorders (8 patients; 1.47%). Further, 28 (6.1%) individuals were diagnosed as normal laryngeal structure and functions. Also, 21 (4.6%) patients didn't undergo stroboscopic evaluation. Table 4.2 shows the frequency of common diagnosis made among voice disorders.

Table 4.2

Distribution of Patients Based on Different Diagnostic Categories

Diagnosis	**Frequency**	**Percent (%)**
Structural	280	61.0
Neurogenic	62	13.5
Functional	60	13.1
Psychogenic	8	1.7
Normal study	28	6.1
Strobe evaluation not done	21	4.6
Total	459	100.0

4.3. Onset

The onset of voice disorders was found to be higher ‘on or during 2019’ (283 patients; 61.7%), when compared to ‘before 2019’ (176 patients; 38.3%), which is depicted in table 4.3.

Table 4.3

Distribution of Patients Based on The Onset of Voice Disorder

Onset	**Frequency**	**Percent (%)**
On or during 2019	283	61.7
Before 2019	176	38.3
Total	459	100.0

4.4. Residential Place

The residential place of patients who visited the voice clinic was analysed. It was found that the majority of patients were from within Mysore district of Karnataka (291; 63.4%). 141 patients came from other districts of Karnataka, which is followed by 26 patients from other states of India, and one from outside India. Table 4.4 shows the frequency of patients who visited the voice clinic from different places.

Table 4.4

Distribution of Patients as A Function Of Place Of Residence

Residential Place	Frequency	Percent (%)
Within Mysore	291	63.4
Within Karnataka	141	30.7
Within India	26	5.7
Outside India	1	0.2
Total	459	100.0

4.5. Smokers

351 among 459 patients were non-smokers, and only 39 were smokers. 32 individuals were reported as ex-smokers and 5 as passive smokers. The history of smoking was not taken from the rest 32 individuals. Among 39 smokers, 38 were males and only one was female. 3 out of 5 passive smokers were females, where all ex-smokers were males. Table 4.5 shows the distribution of patients based on smoking habits.

Table 4.5

Distribution of Smoking Exposure in Patients

	Frequency	**Percent (%)**
Non-smoker	351	76.5
Smoker	39	8.5
Ex-smoker	32	7.0
Passive Smoker	5	1.1
Smoking history not taken	32	7.0
Total	459	100.0

4.6. Toxic Exposure

370 patients reported that they had no exposure to toxins, smoke, or dust, whereas 57 patients reported that they had history of toxic exposure. Further, the history of toxic exposure information was not present on 32 patients. Frequency of toxic exposure details of patients are depicted in table 4.6.

Table 4.6

Distribution of Patients Based on History of Toxic Exposure

Toxic Exposure	**Frequency**	**Percent (%)**
No Exposure	370	80.6
Exposed	57	12.4
Toxic exposure information not available	32	7.0
Total	459	100.0

4.7. Occupation

The study found that the majority of the patients were Non-professional voice users (150 patients). It was followed by professional voice users (95 patients). The number of unemployed, students and retired individuals were 101, 79, and 34, respectively. Patient's different occupations are depicted in table 4.7. The number of working clients in the present study was calculated by adding the frequency count of both nonprofessional voice users and professional voice users. The study found 53.3% of clients were reported to have voice problem from working background.

Table 4.7

Distribution of Patients Based on Occupation

Occupation	**Frequency**	**Percent (%)**
Student	79	17.2
PVU	95	20.7
NPVU	150	32.7
Unemployed	101	22.0
Retired	34	7.4
Total	459	100.0

(Note: PVU indicates Professional Voice Users; NPVU means Non- professional Voice Users)

4.8. Recommendation

The majority of the voice clients were recommended for voice therapy (68.4%), followed by other recommendations (8.9%) and medications (5.7%). The 'other recommendations' included detailed medical evaluations, biopsy, neurological evaluation/opinion, psychological evaluation and so on. 5% of patients were recommended for a regular follow-up, while 3.9% for surgical management. Further,

6.5% of individuals got more than one recommendation (medication, surgery, and/or voice therapy). Seven individuals (1.5%) didn't get any recommendation in case files. Table 4.8 shows the frequency of different recommendations for patients made in their case files.

Table 4.8

Distribution of Clients as a Function Of 'Recommendations'

Recommendation	**Frequency**	**Percent (%)**
VT	314	68.4
Surgery	18	3.9
Medication	26	5.7
Only Follow up	23	5.0
Medication and VT	18	3.9
Surgery and VT	10	2.2
Surgery and medication	2	0.4
Others	41	8.9
No recommendation found in file	7	1.5
Total	459	100.0

(Note: VT indicates Voice Therapy)

4.9. Percentage of Voice Disorders in Each Age Categories

The percentage of diagnosis of voice disorders in each age category was calculated. The structural voice disorders were found to be higher in all age categories (above 50%). The neurological voice disorders were second most frequent among 19 to 65 years and above 65 years age groups. Whereas, the neurological voice disorders were '-nil-' in under 19 years of age. Individuals with psychogenic voice disorders were

the second-largest diagnosis in the 12 to 18 years age group. All others diagnoses in the age category less than 12 years were found to be relatively negligible.

The percentage of structural voice disorders was high in less than 12 years (77.8%) compared to other age groups. It was followed by 12 to 18 years (75%) and 19 to 65 years (63.2%). The number of neurological voice disorders was found to increase with age. The functional voice disorders were higher in 19 to 65 years age group (14.3%) compared to other age groups. Table 4.9 shows the percentage of patients with different voice diagnosis across different age groups.

Table 4.9

Distribution of Different Voice Pathologies Based on Age

			Diagnosis					
			Structural	**Neurogenic**	**Functio-nal**	**Psycho-genic**	**Norm-al**	**Total**
Age Category	<12	Frequency	21	0	2	1	3	27
		Percentage	77.8%	0.0%	7.4%	3.7%	11.1%	100.0%
	12 to 18	Frequency	27	0	2	5	2	36
		Percentage	75.0%	0.0%	5.6%	13.9%	5.6%	100.0%
	19 to 65	Frequency	203	47	46	2	23	321
		Percentage	63.2%	14.6%	14.3%	0.6%	7.2%	100.0%
	Above 65	Frequency	29	15	10	0	0	54
		Percentage	53.7%	27.8%	18.5%	0.0%	0.0%	100.0%
Total		Count	280	62	60	8	28	438
		% within Age Category	63.9%	14.2%	13.7%	1.8%	6.4%	100.0%

4.10. Percentage of Voice Disorders Between Gender

The percentage of structural voice disorders was found to be higher in both genders. After structural voice disorders, the next commonly reported voice disorders in males were functional voice disorders and in females were neurogenic voice disorders. The psychogenic disorders were the least found diagnosis in both genders (1.8% in both). Table 4.10 shows the distribution of voice disorders between genders The chi-square analysis revealed that, there was no significant association between gender and diagnosis (χ^2 (4) = 4.332, p = 0.363).

Table 4.10

Percentage of Different Voice Disorders Between Males and Females

			Diagnosis					
			Stru-ctural	**Neuro-genic**	**Functional**	**Psycho-genic**	**Normal**	**Total**
Gen-der	**Male**	Frequency	174	35	44	5	16	274
		Percentage	63.5%	12.8%	16.1%	1.8%	5.8%	100.0%
	Fe-male	Frequency	106	27	16	3	12	164
		Percentage	64.6%	16.5%	9.8%	1.8%	7.3%	100.0%
Total		Frequency	280	62	60	8	28	438
		Percentage	63.9%	14.2%	13.7%	1.8%	6.4%	100.0%

4.11. Percentage of Voice Disorders Across Different Occupation

Table 4.11

Distribution of Different Voice Pathologies Based on Occupation

			Diagnosis					
			Struct-ural	**Neuro-genic**	**Functio-nal**	**Psycho-genic**	**Norm-al**	**Total**
Occupa-tion	**Student**	Frequency	54	3	8	6	4	75
		Percentage	72.0%	4.0%	10.7%	8.0%	5.3%	100.0%
	PVU	Frequency	66	8	15	0	5	94
		Percentage	70.2%	8.5%	16.0%	0.0%	5.3%	100.0%
	NPVU	Frequency	91	17	25	1	9	143
		Percentage	63.6%	11.9%	17.5%	0.7%	6.3%	100.0%
	Un-employed	Frequency	51	25	6	1	9	92
		Percentage	55.4%	27.2%	6.5%	1.1%	9.8%	100.0%
	Retired	Frequency	18	9	6	0	1	34
		Percentage	52.9%	26.5%	17.6%	0.0%	2.9%	100.0%
Total		Frequency	280	62	60	8	28	438
		Percentage	63.9%	14.2%	13.7%	1.8%	6.4%	100.0%

(Note: PVU: professional voice users, NPVU: Nonprofessional voice users)

Structural voice disorders were the most diagnosed category of voice disorders irrespective of all occupations. It was followed by functional voice disorders in students and the working population. Neurogenic voice disorders were the second most diagnosis in retired and unemployed persons. Table 4.11 shows the different voice pathologies across different occupation groups.

The structural voice disorders were more prominent in students and professional voice users. Neurogenic voice disorders were found to be higher in retired and unemployed individuals (>25% of clients). Psychogenic voice disorders were found to

be more in students (about 8%) and it was very less when compared to other occupations.

4.12. Relationship Between Voice Disorders and Smoking Habit

Most of the clients were diagnosed with a structural voice disorder in smokers, non-smokers, ex-smokers, and passive smokers. It was followed by neurological voice disorders. The occurrence of voice disorders was higher in non-smokers. About 7% of clients with no history of smoking habits were found to have normal voice. Among smokers and ex-smokers, structural voice problems found to be more prevalent followed by neurogenic voice disorders and last functional voice disorders. No psychogenic voice disorders was seen among clients with history of smoking habits. All the clients with cigarette smoking exposure reported to have either one of the vocal pathologies. All of the passive smokers were diagnosed with a structural lesion. Table 4.12 shows the voice pathologies across clients with or without smoking habits.

Table 4.12

Distribution of Different Voice Pathologies Based on Smoking Habits

		Diagnosis					
		Structural	**Neurogenic**	**Functional**	**Psycho-genic**	**Normal**	**Total**
Non-smoker	Frequency	220	43	46	8	23	340
	Percentage	64.7%	12.6%	13.5%	2.4%	6.8%	100.0%
Smoker	Frequency	24	8	6	0	0	38
	Percentage	63.2%	21.1%	15.8%	0.0%	0.0%	100.0%
Ex-smoker	Frequency	18	9	4	0	0	31
	Percentage	58.1%	29.0%	12.9%	0.0%	0.0%	100.0%
Passive Smoker	Frequency	5	0	0	0	0	5
	Percentage	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Total	Frequency	267	60	56	8	23	414
	Percentage	64.5%	14.5%	13.5%	1.9%	5.6%	100.0%

4.13. Relationship Between Voice Diagnosis and Toxic Exposure

The structural voice disorders were predominant in both categories of patients with and without toxic exposure. The second most diagnosis in patients who had toxic exposure was functional voice disorders, whereas, it was neurological voice disorders in clients with no toxic exposure. Patients with no toxic exposure were having all types of voice disorders. The chi-square analysis revealed a significant association between toxic exposure and diagnosis ($\chi^2(4) = 11.544$, $p = 0.021$).

Table 4.13

Distribution of Different Voice Disorders Based on Toxic Exposure

			Diagnosis					
			Structural	**Neuro-genic**	**Functional**	**Psycho-genic**	**Normal**	**Total**
Toxic-Exposure	**No Exposure**	Frequency	229	56	42	8	22	357
		Percentage	64.1%	15.7%	11.8%	2.2%	6.2%	100.0 %
	Exposed	Frequency	38	4	14	0	1	57
		Percentage	66.7%	7.0%	24.6%	0.0%	1.8%	100.0 %
Total		**Count**	267	60	56	8	23	414
		% within Toxin	64.5%	14.5%	13.5%	1.9%	5.6%	100.0 %

Chapter V

DISCUSSION

The objectives of the current study were to identify and segregate the patients with voice complaints according to age, gender, registered place of residence, onset of dysphonia, occupation and to determine the percent of the most common voice pathology or diagnosis among gender, different age groups and different occupations.

459 case files were considered for the present study. Among that, 21 clients did not undergo stroboscopic evaluation. So, the diagnosis detail of 438 clients were obtained from the medical record section. Out of 459 clients, 32 clients did not undergone regular routine voice evaluation and instrumental evaluations where the history of smoking and toxic exposure details was not present in those 32 clients.

Age and Gender

The result of the current study shows the percentage of dysphonia in males were higher than females. The literature revealed that the prevalence of voice disorders is more in female than males. The percentage of females with dysphonia was higher in previous studies (Benninger et al., 2017; Bhattacharyya, 2014; Cohen et al., 2012; Lyberg-Åhlander et al., 2019; Roy et al., 2005; and Van Houtte et al., 2010). In literature, females were significantly reported to have higher prevalence of voice problems in adult age group, where males in paediatric (boys) and geriatric groups (Dodderi et al., 2018; Martins et al., 2016; and Remacle et al., 2017). The possible reason for the difference in the present study is assumed as the hesitation and limitations of Indian women to travel in long distance and consult a professional for voice disorders. The females are more dependent on their husbands for anything and everything in Indian context. They need to depend on the free time of their husbands to consult an ENT doctor or voice specialists for any voice related issues. As males are

independently mobile and ambulation is easy, they visited the voice clinic more compared to females. Hence, this is the reason for poor prevalence of dysphonia in females in present study.

In the present study, the voice pathologies in males were predominant in all age categories. The mean age was found as 41.42 years; that is almost similar (40 to 50 years) to the previous literature (Bhattacharyya, 2014; Cohen et al., 2012; Dodderi et al., 2018; Van Houtte et al., 2010; and Watts & Knickerbocker, 2019). The number of clients within 19 to 65 years age group was higher in the present study. The similar results were reported in the previous studies as well (De Bodt et al., 2016; Roy et al., 2005; and Van Houtte et al., 2010). Individuals with dysphonia was reported to be higher in the age of 40-50 years, according to Martin et al.'s (2016) study. Cohen et al. (2012) reported higher prevalence of dysphonia in individuals above the age of 70. Similarly, Van Houtte et al. (2010) reported that individual between 65 to 85 years had higher prevalence of voice disorders. The present study found that the second highest prevalence of dysphonia was in elder age group, that is, above 65 years of age. The adult age groups are mostly employed and socially active age group. They usually have high demand of voice in their daily life. The continues use of the voice and poor vocal hygiene are almost common in them in this competitive busy wold. The medical issues such as thyroid abnormalities are higher in the adult age group. So, these all can be assumed as the possible reason for the higher prevalence of dysphonia in adult population. Also, the prevalence of voice disorders is seen more in adults individuals followed by elderly clients. This may be because of anatomical changes in the vocal mechanism due to aging where the vocal folds undergo atrophy and bowing (Honjo & Isshiki., 1980; and Pontes et al., 2006).

Place of Residence

The majority of the treatment seeking population in the voice clinic was from the Mysore district of Karnataka followed by other districts of Karnataka and other states of India. This can be due to the awareness about the institute among public. The people from Mysore district can be more aware about the institute and ease of accessibility. The difficulty of travelling from other districts and states can be the other reason of a smaller number of people visiting the institute from places other than Mysore.

Onset

From table 4.3, 38% of the voice patients whose onset of the vocal symptoms arised before 2019, consulted for medical treatment. On the other hand, 62% of patients seeked medical help in the current reporting year (2019) where they noticed voice changes. The result of the present finding indicates that a considerable number of patients (176 in number; 38%) still ignore the initial voice related issues and postpone their medical intervention. The findings of the present study suggest that the general population be educated about the importance of seeking early medical attention before voice problem get worsen. They must insist on early detection/identification in order to have a faster recovery and better treatment outcomes.

Occupation

The present study found majority of patients were nonprofessional voice users and it was then followed by professional voice users. According to studies, workers population had the highest number of voice disorders in the treatment seeking population. Among the working population, nonprofessional voice users were higher (Benninger et al., 2017; Cohen et al., 2012; De Bodt et al., 2016; Martins et al., 2016; Remacle et al., 2017; and Van Houtte et al., 2010). In addition, the number of

professional voice users was not negligible. Remacle et al. (2017) reported that occupation is significantly associated with diagnosis. They also found that percentage of professional voice users were around 41% among working population. The similar result was found in the present study (38.7% of working population was professional voice users). The structural voice disorders were the most common diagnosis in all occupations considered in the study and more so among students and professional voice users (more than 70%). The vocal demand is higher among students and professional voice users. Generally, the higher vocal demand leads to overuse of the voice production mechanism (larynx). The overuse use of the voice may cause the vocal fatigue and in the long run, this may resultant in developing hyperfunctional voice disorders.

The functional voice disorders were high in working population and retirees. The functional voice disorders in working population can be the result of prolonged use of voice in the work place and the higher probability of socialisation with others. The higher vocal demands can lead to fatigue of laryngeal system that may probably leads to functional voice disorders. Since all retirees are elder adults, the anatomical and physiological changes contribute directly to vocal fatigue and subsequent increase in the vocal effort while speaking. Increased vocal effort repeatedly creates lot of tension on the vocal muscles where the physiological mechanism of vocal fold vibration altered. This may probably prone to get functional voice disorders. The neurogenic disorders were high in retirees and unemployed population. The percentage of psychogenic disorders were high in students where it was negligible in other categories. Since, the age of majority of students were less than 18 years, it can relate with findings of higher prevalence of psychogenic voice disorders in children. It can be due to the personality and cultural influence on the voice. The attention seeking behaviour of

children can also be considered as one of the reasons. This supports the importance of considering the psychological assessment for better diagnosis and intervention of voice disorders among children and adolescent age groups. The subjective scales for assessment of functional voice disorders are useful for the assessment of quality of life and psychological status of children and adolescents as per the study done by Touri and Marquardt (2013). Hence, the present study supports the psychological assessment and using scales for the assessment of functional voice disorders among child and adolescent age groups.

Diagnosis

In the present study, the diagnosis such a benign vocal fold lesions (vocal nodule, vocal polyp, Reinke's edema, vocal fold cyst), laryngitis, glottic chink, leukoplakia, laryngeal cancers, sulcus vocalis and other structural lesion were included in the category of structural voice disorders. The vocal fold mobility disorders including unilateral and bilateral vocal fold paralysis, spasmodic dysphonia was included in neurological voice disorders. The functional voice disorders are those disorders which occurs as a result of change in the voice quality without any neurological and structural lesions. It was diagnostically labelled as muscle tension dysphonia by the otolaryngologist at the institute.

In the present study, structural voice disorders were higher when compared to other disorders. The previous literature shows the higher prevalence of benign vocal fold lesions including vocal nodules (De Bodt et al., 2016; Martins et al., 2016; Remacle et al., 2017; and Watts & Knickerbocker, 2019). The functional disorders were also found as significant in similar studies those were the third highest in the present study (De Bodt et al., 2016; Martins et al., 2016; and Van Houtte et al., 2010). Some prevalent studies revealed that the laryngitis was the most prevalent diagnosis (Benninger et al.,

2017; Cohen et al., 2012). The higher prevalence of structural disorders in the present study suggests the importance of educating the public about the importance of vocal hygiene and care. The possible reason of this higher prevalence can be poor voice care, exposure to pollutants and less awareness on early consultation with professionals.

Diagnosis, Age and Gender

The literature shows that the percentage of structural voice disorders is evident in females and children (Martins et al., 2016; Van Houtte et al., 2010; Watts & Knickerbocker, 2019). However, the present study found more structural lesion among male population compared to females and the difference was not statistically significant. The large number of male patients visited the voice clinic may cause this deviation. The structural voice disorders were predominant in all age categories. In clients under 18 years of age, the structural voice disorders were more than 75% in present study which is supporting the literature. Rameshkumar et al. (2016) reported that there was no statistically significant difference between females and males diagnosed with vocal polyp. The authors also reported that there was no statistically significant difference between gender with any of age groups. The present study found no significant association between gender and diagnosis, and this finding supports the findings of Rameshkumar et al.'s (2016) study.

The percentage of neurogenic voice disorders was found to increase with age. The neurogenic voice disorders were completely absent in children and teenagers and it was higher in middle age category. The percentage of the same is higher in geriatric population. In a study done by Remacle et al. (2017) in 1079 patients who visited the ambulatory voice clinic in the Department of Otolaryngology of Lie`ge University Hospital, Belgium, the prevalence of laryngeal mobility disorders was found to be increasing with age. The present study supports the results of Remacle et al. (2017).

The natural aging process leads to decline in the anatomical structures and functions of the human body. The age-related decline in function would also influence the neurological system. The prevalence of degenerative disorders and stroke is higher in the elder individuals (Kamalakannan et al., 2017; Gourie-Devi et al., 2004). These are the possible reasons for the higher prevalence of neurogenic voice disorders in geriatric population. The higher number of functional voice disorders was found in adult population in the present study supports the study of De Bodt et al. (2016); and Martins et al. (2016). According to Van Houtte, Van Lierde, D'Haeseleer, and Claeys (2009), the females are more prone to psychogenic voice disorders. The percentage of psychogenic voice disorders in females was similar to males in current study. The possible reason for this could be a smaller number of female patients compared to males who visited the voice clinic in the year 2019. The percentage of psychogenic voice disorders found more between the age 12 and 18 years. Touri & Marquardt (2013) found that personality (introvert personality symptoms) and cultural factors can influence the prevalence of psychogenic voice disorders in children. hence, this would be considered while assessing children and adolescents during voice evaluation.

Smoking Habits

The majority of the population were non-smokers in the present study. Martins et al. (2016) reported that the number of smokers and ex-smokers were 275 (13.6%) and 35 (1.7%) out of 2019 individuals visited with voice disorders. Roy et al. (2005) reported that 28.2% of the people ever experienced a voice disorders were smokers. The percentage of the smokers and ex-smokers in the present study was 8.5 and 7.0, respectively. Compared with previous studies, present study found the number of smokers reported with voice problems were less. This could be because of the small sample size of the study.

Lyberg-Åhlander et al. (2019) reported that smoking is significantly correlated with dysphonia. In the present study, the structural voice disorders were common among smokers, ex-smokers and non-smokers. According to the study done by Byeon (2015), the organic voice disorders had significant relationship with smoking habits. The smoking cause alterations in the mucosal layer of the laryngeal system. It can lead to dehydration and other mucosal changes including Keratosis. The smoking can also cause vocal fatigue and gastro esophageal reflex disorders. This can be considered as the possible reason for structural voice disorders in smokers. The percentage of neurological and functional dysphonia were high in smokers compared to passive smokers. The percentage of neurogenic disorders were high in ex-smokers. In addition, the smoking effect has significant influence on neurological functions. The neurogenic voice disorders were found higher in geriatric population in the present study. The history of smoking in elder population can influence the decline in the neurological function along with normal aging process. The smoking habits can also cause neurological disorders such as stroke which can lead to dysphonia as a secondary effect. However, the significance of smoking habit with dysphonia could not be estimated in the present study.

Toxic Exposure

Bhattacharyya (2014) reported that 0.7% people with dysphonia reported to have exposure to the airborne irritants or environmental pollutants in a large-scale study in USA. In the present study, 12.4% of patients reported that they had exposure to toxic substances including, dust, fertilisers, smokes and other pollutants. This can be related to the higher pollution rate in India as per World Health Organisation (2016). In general, it is known that the toxic exposure is significantly associated with the dysphonia. The percentage of structural and functional voice disorders were high in people who had

exposure history. The 95% of patients with normal laryngeal findings did not report of any exposure (expect only 1 out of 23 normal diagnosis had toxic exposure). All clients with psychogenic voice disorders did not reported any exposure to the toxic substances or pollutants. The atmospheric pollutants can directly affect the laryngeal mucosa as well as respiratory tract. It can cause mucosal injuries, haemorrhage, edema, inflammation and so on. The prolonged exposure and the higher quantity of toxins would cause more severe level of problems at laryngeal structures (Sataloff & Murry, 2017).

Recommendation

More than 68% of the patients were recommended for voice therapy in the present study. It was followed by ‘other’ recommendations such as biopsy, further medical check-up, including thyroid testing and so on. Further, medication alone was the third common recommendation (26%) made in the case file. The medication alone was recommended mostly for structural voice disorders. Since infective diseases, such as laryngitis, is included in the structural voice disorders, the antibiotics are essential for the treatment. The mild structural and infective voice disorders can be resolved with the help of medications. Further, patients who recommended for surgical management, voice therapy was also recommended for addressing post-operative issues to voice change and its management.

Chapter VI

SUMMARY AND CONCLUSIONS

The study aimed to analyse the patient's characteristics who consulted a voice clinic at AIISH from January 2019 to December 2019. For this, the data of all patients who visited the voice clinic was taken from register and medical records at AIISH. The Microsoft Excel sheet and IBM SPSS software (version 20) were used for the data analysis. The data were analysed in to percentage of age, gender, occupation, diagnosis, the recommendation made after diagnosis, place of residence and the onset of the dysphonia of the treatment-seeking population. The percentage of smoking habits and toxic exposure of clients were also calculated. The association between diagnosis and gender; diagnosis and toxic exposure was done using Chi-square test.

A total of 489 patients who visited the Voice Clinic of DCS, AIISH, from 1st January to 31st December 2019. Out of 489 patients, the case files of 459 patients were found in the medical record section. So, total 459 case files were considered for the present study.

The results of the present study found several points of interests;

- The results of the present study indicated that the males were higher than the females who visited the voice clinic.
- The mean age was 41.4 years, and the age category of patients belonged to 19 to 65 years was predominant.
- The most common diagnosis was structural disorders, followed by neurogenic and functional disorders.
- More than 60% of patients had onset of the voice disorders in the current year than previous years and 40% of them reported to voice clinic after a year where the onset of symptoms started much earlier.

- The majority of the population was from the Mysore district of Karnataka. This may be due to the vicinity of the institute, more awareness and ease of communication by the patients.
- 8.5% of the patients were current smokers, and 7% were ex-smokers.
- 12.4% had exposure to dust, smoke and other pollutants.
- 53.3% of the patients were included in the working population, and 38.7% of the working population was professional voice users.
- More than 68% of the patients were recommended for voice therapy, where others were recommended for medication, surgery, further medical investigations, and its combinations.
- The chi-square analysis showed significant relationship between diagnosis and toxic exposure and not for gender.

Utility of the Study

- The outcome of the present study enlightens the importance of finding the possible reason for the reduction in the number of females seeking medical help for voice disorders. It can help to increase the opportunity of Indian women to approach medical professionals for voice problems by creating public awareness.
- The higher percentage of structural voice disorders showed the importance of its prevention by creating more public awareness on voice care and vocal hygiene.
- The working population should be focused on awareness programs regarding voice care, maintenance of vocal hygiene and preventive measures.
- The study highlights the importance of prevention of structural voice disorders in the adult population.

- The increase in neurogenic voice disorders paves the way to create more awareness among the elderly population to consult voice specialist/ ENT doctors for early identification and intervention. It can improve the quality of life of the elderly individuals.
- The present study shows that it is essential to spread awareness about the clinical services and facilities of the apex government institute (voice clinic) to other regions of the country, so that multitudes may get benefited.

Limitations of the Present Study

- In the present study, the details of 30 patients visited in 2019 could not be considered due to the missing data and wrong case file numbers.
- The number of missing information was included in the calculation of the percentage of the parameters, including diagnosis.
- The statistical correlation of the diagnosis with age, smoking habits, occupation, and recommendations could not be done due to the problem in the distribution of the data.
- The study only considered the client's characteristics and not the technical details like voice parameters including fundamental frequency, EGG, etc.
- The study covered only one year of data from January 2019 to December 219.

Future Directions

- The percentage of other causative factors such as diabetics, thyroid problems, allergy, neurological issues, vocal abusive behaviours and other medical conditions can be studied and correlated with dysphonia.

- Similar studies can be done in various other voice clinics or hospitals across India for estimating country wise prevalence data.
- Further studies can be done to investigate the effect of different toxic exposure in clients with voice disorders.

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