DEVELOPMENT OF MANUAL FOR P. H. C. DOCTORS ON VOICE AND ITS DISORDERS

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May, 2015

CERTIFICATE

This is to certify that this dissertation entitled "**Development of manual for P.H.C. doctors on voice and its disorders"** is a bonafide work in part fulfillment for the degree of Master of Science (Speech-Language Pathology) of the student (Registration No. 13SLP024). 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 the award of any other Diploma or Degree.

Mysore
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DECLARATION

This is to certify that this dissertation entitled "**Development of manual for P.H.C. doctors on voice and its disorders"** is the result of my own study under the guidance of Dr. Jayakumar T., Lecture in Speech Sciences, Department of Speech-Language Sciences, All India Institute of Speech and Hearing, Mysuru and has not been submitted earlier to any other University for the award of any other Diploma or Degree.

Mysore
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Dedicated to
Acha &
Amma.....

And my dear
guide
Jayakumar sir

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Chapter 1

INTRODUCTION

The Primary Health Centres (PHCs) play the central role in delivering health care to rural population of India. The PHCs are meant to deliver preventive, promotive and curative health care to the community. Apart from mere delivery of direct services to individuals visiting the centre, the PHCs provide health education, nutrition promotion, immunization, mother child and family welfare services, and information on basic sanitation (WHO, 1978). However the primary health centre (PHC) network in India assumes great importance, since PHC is the only existing minimum necessary infrastructure to provide various disease/disability prevention and rehabilitation services. There are 23,673 PHCs functioning in the country as on March, 2010 as per Rural Health Statistics Bulletin (2010).

Community based rehabilitation (CBR) for the disabilities such as locomotor disability, visual handicap, speech & hearing impairment and mental retardation through PHCs has started implementation in India since 1994. The aim of community-based rehabilitation is to help people with disabilities, by establishing community-based programs for social integration, equalization of opportunities, and rehabilitation programs for the disabled.

Studies have been conducted to evaluate the awareness of PHC doctors about CBR and disabilities. The results of one of such studies revealed that only mere 12% of doctors have heard about CBR and only 37% had any clue about its role in this broad based, community oriented approach in disability management (Gaash, Ahamad, Bhan and Mussafer, 2004). If this is the awareness level about a well-established programme like CBR for PHC doctors who becomes the main, first or the

only technical contact of the patient from whom the primary referral for disability management is expected, then what will be the condition of other invisible impairments like speech/voice disorders.

Speech is the most important means of communication an individual from infancy. The essential component which helps in putting forth speech is the voice of a person. A normal voice should have a quality that is pleasant, has appropriate pitch, loudness with adequate flexibility and sustainability (Johnson, Brown, Curtis, Edney & Keaster, 1965). Any deviation from this will result in a voice disorder/dysphonia. Voice disorder affects a person's quality of life and so it is important to treat voice disorders at its early stage.

Voice is the acoustic signal generated by the vocal folds which is situated in the larynx for talking, reading, singing, laughing, crying, screaming etc. The mechanism for generating the human voice can be subdivided into three parts; the lungs, the vocal folds within the larynx, and the articulators in the vocal tract above the larynx. The lung produces sufficient airflow and air pressure to vibrate vocal folds and this air becomes the main source of vibration of the vocal folds. The vocal folds are a vibrating valve that cuts the airflow from the lungs into puffs of air which are resonated to the audible pulses that form the laryngeal sound. The muscles in the larynx alter the length and tension of the vocal folds to modify pitch and loudness of the voice produced. The articulators such as of tongue, palate, cheek and lips articulate and filter the sound generating from the larynx and to some degree can interact with the laryngeal airflow to strengthen it or weaken it as a sound source. The vocal folds and the articulators together are capable of producing highly complicated arrays of sound.

The human voice fulfils a number of roles in the process of oral communication, as well as contributing to the way in which individuals relate to each other. It is recognized that the human voice makes a major contribution to the audibility of verbal communication (Greene and Mathieson, 2001). A voice constantly transmits information about the speaker. It is as unique as the finger print and helps to define the personality, mood and health. The pitch of the voice may be modulated to suggest emotions such as anger, surprise, or happiness. If any abnormality is found in pitch, loudness and pleasantness of the voice, then it is considered as voice disorder.

Voice disorders are the medical conditions that range from complete absence of the voice to varying degrees of vocal impairment which involves abnormal pitch, loudness or quality of the sound produced by the larynx and this will in turn affects the speech production. Disordered voice can range from being functionally ineffective to being merely aesthetically unpleasant with the least severe form. These vocal changes can be the manifestation of disordered laryngeal, respiratory and vocal tract functions, which might reflect structural, neurological, psychological and behavioural problems as well as systemic conditions (Greene and Mathieson, 2001).

Epidemiology of voice disorders

Epidemiologic studies related to prevalence and risk factors of voice disorders in the general population are relatively uncommon. Roy, Merrill, Gray and Smith (2005) investigated the prevalence of voice disorders, the variables associated with increased risk of voice disorders, and the functional impact of voice disorders on the general population. They took 1,326 (male & female) adults in Iowa and Utah within an age range of 20-66 years and interviewed them using a questionnaire that addressed three areas such as prevalence, potential risk factors, and occupational consequences/effects related to voice disorders. In their study, **29.9%** of the

participants were found to have voice problems, among which 21.5% reported to have chronic problems (i.e., duration > 4 weeks), and 78.5% were having acute problems (i.e., duration < 4 weeks). According to them there was only **5.9%** of the voice disorder population who previously sought for professional help to improve their voice. These researchers identified specific factors that uniquely contribute to the occurrence of a chronic voice disorder such as sex (women), age (40–59 years), voice use patterns and demands, esophageal reflux, chemical exposures, and frequent cold/sinus infections. Their findings also indicated that voice disorders adversely impacted job performance and attendance.

Duff, Proctor, Yairi (2004) studied 2,445 African-American and European-American preschool children (1,246 males and 1,199 females) between 2 and 6 years of age and presence of voice disorder was identified using a three-step approach including teacher identification, investigator screening, and parent identification. Teachers were asked to identify children who are suspected to have any communication problems such as speech, language, stuttering, voice or hearing. These children identified by the teachers were screened by the investigator which will be a speech language pathologist. When an investigator identified a child as having a voice disorder, a second investigator was asked to listen to the child and make a judgment about his/her speech. A voice disorder was identified on the basis of the judgment of two speech-language pathologists. Parent or guardian of each identified child received a survey and was asked to indicate any concerns regarding past or present speech, language, hearing, voice, and fluency development. By combining all the three steps the researchers identified that in 95 children or 3.9% of their sample had voice disorders characterized by hoarseness in preschool children.

India shelters a huge number of people who uses their voices for their daily living. Majorly this includes, teachers, sales persons, politicians, singers, actors, and street vendors. In the Indian scenario factors such as environmental noise and dust pollution, lack of acoustic amplification, life style (smoking, spicy foods, excessive consumption of alcohol, tobacco, coffee, tea, and carbonated soft drinks), the tropical climate, and excessive voice use etc. increases individuals' susceptibility to voice problems. For example, a street vendor selling in a public railway station has to raise his vocal intensity above the noise of the loud trains and the heavily packed crowd, in the midst of the dusty environment for long hours. A full-time school teacher in India is expected to teach an average of about 30 classes/week, where the duration of each class being about 40 minutes. Classrooms typically have about 30–40 students and without amplification systems (Konnai, Jayaram, Scherer, 2008).

The National Sample Survey Organization (NSSO) in 2002, estimated that 204 per 100,000 persons in India had a speech disability with an incidence rate of 23.3% for persons <15 years of age, 11.5% for persons within 15-59 years of age and 3.4% for persons >60 years of age. Among these 11.4% below the age of 15 years, 9.4% between 15-59 years of age had voice problems.

Prakash, Rajendran, Nagarajan, Seethapathy, Gnansekar (2008) studied vocal abuse and vocal hygiene practices among different level professional voice users in India. 400 subjects in the age range of 25 to 45 years which included professional voice users like singers, politician, teachers and vendors, 100 each in each profession, participated in their study. They used a questionnaire consisted of few forced choice questions (Yes/No) and open-ended questions to collect information on the vocal hygiene practices in these vocal professionals and they found that 86% of politicians and 74% of vendors had the highest point prevalence and frequency of voice

problems; 59% of singers and 49% of teachers reported to have voice problems. According to their findings, politicians had highest prevalence of abusive non-vocal habits and about 84.3% of professional voice users considered that abusive (non vocal) habits had a negative influence on voice. All subjects indulged in abusive vocal habits like throat clearing, loud speaking/singing for long durations. More than 50% of subjects reported that they would resort to home remedies or not seek any help. According to these researchers, both ancient traditional practices (consuming milk with pepper or turmeric) and empirically proven methods are practiced among these different voice professionals in India to prevent voice problems. They also found that lack of awareness to treat the voice problems earlier was high among vendors and politicians.

Banjara, Mungutwar, Singh, Anuj (2011) conducted a retrospective study in Raipur, India to find out the clinical profile, predisposing factors and etiology of hoarseness of voice. They analysed 251 cases who had a change in voice within the age range of 11-80 years in a male to female ratio of 1.9:1. All cases were analyzed for detailed case history and underwent pre and post operatively stroboscopic examination. Results revealed that smoking was commonest predisposing factor (44.22%) followed by vocal abuse (30.28%) and out of 251 cases, 83.67% cases were organic and 16.33% cases were functional in origin. In their observation from June 2007 to September 2010 the estimated incidence of hoarseness of voice was 0.45% among the out patients attended their ENT OPD in Raipur, India.

Information about the prevalence of communication disorders is essential for planning prevention and rehabilitation services with this objective Sreeraj, Suma, Jayaram, Sandeep, Mahima, Shreyank (2013) estimated the prevalence of communication disorders between gender and across age groups among a rural

population of India. They conducted a door-to-door survey of 15,441 individuals from 15 villages in Mandya district, Karnataka, irrespective of their age and gender. They carried out the study by administering a modified high-risk questionnaire which helps to identify individuals at risk of communication disorders. During this survey individuals found at risk were referred for detailed audiological and/or speech and language evaluation for the further phase of the study. Through survey they found that the prevalence of individuals at risk of communication disorders was 6.07% among which prevalence speech and language disorders was 9.42%. Among those with speech and language problems the prevalence of voice disorder was 2.9% for the individuals within the age range of 15-50 years.

Manohar and Jayaram (1973) conducted a survey in Mysore city on 1,454 school children and they concluded that 9% school children in India aged between 5-14 years had voice problems based on quality, pitch and loudness deviations. Mittal, Zaid, Puri, Duggal, Rath and Bhargava (1977) in New Delhi found out of 372 children 10% of them had voice defects such as whispering, hoarse or irregular (pitch break) problems.

Prathibha and Yeshoda (2012) conducted a study to examine the prevalence of voice problems among pre-schoolers in Yemmiganur town, Andhra Pradesh. In this study 320 children participated wherein subjects were divided onto two age groups i.e, 3.5-4.5years and 4.5-5.5 years and in each group consisted of 160 children of 80 boys and 80 girls. Information for the study was collected from the parents and teachers of the participants using the Functional Indicators of Voice Problems (FIVP) questionnaire, along with this acoustical analysis of the voice samples of the children was also done. The results showed that out of 320 children who participated in the study 71 children had deviant voices among which 51% were males and 49% were

females and the periodic prevalence was estimated as 22% in the given population. According to these researchers vocal behaviours such as screaming whispering imitating environmental sounds and making vocal noises during play and learning through verbal means were observed in children.

Impact of voice disorder on the quality of life

Quality of life is a term for describing the well-being in economic, social, and psychological domains. Any limitation or restricted participation in daily activities may result in deterioration in quality of life. The impact of a voice disorder on an individual is more than a mere visible abnormality of the larynx or audible deviant voice quality. The daily activities and social function of an individual are often affected as well. According to a study done by Ma & Yiu (2001) where they evaluated the perception of voice problem, activity limitation, and participation restriction using the Voice Activity and Participation Profile (VAPP) questionnaire administered on 40 subjects with dysphonia. In their study the persons with dysphonia reported problems in job, daily communication, social communication, and emotional functioning.

Verdolini and Ramig (2001) reported that studies across several continents consistently point to teaching as a particular occupational risk for experiencing a voice problem. A large proportion of teachers with voice problems miss their work because of their voice problem. According to these researchers singers are the second professionals who appear to be at particular risk for experiencing voice problems. Other occupations which require further concern are those requiring significant vocal loading, such as lawyer and clergy men. These professionals also may have an increased risk for seeking treatment due to a voice problem. They also reported that the economic study estimates based on empirical

literature indicate that voice disorders may result in societal losses in the billions of dollars in the US alone, considering only lost work days and health care costs.

Moving on to the Indian scenario, as discussed earlier according to the study conducted by Prakash et al. (2008) politicians (86%) and vendors (74%) had the highest point prevalence and frequency of voice problems than singers (59%) and teachers (49%). Swapna, Suresh, Santhosh and Achamma (2012) identified the prevalence of voice disorders and the risk factors for developing voice pathology in teachers. They conducted the study through administering a questionnaire to 448 teachers and found that 9% of teachers had an indication of voice disorder based on the positive responses got from the questionnaire. Out of the 9% of subjects they identified 26% had history of recurrent allergic rhinitis and laryngitis, 18% had sinusitis and post nasal drip, 18% had asthma, 26% had gastro esophageal reflux disorder, (8%) had minimal sensory neural hearing loss and 8% had hypothyroidism. These researchers concluded that interaction of multiple factors like hereditary, behavioral, lifestyle, medical and environmental can contribute to voice disorders in occupational voice users.

Primary health center (PHC) related studies

With the negative impact on patient quality of life health care costs associated with evaluating and managing patients with voice problem and adverse impact on work productivity, PHC doctors have a vital role in managing the public health impact of laryngeal/voice disorders. PHC doctors are often the first physicians to evaluate patient symptoms and initiate treatment; thus, determining and coordinating referrals is an essential aspect of primary care.

To understand how primary care physicians (PCPs) manage patients with dysphonia and the barriers they face when evaluating patients for voice problems, Turley & Cohen (2010) conducted a survey study including 933 primary care physicians. A questionnaire with questions concerned physician comfort level in recognizing an abnormal voice, their view of the quality of life impact of dysphonia, frequency of evaluating patients for voice problems, barriers to the evaluation of voice problems, reasons for referral, and common treatments prior to referral was sent to the PCPs. Out of the 29% PCPs who responded, only 36.5% routinely evaluated their patients for voice problems. According to them the barriers for not evaluating patients for voice problems were patients not complaining about hoarseness, more pressing issues, not feeling comfortable assessing patients for voice problems, uncertainty about how to evaluate for voice problems and time constraints. Chronic voice changes and not being able to understand patients' speech were the most common reasons for referral. Reflux and allergy treatment were common treatment modalities prior to referral. A total of 67.5 percent of PCPs who responded were interested in learning more about voice problems.

Cohen, Kim, Roy, Asche & Courey (2012) conducted a study to determine the prevalence and common causes of dysphonia as diagnosed by primary care physicians (PCPs) and otolaryngologists and to evaluate differences in etiologies offered by these providers. They conducted a retrospective analysis of data from a large, nationally representative administrative U.S. claims database which consisted of 55 million individuals. Among this 536,943 patients between the ages of 0 to >65 years were given a dysphonia diagnosis which gives a point prevalence rate of 0.98%. The prevalence rate was higher among females as compared to males (1.2% vs. 0.7%) and among those >70 years of age (2.5%). The most frequent diagnoses overall were acute

laryngitis, nonspecific dysphonia, benign vocal fold lesions, and chronic laryngitis. Among the dysphonic patients 48.4% of them were evaluated by a PCP and 33.5% was by an otolaryngologist. Dysphonic pediatric patients were more commonly seen by PCPs and with the increasing age otolaryngology evaluation increased and PCP evaluation decreased. According to their finding, specific diagnoses also differed with respect to PCPs and otolaryngologists. PCPs most commonly offered diagnoses of acute laryngitis, whereas otolaryngologists more commonly diagnosed laryngeal pathology, such as vocal fold paralysis and benign vocal fold lesions, nonspecific dysphonia and chronic laryngitis.

Later in 2014, Cohen, Kim, Roy & Courey at Duke University Medical Center, USA conducted a retrospective analysis of a large database of 149,653 unique patients seen by a PCP as an outpatient for a laryngeal/voice disorder. They evaluated the frequency, timing, and factors that influence referral of patients with laryngeal/voice disorders to otolaryngology following initial evaluation by a primary care physician (PCP). Their study revealed that 90.9% of patients with laryngeal/voice disorders were not referred to any otolaryngologist or voice care professionals, whereas 4% of patients were referred to otolaryngologist and 2.6% were self-referred to otolaryngologist. This shows a very low rate of referrals from the PCPs to an otolaryngologist of patients with dysphonia.

In India studies similar to this, where they check for the rate of referrals from PHC doctors to other voice care professionals are rarely noted. It can be assumed that in a developing country like India the referral rate will be still reduced when compared to the referral rate in a country like US. From the reviewed literature it can be concluded that there is a high prevalence rate of voice disorders in India, along with a significant impact on the quality of life and job functioning. At this conclusion,

it can be inferred that there is a great need of educating the PHC doctors regarding assessment and management of voice disorders, since PHC doctors are the first and near professional whom the dysphonic population in the rural sector of India can contact.

A manual is a booklet which gives information about a particular topic. A manual on voice disorders is a booklet which explains about voice, voice production, types and causes of voice disorders and assessment and management of voice problems. The manual for P.H.C. doctors will help them to get a basic knowledge on voice disorders, its assessment and management which may help in making proper referrals. Giving awareness to PHC doctors help in the rudimentary level management of voice disorders and this will in turn improve the quality of life of the vocal users in India.

Need for the study:

In spite of a high prevalence rate of voice problems, in India there is a low rate of referral of patients with laryngeal/voice disorders from rural settings. In PHCs doctors with a bachelor's degree are commonly recruited. Their bachelors' curriculum does not contain any details about speech production and its physiology. This also leads us to the fact that PHC doctors are less aware of voice disorders and its management option. This shows the need for educating PHC doctors on voice disorders and its management options which may help in making proper referrals. As there are more than 20,000 PHCs in India and each PHC is expected to cover about 30,000 rural populations, giving awareness to PHC doctors help in the grass root level management of voice disorders and this will in turn improves the quality of life of these vocal users.

Objectives of the study:

- To develop a manual on voice disorders to increase the awareness in PHC doctors.
- To find the effectiveness of the manual among PHC doctors.

Chapter 2

METHOD

Present study was carried out in two phases. Phase I dealt with the development of manual for PHC doctors on voice disorders and Phase II dealt with the evaluating the effectiveness of developed manual.

Phase I: Development of manual

In Phase I, manual was developed with various source of information. The systemic way of developed manual procedure is explained in the following steps.

Step 1: The various resources of information such as journal, books and internet websites was reviewed for information regarding voice disorders and its various treatment options. All those information was collected from All India Institute of speech and Hearing (AIISH) library and Information centre.

Step 2: The information collected was compiled and organised as required for the manual.

Step 3: With all the information collected, resource manual consisting of the following contents was formulated.

- Introduction
- What is speech, language and communication?
- What is voice?
- Development of voice
- Voice disorders
- Causes
- Classification of voice disorders

- Impact of voice disorder on the quality of life
- Need for assessment and treatment of voice problems
- Team for diagnosis and treatment of voice problems
- Assessment of voice problems
    - Major signs and symptoms of voice problems
- Management of voice disorders
    - Available treatment methods
    - Preventive tips
- Conclusion
- Bibliography
- Appendix: List of major speech and hearing clinics / Institute in Karnataka

The manual was of about 25 pages. It contained pictures of different vocal conditions which was incorporated from different resource materials and also from the resource available from the Voice Clinic at AIISH, Mysore with concerned.

Content Validity

Once the manual was developed it was subjected for content validity. Three Speech language pathologists who have experience of more than 5 years in voice research/pathology and two Otolaryngologists who have experience of more than 5 years in voice assessment and management were requested to do the content validity of the manual. The three speech language pathologists and two otolaryngologists read through the entire manual and suggested few modifications in the manual. Later manual was revised according to their suggestions. The manual is attached in the Appendix 1

Phase II: Evaluating the effectiveness of the developed manual

Participants: A total of 20 PHC doctors who has masters or bachelor's degree (except Masters in Otorhinolaryngology) within Mysore district with a minimum experience of 2 year working in PHC was selected as participants. Their phone numbers were collected from the government website and were called up for requesting to participate in the study. Out of which only 15 doctors accepted to participate in the study.

Procedure: A pre test/post test questionnaire was developed based on the manual which consisted of 25 multiple choice questions. This questionnaire is included in the Appendix 2. Using this questionnaire a pre test was given to all the doctors to evaluate their awareness level on voice disorders before reading the manual. After the pre test the developed manual was introduced. All the doctors were given a minimum of three days to read the manual. Later the same questionnaire as that of pre test was used to take a post test only after making sure that the doctors have read through the manual and also to estimate the effectiveness of the manual.

Later the pre test and post test scores were obtained and these scores were compared statistically using Paired sample t test. Descriptive statistics was also done to get the mean scores and standard deviation for the pre and post test scores.

Chapter 3

RESULTS AND DISCUSSION

The present study aimed at developing a manual for PHC doctors on voice disorders and to find the effectiveness of the manual among PHC doctors. A detailed literature review was done and the information from the literature was pooled out. Then this information was compiled and organized as required for the manual. Following the construction of the manual it was given to three speech language pathologists and two otorhinolaryngologists who are experienced in voice assessment and voice research/pathology. They were asked to provide suggestions regarding any necessary modification in the manual. Based on their suggestions, necessary and feasible modifications were incorporated. Then the manual was introduced to twenty five primary health center doctors. A pre and post test of 25 questions based on the manual was administered before and after reading the manual for checking the effectiveness of the manual.

The results of this study are discussed under the following parameters:

- The modifications suggested by the speech language pathologists (SLPs) and otorhinolaryngologist for the proposed manual.
- The effectiveness of the manual in providing knowledge and awareness for the P. H. C. doctors.

Modifications of the manual

Three SLPs and two otorhinolaryngologists provided various suggestions to be incorporated in the manual. Major suggestions provided by the SLPs were to include pictures for the histology of vocal folds and development of voice. They also

suggested for the reduction of the content under the topic of assessment of voice disorders and suggested for making changes in the title of the manual. There were only minor modifications suggested by the otorhinolaryngologists which included few corrections regarding the terminologies used in the manual. These modifications were incorporated in the manual and the current manual was formulated. The modified manual was used for finding the effectiveness of manual

The effectiveness of the manual

After incorporating the necessary suggestions in the manual, a questionnaire containing 25 multiple choice questions was developed based on the manual. The questionnaire was administered as pre test and post test prior to and after the introduction of the manual to fifteen P. H. C. doctors within Mysore district. For checking the effectiveness of the manual pre test scores and the post test scores were compared.

The number of doctors who answered correctly for each question in the pre and post test is given in the Table 3.1. From which it is understood that majority of doctors scored correctly for questions related to anatomy and physiology of voice in the pre test itself. For questions related to signs and symptoms, assessment and management of voice disorders around 50% doctors scored incorrectly in the pre test. For the post test which was administered after reading the manual, all doctors scored correctly for majority of questions from all the areas. The same results are represented in a graphical form as shown in Fig 3.1 which also shows an increase in the number of doctors who scored correctly in the post test, when compared to the pre test which was done prior to the introduction of the manual. The Table 3.1 and Fig 3.1 also shows that for few questions almost all doctors have scored correctly in the pre test

itself from which it can be inferred that doctors have a good knowledge in some area related to voice/speech disorders. However, majority of questions were answered wrong by most of the doctors which confirms the present study assumption that the PHC doctors have poor knowledge on voice/speech disorders.

Table 3.1
Number of doctors answered correctly in the pre and post test for each questions.

Sl. no.	**Questions**	**Pretest (No. of doctors correctly answered)**	**Posttest (No. of doctors correctly answered)**
1.	Which is the organ responsible for voice production?	15	15
2	What is the smallest meaningful unit of sound?	11	15
3	What is the main source of vibration of vocal folds?	11	14
4	Which are the three subsystems of voice mechanism?	12	15
5	A normal voice quality should be ----------	14	14
6	From which age voice development begins?	14	15
7	How will be the vocal pitch for an adult male and female respectively?	10	15
8	50% of voice disorders are caused by ----------	11	15
9	Which voice disorder among these comes under a neurogenic etiology?	8	15
10	Among these which can be a cause for a vocal pathology?	11	14
11	What vocal profile can be expected for a condition of vocal nodules?	3	11
12	What is an abnormal growth of tissue projecting from the mucous membrane of the vocal folds?	9	13
13	A voice quality which lacks normal variation of pitch during speech is called ----------	5	12
14	Voice quality that lacks clarity, has increased noisiness (breathiness) and lacks its harmony is termed as ----------	8	13
15	In which condition does the patient complain about a wobbly or shaky voice?	4	13
16	Complete absence of voice is termed as ----------	15	15
17	---------- is an open ended way of obtaining	7	11

	information on physical, emotional, and behavioural factors.		
18	The perceptual, acoustic and aerodynamic evaluation of voice is carried out by_____	14	14
19	Which among the three types of voice evaluation is considered as the gold standard?	3	14
20	Which structure contributes to the extraordinary versatility of the human voice?	7	15
21	Physiologic Voice therapy focus on	9	14
22	Which of the following is a vocal misuse behavior?	5	12
23	Which of the following dietary modification will help in prevention and maintenance of good voice?	13	15
24	Which of the following lifestyle modification will help in prevention and maintenance of good voice?	7	15
25	Which profession does not come under professional voice users?	15	15

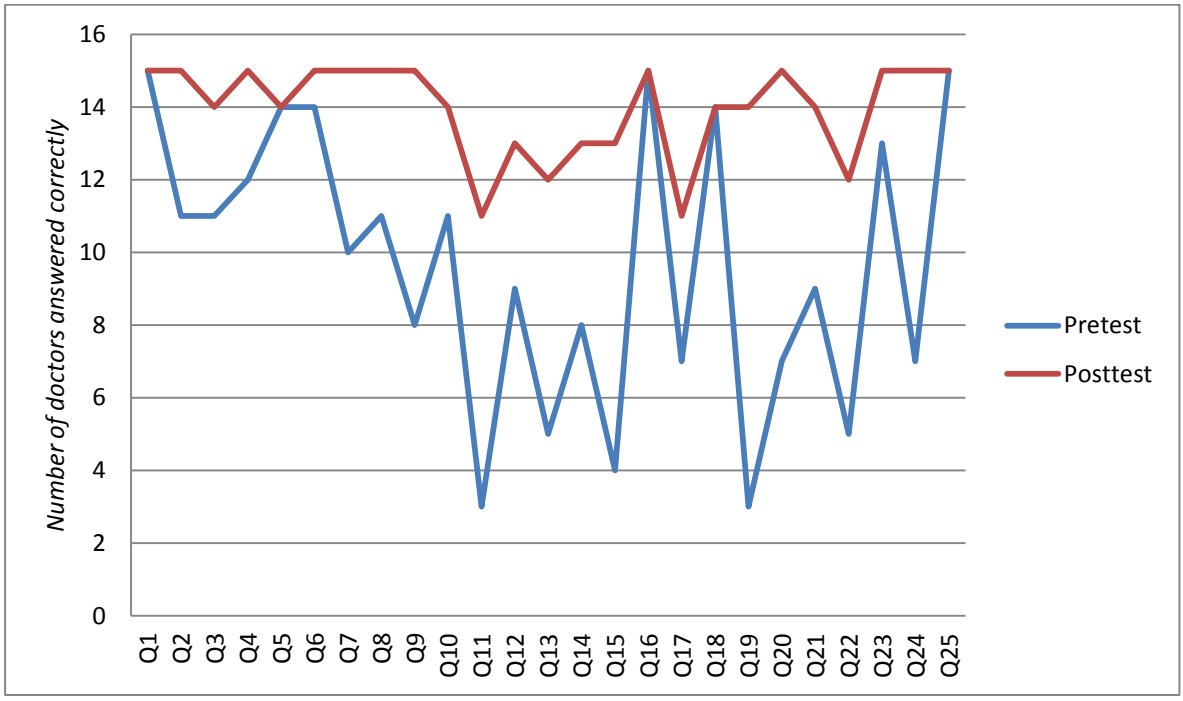

Figure 3.1 Line graph of number of doctors answered correctly in the pre and post test.

For finding the effectiveness, the manual was introduced to fifteen P. H. C. doctors. In the Table 3.2 the total score achieved by each doctors for the pre and post

test is given along with their improvement in the scores and percentage of improvement in the post test compared to pre test. It can be observed that around 70% doctors scored less than 16 out of 25 in the pre test and over 90% doctors scored more than 23 in the pre test. The pre test is designed in such a way that it should not have a floor effect or ceiling effect. However the pre test score was more than 50% in most of the PHC doctors. Post test showed 30% improvement from pre test, but still there was a scope of 10% more for the PHC doctors in the post test. This may be improved or reach the maximum level of post test if the PHC doctors go through the manual again with more concentration.

Table 3.2
Total scores for pre and post test, improvement in score and the percentage of improvement for each doctor.

Sl. no.	**Total Score**		**Improvement in score**	**Percentage of improvement (%)**
	Pre test	**Post test**		
D1	12	23	11	44
D2	16	23	7	28
D3	18	23	5	20
D4	14	22	8	32
D5	16	24	8	32
D6	13	23	10	40
D7	18	24	6	24
D8	16	24	8	32
D9	16	22	6	24
D10	16	23	7	28
D11	17	24	7	28
D12	17	25	8	32
D13	15	24	9	36
D14	16	22	6	24
D15	18	25	7	28
Total	**238**	**351**	**113**	**30**

D - Doctors

The mean score for pre test as given in the Table 3.3 is 15.87, which is more than 50% and this suggest that the P. H. C. doctors are not completely unaware about voice production and its disorders. But their knowledge has to be increased

furthermore so that their confidence in assessment and management options available for voice disorders will increase and their referrals to voice care professionals increase. This manual has worked to bring forth knowledge and awareness on assessment and management options available for voice disorders, as it inferred from the mean post test score of 23.4 which is more than 90%. It also proves the effectiveness of the manual as represented in the Fig 3.2.

Table 3.3
Mean and Standard deviation for pre and post test scores

Phases	Mean Score	Standard deviation
Pre test	15.87	1.77
Post test	23.40	0.99

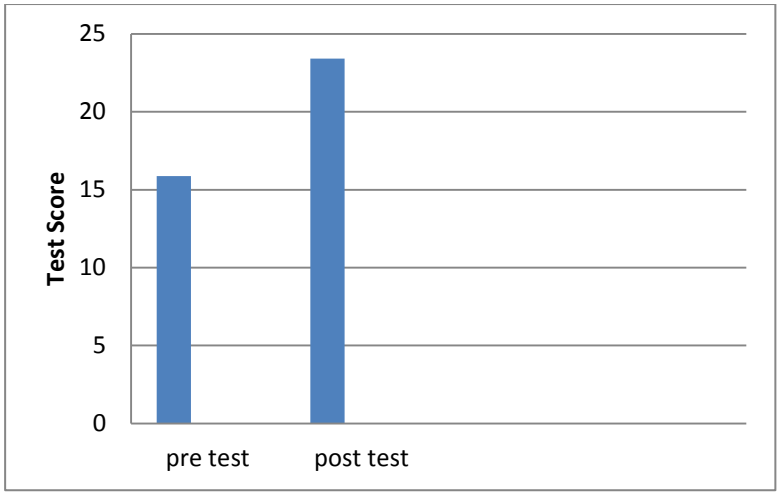

Figure 3.2 Mean pre and post test scores

Table 3.4 shows the mean score for pre test and post test for each question, along with the t-value and significance for the comparison of pre and post score of each question using a Paired sample t test. It can be observed that out of the twenty five questions, nearly thirteen questions had a significant difference when the pre and post test was compared. This again confirms that the developed manual was effective in improving the awareness and knowledge of the PHC doctors on voice disorders

especially in the areas such as signs and symptoms, assessment and management of voice disorders. However, pre test score for ten out of twenty five questions were not significantly different from the post test scores since majority of those questions were related to anatomy and physiology of voice.

Table 3.4
t-value and p-value *for the comparison of the pre and post test scores for each question.*

Questions Sl. No.	Mean		t- value	p-value
	Pre test	Post test		
1.	1.00	1.00	0.00	1.00
2.	0.73	1.00	-2. 26	0.04*
3.	0.73	0.93	-1.87	0.08
4.	0.80	1.00	-1.87	0.08
5.	0.93	0.93	0.00	1.00
6.	0.93	1.00	-1.00	0.33
7.	0.67	1.00	-2.65	0.02*
8.	0.73	1.00	-2.26	0.04*
9.	0.53	1.00	-3.50	0.00**
10.	0.73	0.93	-1.87	0.08
11.	0.20	0.73	-3.23	0.01*
12.	0.60	0.87	-1.74	0.10
13.	0.33	0.80	-3.50	0.00**
14.	0.53	0.87	-2.09	0.06
15.	0.27	0.87	-4.58	0.00**
16.	1.00	1.00	0.00	1.00
17.	0.47	0.73	-2.26	0.04*
18.	0.93	0.93	0.00	1.00
19.	0.20	0.93	-4.79	0.00**
20.	0.47	1.00	-4.00	0.00**
21.	0.60	0.93	-2.65	0.02*
22.	0.33	0.80	-3.50	0.00**
23.	0.87	1.00	-1.47	0.16

24.	0.47	1.00	-4.00	0.00**
25.	1.00	1.00	0.00	1.00

* p<0.05, ** p<0.01

Finally when the total pre test score and post test score was compared there was a significant difference between the scores as observed in Table 3.5. This shows a significant improvement in knowledge and awareness on voice disorders for PHC doctors which again proves the effectiveness of the manual.

Table 3.5
t-value and the significance for the total pre and post test scores

	t value	Sig.
Pre test Vs Post test	-18.26	0.00**

**p<0.01

To conclude from the results, this manual worked as an effective tool in providing knowledge and awareness on voice and its disorders to the primary health centre doctors. This would help them in making proper referrals and suggestions to the population with voice disorder approaching them. In this way, voice disorders can be identified and managed effectively in rural population of India.

Chapter 4

SUMMARY AND CONCLUSION

Speech is the important means of communication and voice becomes the major component of speech. Voice is one of the basic components of speech. A normal voice should pleasant to hear with appropriate pitch and loudness. Any deviation from this causes voice problems. From the epidemiological studies it can be observed that there is a high prevalence rate of voice disorders in India and the impact of voice disorders on the quality of life and occupation is also adverse. This suggests the need for bring awareness among the professionals and people regarding the assessment and management of voice disorders. PHC doctors are the medical professional who closely works with communities. Hence the aim of this study was to develop a manual for primary health centre doctors and to find the effectiveness of the developed manual among PHC doctors. Hence this study was carried out in two phases.

Phase I consisted of the development of the manual by collecting and compiling information from different resources. This developed manual was subjected to content validity. The three speech language pathologists and two otorhinolaryngologists who participated in the content validity check gave few comments and suggestions. Later the manual was modified after incorporating these suggestions.

In Phase II for evaluating the effectiveness of the manual, a pre test/post test questionnaire was developed which consisted of 25 multiple choice questions. This questionnaire was administered on 15 PHC doctors after and prior to introducing the manual. The pre test and post test scores were compared statistically.

The results were discussed under to headings such as the modifications of the manual and the effectiveness of the manual. Under the modifications of the manual, the suggestions and comments given by the SLPs and otorhinolaryngologists were discussed. In the later part the pre test and post test scores obtained by the doctors were statistically compared using Paired sample t test. Results of this suggested that the doctors were not completely unaware about the aspects of voice and its disorder since majority of doctors scored more than 50%. But a significant improvement in their post test scores near maximum score of 25 was observed compared to pre test scores. This suggests that the manual was an effective tool in improving the knowledge and awareness of the PHC doctors on voice and its disorders.

On a whole, this manual helped to increase the awareness in PHC doctors on voice disorders and its management options. This in turn increases the number of referrals of voice disorders from PHC doctors to speech language pathologists and otolaryngologists and this helps in a better management of voice disorders at a grass root level in India.

Future research in this area should look forward to check the number of referrals of dysphonia patients from the PHC doctors to the voice care professionals. The reasons for the reduced referrals of voice disorders from the PHC doctors should be studied. Future studies can also be recommended to check the awareness among the doctors and to increase their awareness especially in the rural parts of India.

Limitations of the study

- PHCs within Mysore city premises were only considered
- More PHCs in the rural sector could have been included.

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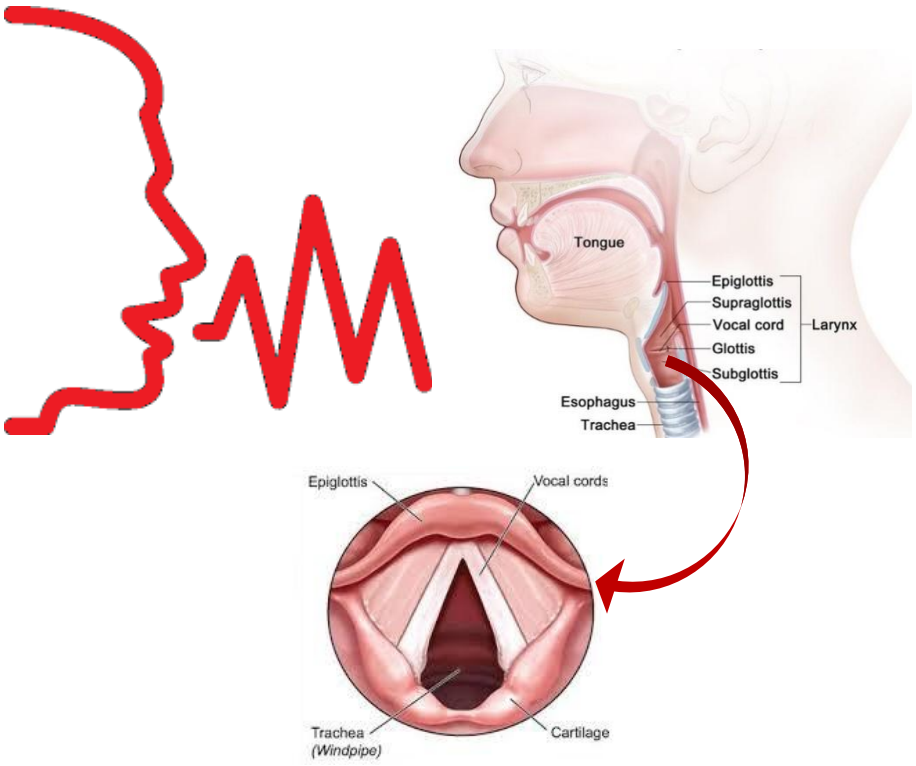
Appendix - 1

MANUAL FOR P. H. C. DOCTORS ON VOICE AND ITS DISORDERS



ALL INDIA INSTITUTE OF SPEECH AND HEARING
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CONTENTS

Introduction

Voice is the sound uttered through the mouth of living creatures especially of human beings in speaking, shouting, singing etc. The sound of the human voice tells the listeners enormous information about personality, emotions, confidence and feelings. Voice also discloses a great deal about the educational background, social status, health and mental alertness.

Voice is produced from the voice box which is called the larynx through the vibration of the vocal folds/cords. Any sound can be measured or quantified by frequency and amplitude. Similarly the voice can also be measured for pitch (perceptual measure of frequency) and loudness (perceptual measure of amplitude) along with quality (perceptual measure of pleasantness of hearing).

Voice disorders are medical conditions involving abnormal pitch, loudness or quality of the sound produced by the larynx and thereby affecting speech production. India is home to a large number of people who rely on their voices for their daily living. This includes, but is not limited to, teachers, sales persons, politicians, singers, actors, and street vendors. . Factors such as environmental noise, dust pollution, life style (consumption of alcohol, smoking, spicy foods, tobacco, tea, coffee, carbonated drinks etc.), the extreme climates and excessive use of loud voice makes individuals more susceptible to voice problems in Indian context.

In spite of a high prevalence rate of voice problems, in India there is a low rate of referral of patients with laryngeal/voice disorders from PHC (Primary health centre) doctors. Hence this manual, gives brief explanations for voice and its disorders along with the assessment and management options. This may help to increase the number of referrals of voice disorders from PHC doctors to speech language pathologists and otolaryngologists. Further, it may lead to a better management of voice disorders at a grass root level in India.

Rural population in India is about 68.7% of total population according to World Bank in 2011. Rural health infrastructure with its vast network of sub-centres, Primary Health Centres and district hospitals are the only delivery mechanisms that could offer services in rural areas with suitable training of personnel like doctors, Auxiliary Nurse Midwiferies (ANM), multipurpose health workers and strengthening

of the existing infrastructure. This network could deliver the required services in rural areas with minimum cost.

Clear standards and effective quality assurance within clinical teams must be the way forward- “prevention is better than cure”. Good medical and rehabilitation practices and sound medical control are the keys to the way forward, for an integrated management of any disorder. The task is to extend this good practice forward by building up linkage at the grass root level and promote referrals.

What are speech, language and communication?

Communication is the imparting or exchanging of information by speaking, writing, or using some other medium. It is a purposeful activity of exchanging information and meaning across space and time using various technical or natural means, whichever is available or preferred. For e.g., "Television is an effective means of communication”.

Language is a human system of communication that uses arbitrary signals, such as voice sounds, gestures, or written symbols. The functions of language include communication, the expression of identity, play, imaginative expression, and emotional release. Language can be of different varieties like spoken language, written language, sign language, computer language etc.

Speech is communication through conventional vocal and oral symbols. It is the natural exercise of vocal organs, the utterance of words or sentences; oral expression of thoughts and feelings.

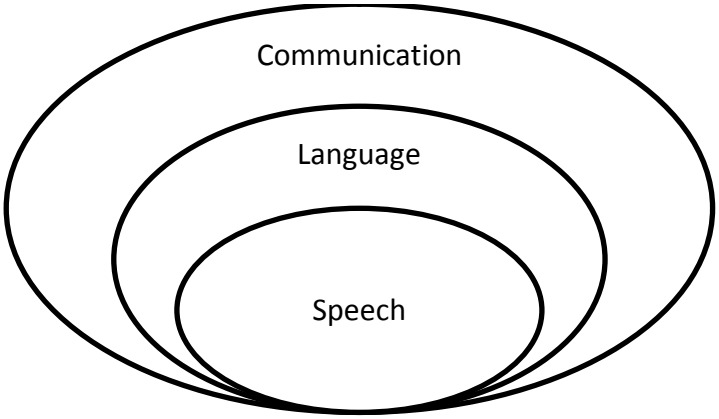

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Figure 1: Speech, language and communication

Speech production is the process by which spoken words are selected to be produced, have their phonetics formulated and then finally are articulated by the motor system in the vocal apparatus. It is the generation of airflow and the creation of air pressures by displacement of bodily structures which taken together cause disturbances of air that constitute phonemes, the smallest meaningful unit of sound. Speech is the verbal means of communication. Speech consists of voice, articulation, fluency and prosody.

Voice: is the sound produced by the vibration of vocal folds. The continuous flow of air from the lungs gets converted into puffs of air by the vibration of vocal folds.

Articulation: is how speech sounds are made (e.g., when we say the sound 't' our tongue is elevated and touches the palate)

Fluency: is the continuous flow of speech without interruptions.

Prosody: is the appropriate use of pitch, loudness, tempo, and rhythm in speech to convey information about the structure and meaning of an utterance.

What is voice?

The voice is an integral part of the unique human attribute known as speech. It is the sound formed in or emitted from the human larynx for speaking, singing or other utterances. The voice reveals the inner self and is a reflection of the personality of the individual. The larynx houses the major source of sound used during speaking.

Breathing air out of the lungs produces the power supply for the voice. This airflow from the lungs makes the vocal folds (or vocal chords) in the larynx (or voice box) vibrate to make the basic sound of the voice; this process is called 'phonation'. Sound produced at the level of vocal folds has both noise as well as voice component. Nasal cavity and oral cavity acts as a filter or sieve which cut down the unwanted sound in the voice and amplifies the required sound. This process is called as 'resonance'. Production of a natural, effective voice depends on how well we balance or coordinate these three fundamental components of breathing, phonation and resonance.

Hence, speaking and singing involve a voice mechanism that is composed of three subsystems. Each subsystem is composed of different parts of the body and has specific roles in voice production.

Table 1: Subsytems of voice mechanism

Subsystems	**Voice Organs**	**Role in Sound Production**
Respiratory system	Diaphragm, chest muscles, ribs, abdominal muscles, Lungs	Provides and regulates air pressure to cause vocal folds to vibrate
Phonatory system	Voice box (larynx) and Vocal folds	Vocal folds vibrate, changing air pressure to sound waves producing "voiced sound," frequently described as a "buzzy sound"Varies pitch of sound
Resonating system	Vocal tract: throat (pharynx), oral cavity, nasal passages	Changes the "buzzy sound" into a person's recognizable voice

Voice is an auditory perceptual term which means the audible sound produced by larynx, which embodies such parameters as pitch, loudness, quality and variability.

For a normal voice,

- Quality must be pleasant
- Pitch must be appropriate to the age and gender of the speaker
- Loudness should be appropriate to the communication event, not so weak or too loud.
- Adequate flexibility (able to vary pitch)
- Adequate sustainability

Development of voice

The voice development happens from birth. The voice changes happens dynamically with growth and decline in life. At the major stages of life, the uses of voice are different; similarly the demands placed upon it are also different. Birth cry reflects the beginning ability of the infant to control his or her voice. The next most obvious voice use change can occurs as the child begins to use the voice in the production of speech sounds. The infant, with a small larynx and short vocal folds, exhibits the highest vocal pitch, whereas the older child, whose larynx has grown, possesses a lower vocal pitch. By the age of 18 years or still younger, the voice

reaches its mature or adult stage. Males will have low pitch and females will have high pitch. After 65 years of age or so, the voice begins its decline. Voices that show a decline or increase in habitual vocal pitch, decreased control of loudness, or changes in voice quality may be showing signs of diminished physical status. In older age, the fundamental frequency of the male voice begins to ascend, whereas in the female voice it does not.

Vocal fold anatomy

Vocal folds also develop from childhood to adulthood. Vocal folds are highly elastic with a complex histological structure covered by mucosal layer, which contributes to the extraordinary versatility of the voice and its wide range of pitch, loudness and quality. The vocal fold is composed of 3 functional layers; Cover, transition and body.

Table 2: Layers of vocal fold

Functional layers	**Histological layers**
Cover	**Epithelium**: ciliated columnar epithelium covered by squamous epithelium **Superficial layer of Lamina propria:** loose fibrous matrix
Transition	**Intermediate layer of lamina propria**: elastic fibers **Deep layer of lamina propria**: collagenous fibers
Body	**Vocalis muscle**

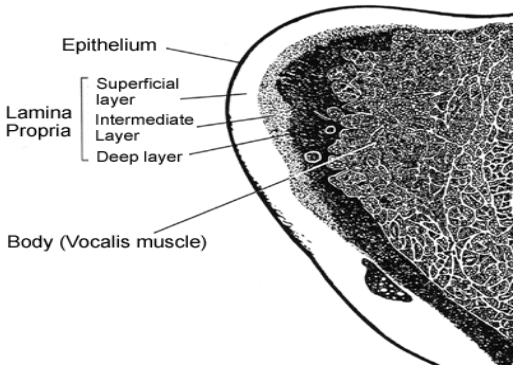

Figure 2: Layers of vocal folds

Voice disorders

A normal voice should have a pleasant quality of voice, appropriate pitch, loudness with adequate flexibility and sustainability. Any deviation from this will result in a voice disorder or dysphonia. An abnormal voice is any voice that calls attention to itself, does not meet the occupational or social needs of the speaker, or inappropriate to age, gender or situation.

Dysphonia/Voice disorders range from complete absence of the voice to varying degrees of vocal impairment. Abnormalities can involve one or more of the vocal parameters: habitual pitch, pitch range, loudness, quality, resonance, flexibility and stamina. Most voice disorders can be acquired from infancy throughout the life span, although a small proportion is congenital because of foetal abnormalities of the vocal tract or related systems.

Causes

Causes of voice disorders tend to be multifactorial. But the general classification scheme tends to group the cause of voice disorders into three main categories such as Functional, Structural and Neurogenic. Voice problems may result from structural problems within or outside of the larynx, neurological problems, lifestyle habits and choices, medications, psychological problems, systemic diseases of the body, physical injury to larynx, digestive disorders, respiratory disorders and unknown causes. Structural and neurological problems can be congenital or acquired.

Voice disorders can be the result of various physical**,** psychological and environmental factors**.** The following are the most common causes.

- **Vocal abuse (voice strain or overuse)and vocal misuse**

  More than 50% of people with voice disorders have a cause of vocal abuse and misuse. Some vocal behaviours like prolonged talking, excessive singing shouting etc. are vocal abuse. Vocal behaviours like mimicry, false voice etc. are examples of vocal misuse.

  Professional voice users, such as teachers, singers, politician, lawyers and fitness instructors, use their voice more than the rest of the population. They

are at a greater risk to strain their voices since they keep using it even when rest is needed and/or recommended.

- **Allergies, colds or upper respiratory infections**

  Allergies, such as hay fever, as well as infections often cause swelling of the vocal folds (oedema). A hoarse/rough voice or even a complete loss of voice (aphonia) is often the result.

- **Throat dehydration**

  The area around the vocal cords should be kept hydrated in order to have a healthy voice. Dusty environments, air-conditioned rooms, smoking (including passive smoking), alcohol and frequent caffeine intake cause throat dehydration and in turn lead to voice changes.

- **Gastroesophageal reflux**

  This refers to the feeling of 'burning' in the stomach induced by acids, which may be caused by alcohol and spicy food. The acid comes up the oesophagus and dribbles down into the laryngeal area causing vocal fold pathology. Medication and diet can prevent this.

- **Smoking**

  Apart from being a threat to the lungs and their function, smoking causes dryness in the mouth and vocal folds area. This causes hoarseness/roughness of voice (temporary/permanent), vocal nodules and swelling of the vocal cords.

- **Aging & neurological conditions**

  Aging causes changes in the structure of the vocal folds and the muscles around the vocal tract. Conditions such as Parkinson's disease and other neurological conditions can also cause problems in the breathing mechanism which in turn reflects on voice production.

- **Psychological stress**

  A person may lose his/her voice even when no physical damage is apparent or present. Stress or psychological issues can cause a person to become hoarse or even lose the voice temporarily.

- **Hormonal changes**

  Hormonal changes, secondary to the menstrual cycle, may result in physical changes that affect voice production. Increased subglottal (area beneath the vocal cords) pressure may cause hoarseness or loss of voice.

Other causes may include scarring from neck surgery, trauma and cancer of the larynx.

Classification of voice disorders

Traditionally, voice disorders have been classified as organic and non-organic, but this system does not necessarily consider the cause of the problem. Another etiological classification given by Green and Matheison (2002) classified it as behavioural and organic.

Table 3: Classification of voice disorders

Behavioural	
Hyper functional	Muscle tension dysphonia (MTD): vocal nodules, polyps, contact ulcers.
Psychogenic	Puberphonia, Functional aphonia
Organic	
Structural abnormalities	Congenital: Laryngeal web, cleft palate, sulcus vocalis Acquired: trauma, Vocal tract stenosis, Presbylarynx
Neurogenic	Recurrent laryngeal nerve paralysis/ paresis, Parkinsonism, Spasmodic dysphonia
Endocrinological	Adverse drug therapy Myxoedema Thyrotoxicosis

Laryngeal disease	Neoplasm: benign/malignant Laryngitis Fungal infection Autoimmune disease

Few vocal conditions which are very commonly seen are listed in detail below:

Vocal nodules: They are nodules that occur on vocal folds. They are non-malignant minute neoplasms seldom exceeding 1.5 mm in diameter. They are symmetrical, bilateral lesions usually occurring at the junction of the anterior and middle thirds of the vocal folds, the midpoint of the membranous vocal folds. Expected vocal profile is that they will have a breathy/rough voice, low pitch and reduced pitch range and voice deteriorates with use. Vocal nodules generally occur due to vocal overuse.

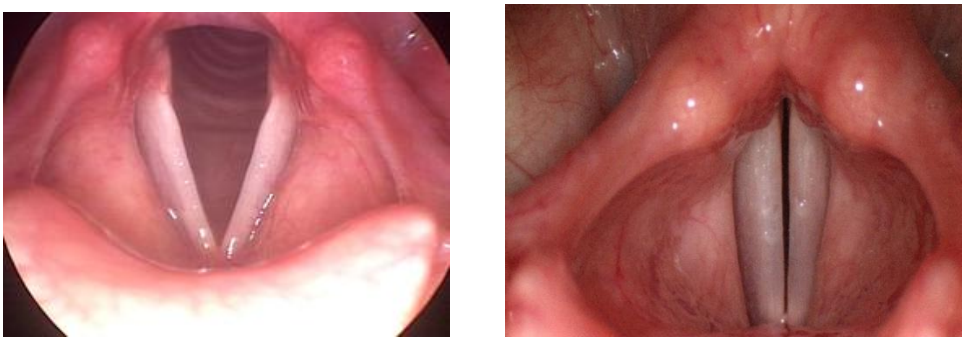

Figure 3: Normal healthy vocal folds in open and closed positions

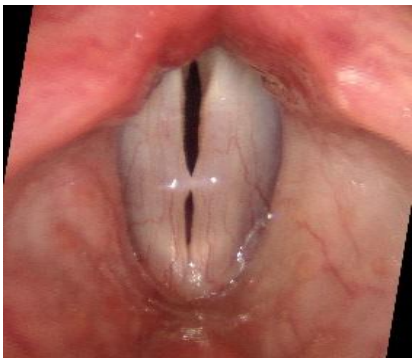

Figure 4: Vocal nodules

Vocal polyps: Vocal polyp is an abnormal growth of tissue projecting from the mucous membrane of the vocal folds. They are either pedunculated or sessile. A pedunculated polyp is attached through peduncle and has stalk. The typical site is 3mm behind the anterior portion on the free edge or the inferior surface of the vocal folds. A polyp is larger and more vascular, oedematous and inflammatory than a

nodule. They may also involve almost the entire length of the vocal folds. Expected vocal profile is that they will have a breathy/rough voice, low pitch and reduced pitch range and voice deteriorates with use. Vocal polyps generally occur due to sudden abuse of voice.

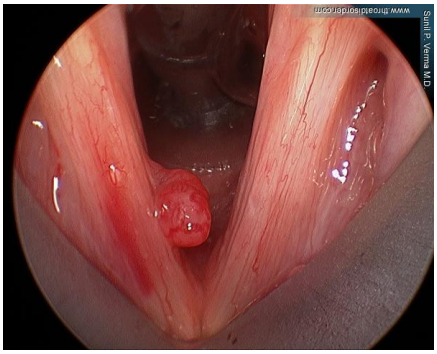

Figure 5: Vocal polyp

Laryngeal contact ulcers: Contact ulcers occur on the posterior part of the vocal folds which is like a discontinuity or break in the vocal fold membrane. They consist of crater-like forms with highly thickened squamous epithelium piled up over connective tissue, with some oedema. Contact ulcers are the result of an extreme form of vocal abuse typified by the speaker's excessively low speaking fundamental frequency, high levels of vocal squeak and effortful phonation. Their habitual pitch is low and pitch range is restricted to the lower part of the speaker's range and the voice is harsh, with high levels of vocal squeak and a rough vocal note.

Figure 6: Laryngeal contact ulcers

Vocal Fold Paralysis: Vocal fold paralysis is a condition where there is complete absence of movement in the affected vocal fold which can be the result of damage to the nerves which innervates the vocal folds. Types of paralysis can be:

- Unilateral paralysis: One vocal fold is affected.
- Bilateral paralysis: Both the vocal folds are affected.

Unilateral vocal fold paralysis will produce

1. Breathiness to whispered voice
2. Tremor on vowel prolongation
3. Reduced loudness and pitch
4. Pitch breaks

Bilateral vocal fold paralysis, the voice will be virtually *whispered* owing to the wider gap between the vocal folds during closure than is found in unilateral paralysis with markedly *reduced loudness*.

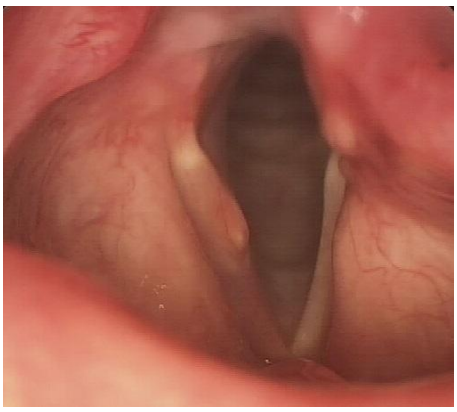

Figure 7: Right vocal fold paralysis (unilateral)

Impact of voice disorder on the quality of life

Dysphonia can affect communication and social life, and patients have reported psychological and emotional problems as a direct consequence of their voice disorders.

Problems that affect quality of life are:

- Problems with work or other daily activities as a result of physical health status.
- Trouble in speaking loudly.
- Run out of air and need to take frequent breaths while talking.
- Frustration, anxiousness or depression will be present.
- Trouble with using the telephone.
- Have to repeat themselves to be understood.
- Social life affected.

Need for assessment and treatment of voice problems

The primary objectives of the assessment of voice problems is to discover the etiological factors associated with the development of the voice disorder, describe the deviant vocal symptoms and to develop an understanding of how the disorder is affecting the subsystems of voice production, respiration, phonation and resonance. This will help to develop a tailor made vocal management plan according to the individual's voice problems. A systematic management approach helps in modifying or eliminating the etiological factors and to improve by rebalancing the subsystems of voice production.

The Team for assessment and treatment of voice problems

No one professional is able to offer a patient all the care that a person with voice problem requires. Hence, a team of professionals contribute their expertise to the assessment, evaluation and clinical management of individuals with voice disorders. Management of voice disorders require a team of professionals. Due to advancement of field and technology the professionals are able to offer complete care to individuals with voice disorders.

A client may be referred by a general physician, specialist, teachers, family members or self- referred. The core team comprises of **the otorhinolaryngologist, the speech language pathologist and the patient** and/or **parents/caregivers**.

An **otorhinolaryngologist** is a physician who specializes in the assessment and treatment of clients with ear, nose and throat disorders. Otorhinolaryngologist makes a medical diagnosis of the client's condition and prescribes appropriate medications, surgical procedures and/or voice therapy.

Speech-language pathologists (SLP) (sometimes called speech therapists) assess, diagnose, treat, and help to prevent speech, language, cognitive-communication, voice, fluency and swallowing disorders. The speech language pathologist assesses the client's voice using auditory- perceptual evaluation, acoustic and aerodynamic methods. The speech- language pathologist also provides behavioural voice therapy and keeps ongoing data regarding the individual's vocal progress, and assesses the client's voice at appropriate intervals. The client or client's

parents/caregivers contribute valuable input regarding the patient's progress, impact of treatment, lifestyle changes and socio cultural information.

In addition to the core team, a collateral team is also there to contribute additional professional expertise depending on the client's situation and problem. This team includes professionals like *audiologist, neurologist, teacher, endocrinologist, social worker, respiratory therapist, gastroenterologist, psychotherapist, physical therapist and occupational therapist.* This team will be always lead by an otorhinolaryngologist or speech language pathologist. This type of multidisciplinary team approach ensures that the person receives the best possible care for their voice problems.

Assessment of voice problems

It is common in medical practice to evaluate a group of signs and symptoms from the client to deduce a diagnosis. Once the diagnosis has been secured, treatment is planned appropriately. Voice disorders tend to be managed differently because they frequently have spectrum of causes. A fully successful voice treatment requires coordinated medical treatment, voice therapy, and psychological support that may be most efficiently offered by a multidisciplinary team.

Joint assessment is obviously time consuming and at first may not appear to be cost efficient. However, a well-orchestrated inter- disciplinary assessment provides for shared observations and may be the most efficient way to reach immediate consensus about treatment priorities and plans.

Voice production is a multisystem activity. The respiratory, phonatory, neurologic, cognitive and digestive systems also participate, yet no body part or system is totally dedicated to voice production. Voicing is a secondary function that involves integration and coordination of the movements of different structures. Voice production is a dynamic rather than static phenomenon. It is influenced by the overall health of the body, the mind, and the emotions. It is also influenced by the external environment, and it is perceived in different ways by different listeners.

- **Major signs and symptoms of voice problems**

Fundamental frequency/Pitch: Fundamental frequency (F0) is the instrumental measure of vocal fold vibrations and perceptual correlates of fundamental frequency is the pitch. Symptoms related to pitch are,

- **Monopitch**: This term refers to a voice that lacks normal variation of pitch during speech. Monopitch is one of the many characteristic signs of neurological impairment that may affect the voice. It may also simply be a reflection of an individual's personality or, more significantly, of psychiatric disability.
- **Inappropriate pitch**: This refers to the voice that is judged to exceed the range of acceptable pitch for age and/or gender, being either too low or too high. The inappropriate use of high pitch or Puberphonia is often reported by a male adolescent who uses inappropriately high pitch as the habitual voice rather than the more typical low pitch male voice.
- **Pitch breaks**: A patient may complain of periodic squeakiness and voice cracks. The voice seems out of control, and the patient reports never knowing what sound will come out. Therefore, it is labelled as pitch breaks. It occur as a result of a laryngeal pathological condition or due to some loss of neural control of phonation.
- **Reduced pitch range**: This is a condition where patients may complain about a reduction in pitch range, usually at the high end of the range, and an inability to produce these pitches without excessive strain or at all. This symptom is usually associated with singers who complain that they are experiencing difficulty producing notes that occur at the upper end of their singing range.

Loudness: It is the perceptual correlate of intensity. Symptoms related to loudness are,

- **Monoloudness**: This refers to voice that lack variation in loudness level. The use of increased loudness for emphasis is absent, and there may be an inability to voluntarily vary loudness.
- **Loudness variation**: When variations in loudness are extreme, either too soft or excessively loud. The inability to control vocal loudness also may be

attributable to the loss of neural control over phonatory mechanism or to problems affecting the respiratory mechanism.

- **Reduced loudness range**: Reduction in a patient's loudness range usually involves a loss of the ability to produce loud sounds. Many times, reduced phonational range and reduced loudness range occur in the same patient.

Quality:

- **Hoarse or rough voice**: Voice quality that is noticeably abnormal in its lack of clarity with roughness (harshness), its increased noisiness (breathiness) and its discordance is termed as hoarseness. This symptom reflects aperiodic vibration of the vocal folds. Pathological conditions that affect the vibratory behaviour of the vocal folds will usually result in some degree of perceived hoarseness/roughness.
- **Breathy voice**: This refers to the perception of audible air escape during phonation which leads to an audible noise. The voice lack clarity of tone and is usually reduced in loudness.
- **Tension**: Tension in the voice suggest the listener a hard edge to the voice, with observable muscular tension in the external neck.
- **Tremor**: Patients may complain that the voice is wobbly or shaky. They are unable to voluntarily produce a steady sustained sound at constant pitch and intensity. This sign may be described as regularly rhythmic variations in pitch and loudness of the voice that are not under voluntary control.
- **Strain/struggled voice**: These patients report of difficulty to talk or it is strain to talk. This may include inability to get voicing started or to maintain voice. They experience a great deal of tension while speaking and become fatigue due to the effort involved.
- **Sudden Interruption of voicing**: A sudden unexpected drop in loudness and an equally unexpected change in voice quality to breathy voice is a very noticeable perceptual sign.
- **Diplophonia**: This word literally means "double voice". It is said to be present when two distinct pitches are perceived simultaneously during phonation or speech.

Other behaviours:

- **Stridor**: the term stridor refers to noisy breathing, involuntary sound that accompanies inspiration, expiration or both and it is indicative of a narrowing of the airway at a certain point.
- **Excessive throat clearing**: A frequent accompaniment to a variety of voice disorders, excessive throat clearing probably represents an attempt by the patient to clear excess mucus on the vocal folds, or it amay be response to the sensation of something in the throat. It is a natural behaviour but is considered a perceptual sign of disordered voice when it occurs frequently and consistently.
- **Vocal Fatigue**: Patient complain of feeling tired after prolonged talking and often state that continued talking requires a great deal of effort. Moreover they may report occasional roughness, which tends to be more apparent at the end of the working day or with prolonged voice use.
- **Pain and other physical sensations**: Pain described in voice production varies considerably across patients and across locations. Some report pain on both sides of the neck lateral to the larynx, others localize the pain to a specific unilateral area or to mid-larynx, and occasionally pain radiating into the upper chest. Other physical sensations reported by patients include itching sensation in the throat, irritation in the throat, feelings of a lump in the throat, feelings of strain or tension or the sensation of dryness and frequent cough.
- **Aphonia:** Aphonia means absence of voice. The patient speaks only in a whisper and may sometimes complain of a variety of symptoms, including dryness in the throat, soreness, and a great deal of effort in the attempting to speak. Aphonia can be consistent or episodic.

  Consistent: This is the absence of voicing, usually perceived as whispering, that is constantly present.

  Episodic: It may take a number of forms. A patient may exhibit unpredictable, involuntary aphonic breaks in voice production that last for only a fraction of a second.

Table 4: Summary of signs and symptoms

Summary of Signs and symptoms	
Pitch Monopitch Inappropriate pitch Pitch breaks Reduced pitch range **Loudness** Monoloudness Loudness variation Reduced loudness range **Quality** Hoarse voice Breathy voice Tension Tremor Strain/struggle voice Sudden Interruption of voicing Diplophonia	**Other behaviours** Stridor Excessive throat clearing Vocal Fatigue Pain and other physical sensations **Aphonia** Consistent Episodic

The first encounter of assessment is collecting history about the voice disorder. The case history is taken to elicit information about physical, emotional, and behavioural factors in an open-ended way. The major patient factors that may contribute to the assessment of voice disorder are considered such as (1) Level of vocal skill, (2) lifestyle, (3) Psychological status and (4) Gastro Esophageal reflux.

Because the voice is a multidimensional entity, it is important that the case history be broadly based in order to elicit information regarding all aspects of individual's life that may affect vocal function. Quality of life assessment also will be done using different checklists available.

Physical examination of a person with voice complaints involves a complete ear, nose, and throat assessment and examination of other body systems, as appropriate which will be done by an otolaryngologist. Subjective examination has been supplemented by technological aids that improve the ability to "see" the vocal mechanism, and allow quantification of most aspects of its function. Otolaryngologists' uses different instruments such as stroboscopy, laryngoscopy, endoscopy etc. for visualizing the vocal folds. These technologies allow detection of small masses, vibratory asymmetries, dynamic segments due to scar or early cancer, and other abnormalities.

Further assessment of voice disorders by a speech language pathologist would include perceptual, acoustic and aerodynamic evaluation depending on the availability of the facility.

Perceptual evaluation is often considered as the gold standard that provides a real life basis of comparison between the patient's voice and a reference group of normal voices. Perceived voice quality by self and others is the means by which an individual's vocal and communicative effectiveness is judged. Thus the patient's perception of the initial severity of the disorder forms an important basis for decisions regarding the success of treatment and patient satisfaction. During the perceptual evaluation the clinician asks the patient to perform various vocal activities designed to assess aspects of vocal production such as respiratory- phonatory efficiency, vocal endurance, reflexive laryngeal function and presence of musculoskeletal tension. In addition to these vocal activities the patient's voice is rated on some perceptual voice rating scales.

Acoustic analysis of patient's vocal output is recorded and assessed for vocal function. From the acoustic analysis, inferences can be made about vocal fold vibration. Many computerized acoustic devices are available commercially, including the Visi-Pitch and Computerised Speech Lab by Kaypentax, Dr. Speech by Tiger Electronics etc. These programs perform similar types of analyses including variables related to fundamental frequency (F0), intensity, periodicity and noise component in speech.

Aerodynamic assessment is capable of producing a variety of measures related to airflow, air pressure, and lung volume. Evaluation of respiration involves assessment of the patient's abilities to control the respiratory mechanism for speaking as well as for vegetative purposes. Aerodynamic measuring instruments range from simple sensing devices to elaborate combinations of pressure transducers and airflow meters which include Manometer, Anemometer, Aerometer, Pnemotachograph, Plethysmograph, Spirometer etc.

Management of voice problems

Interventions programs are specifically designed to help particular voice disorders and diseases. They can take the form of behavioural, surgical and medical

therapies. Even for voice disorders there are different approaches like behavioural, medical and surgical based on the symptomatology. Behavioural approach includes voice therapy. Medical approaches include treatment using different drugs and surgical intervention includes phonosurgery.

Voice therapy is provided by a licensed speech language pathologist, for patients determined to be candidates for voice remediation that was established by the results of the comprehensive diagnostic evaluation completed by a voice care team. A general goal of voice therapy is to restore the best voice possible, one that will be functional for purposes of employment opportunities, social interactions and activities of daily living.

Principles of Voice Therapy:

- **Hygienic Voice Therapy**- Focuses on identifying inappropriate vocal hygiene behaviors which are modified or eliminated.
- **Symptomatic Voice Therapy**- Focuses on modification of the deviant vocal symptoms identified by the speech language pathologistsuch as breathiness, low pitch, glottal attack and so on.
- **Psychogenic Voice Therapy**- Focuses on emotional and psychosocial status of the patient that led to and maintains the voice disorders.
- **Physiologic Voice therapy**- Focuses on modifying and improving the balance of laryngeal muscles effort to the supportive airflow, as well as the correct focus of the laryngeal tone.
- **Eclectic Approach of Voice Therapy**- It is the combination of any and all of the previous voice therapy orientation.

Phonosugery

The concept of phonosugery was developed to preserve and enhance the mucosal wave which will be carried out by otolaryngologists. In cases of mass lesions of vocal folds, where mucosal or sub mucosal disease is reactive phonosurgery is suggested. In phonosurgery abnormal looking tissue may be preserved to minimize scarring and preserve the layered ultrastructure of the vocal fold as much as possible.

Preventive tips for voice problems

Voice problems are caused frequently by vocal overuse or misuse. Some vocal habits like prolonged talking, loud talking, screaming, shouting, excessive singing etc. are vocal overuse. Mimicry, using false voice etc. are examples of vocal misuse. Along with the changes in the life style, stress and strain contributes much for one's voice problem.

For the preservation of healthy voice there are a set of practices that emphasizes the importance of voice care with respect to suitable voice behaviours, lifestyle and diets. These preventive tips will help to conserve and maintain good voice.

They are,

- Avoid certain food items that are harmful for voice in a long run like, coco, dairy products, spicy foods and beverages.
- Drink minimum 6-8 glasses of water per day.
- Include citrus juice and herbal tea instead of other beverages.
- Avoid alcohol intake and smoking.
- Avoid throat clearing and whispering.
- Avoid screaming, shouting and yelling.
- Avoid talking in noisy environment
- Get adequate amount of sleep.

All India Institute of Speech and Hearing (AIISH), Mysore

All India Institute of Speech and Hearing is a premier institute in the country situated in Mysore. It caters to clients of all ages having a whole range of communication disorders including voice disorders. A team of professionals are involved in the assessment and management of voice disorders at AIISH. The trans-disciplinary team comprises of Otolaryngologist, Speech and language pathologist, Phonosurgeon, Psychologist and social worker. AIISH has dedicated units such as **Voice Clinic** for the assessment of voice and its disorders and **Unit for Professional Voice Care (PVC)** which caters the vocal needs of professional voice users like teachers, singers, actors etc. AIISH also plays a significant role in the management of voice disorders wherein according to the assessment results recommendations for

medical or non-medical interventions is made or voice therapy recommendations are made and provided.

Conclusion

This manual, gives brief explanations for voice and its disorders along with the preventive, assessment and management options. This manual designed to increase the number of referrals of voice disorders from PHC doctors to speech language pathologists and otolaryngologists, further it may lead to a better management of voice disorders at a grass root level in India.

Appendix: Other Speech and Hearing clinics / Institute in Karnataka

I. Mysore

- ✓ Better life speech and hearing clinic, Ms. Shwetha& Mr. Madhu. #37, K Block, KHB colony, Adichunchanagiri road, Kuvempunagar, Mysore, Ph No.0821 4194782
- ✓ Chatter Box, A speech-language therapy and hearing center, Mr. JayaprakashEraiah, #57, "Jaya", B Block, III stage, Vijayangar, Mysore 570017, Ph No. 0821 2415858
- ✓ JSS Institute of speech and hearing, Ooty Road, Mysore-570025, Ph No. 0821 2548229
- ✓ Vaibhav Speech and hearing center, 1432/9, 1st floor, Tribhuvan towers, Dewan's Road. Mysore-570001, Ph No. 0821 2437373

II. Bangalore

- ✓ Ashwini speech and hearing clinic, 322/A, 5th main, 2nd Block, Near Patel's Inn Club, RT nagar, Bangalore-32, Ph No. 91-80-32423466
- ✓ Basavangudi ENT care centre, 44/1, H. B. Samaja road, Basavanagudi, Bangalore, Ph No. 91-80-26604569
- ✓ BharathiRexton speech & hearing centre, 66, Coles road, Frazer town, Bangalore, Ph No. 91-80- 25561429
- ✓ Centre for Speech and Language therapy, Ms. Somy Roby, #7, E1 Honnora, Agape street, HoramavuAgara, Bangalore, Ph No. 9740140826
- ✓ Dr. Premalatha B. S. Speech and Hearing centre, No. 690, 11th main, 36th cross, 2nd block, Rajajingar, Bangalore, Ph No. 9845276134

- ✓ Dr. Chandrasekar Institute of Speech and Hearing, Lingarajapuram, Hennur Road, Bangalore, Ph No. 080 25460405
- ✓ Fortis, #65,1st main road, Sheshadripuram, Bangalore, Ph No. 080 67947301
- ✓ Harmony Speech and hearing clinic, No. 65/1, Krikkondrahalli, Next to South Indian Bank, Sarjapur road, Bangalore, Ph No. 080 66389680
- ✓ Karnataka institute of speech and hearing, behind mini balabhavan, JeevanBhima Nagar, Bangalore, Ph No. 080 25266555
- ✓ Naseema Institute of speech and hearing, No. 11, 4th block, AVS compound, 4th floor, 80 feet road, Ejipura main road, Kormangala, Bangalore, Ph No. 080 41507099
- ✓ Naseemahearing and speech centre, No. 11, ABF compound, 4th block, Kormangala, Bangalore, Ph No. 080 41517522
- ✓ Samvaad Institute of Speech and hearing, No. 18, 1st cross, 5th main Anandgiriextn, Hebbal, Bangalore, Ph No. 080 65351150
- ✓ Sanjay speech and hearing centre, Cloud nine, 1533, 9th main, 3rd block, Jayanagar, Bangalore, Ph No. 09900295717
- ✓ Sonia &Prateek's ENT cure and care, No. 494, 1st cross, F block, Shankar Nagar, Bangalore, Ph No. 09742201211
- ✓ Speech and Hearing centre, 44/1, H Siddaiah road, Wilson's Garden, Bangalore, Ph No. 080 22247266

III. Mandya

- ✓ Mandya Institute of Medical Sciencs (MIMS), SH17, Tamilians Colony, Nehru Nagar, Mandya- 571401, Ph No.082322 22086

IV. Mangalore

- ✓ Dr. M.V.Shetty College of Speech and Hearing, Maladi Court, Panjimogaru, Mangalore-575013, Ph No. 082 42427897
- ✓ Father Muller College of Speech and Hearing, Unit Of Father Muller Charitable Institutions, Father Muller Road, Kankanady, Mangalore - 575 002, Ph No. 0824-2238328
- ✓ School of Allied Health Sciences, Manipal University, manipal.edu, Madhav Nagar, Manipal-576 104, Ph No. 91 820 2922953
- ✓ Kasturba medical College, Light house hill road, Hampankatta, Mangaluru-575001, Ph No. 0824 2422271

- ✓ The Nitte Institute of Speech and Hearing, Medical Sciences Complex,Deralakatte,Mangalore – 575 018, Ph No. 91 -824 -2204069

V. Other Internship Centres from AIISH

- ✓ District Hospital, Athani Road, Bijapur-586101
- ✓ Malle Gowda District Hospital, Chikmanglur-577177
- ✓ Karnataka Institute of Medical Sciences, P B Road, Vidyanagar, Hubli
- ✓ District Hospital, PB Road, Haveri– 581110
- ✓ District Hospital, BH Road, Tumkur- 572102

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Appendix-2

Name: ..... Designation: .....

Pre/Post test

1. Which is the organ responsible for voice production?
   a. Mouth b. larynx c. lungs
2. What is the smallest meaningful unit of sound?
   a. Letter b. phoneme c. voice
3. What is the main source of vibration of vocal folds?
   a. Blood pressure b. Elasticity of muscles c. air
4. Which are the three subsystems of voice mechanism?
   a. Digestive, respiratory, phonatory
   b. Respiratory, phonatory, resonatory
   c. Phonatory, resonatory, circulatory
5. A normal voice quality should be ----------
   a. Pleasant b. irritable c. breathy
6. From which age voice development begins?
   a. At 1yr b. at birth c. at 2yrs
7. How will be the vocal pitch for an adult male and female respectively?
   a. High, mid b. high, low c. low, high
8. 50% of voice disorders are caused by ----------
   a. Allergies b. Smoking c. vocal abuse & misuse
9. Which voice disorder among these comes under a neurogenic etiology?
   a. Contact ulcers b. Spasmodic dysphonia c. Sulcus vocalis
10. Among these which can be a cause for a vocal pathology?

a. Partial glossectomy b. cardiac anomaly c. Gastro Esophageal reflux

11. What vocal profile can be expected for a condition of vocal nodules?

    a. Breathy voice b. squeaky voice c. harsh voice

12. What is an abnormal growth of tissue projecting from the mucous membrane of the vocal folds?

    a. oedema b. vocal polyp c. contact ulcers

13. A voice quality which lacks normal variation of pitch during speech :

    a. Hoarse voice b. Monopitch c. Innappropriate pitch

14. Voice quality that lacks clarity, has increased noisiness (breathiness) and lacks its harmony is termed as ----------

    a. Harshness

    b. Hoarseness

    c. Roughness

15. In which condition does the patient complain about a wobbly or shaky voice?

    a. Tension

    b. Tremor

    c. Strangled voice

16. Complete absence of voice is termed as ----------

    a. Dysphonia

    b. Aphonia

    c. Pitch break

17. ---------- is an open ended way of obtaining information on physical, emotional, and behavioural factors.

    a. questionnaire

    b. case history

c. perceptual evaluation

18. The perceptual, acoustic and aerodynamic evaluation of voice is carried out by_____

    a. SLP

    b. pulmonologist

    c. Physician

19. Which among the three types of voice evaluation is considered as the gold standard?

    a. Perceptual analysis

    b. Acoustic analysis

    c. Aerodynamic analysis

20. Which structure contributes to the extraordinary versatility of the human voice?

    a. Epithelial layer

    b. Mucosal layer

    c. Intermediate layer

21. Physiologic Voice therapy focus on

    a. Modifying inappropriate vocal behaviors

    b. Modifying and improving the balance of laryngeal muscles effort

    c. Modification of the deviant vocal symptoms

22. Which of the following is vocal misuse behaviour?

    a. Mimicry

    b. Loud talking

    c. Screaming

23. Which of the following dietary modification will help in prevention and maintenance of good voice?
    a. Including coco in diet
    b. Including dairy products in diet
    c. Including citrus juice and herbal tea in diet
24. Which of the following lifestyle modification will help in prevention and maintenance of good voice?
    a. Avoid talking in noisy environment
    b. Avoid using amplification device
    c. Using whispering voice to speak
25. Which profession does not come under professional voice users?
    a. Teacher
    b. Engineer
    c. Singer

Signature