

TITLE

A STUDY OF ETIOLOGY AND DEMOGRAPHIC
CHARACTERISTICS OF CHRONIC HOARSENESS OF
VOICE AT THE KENYATTA NATIONAL HOSPITAL
NAIROBI, KENYA.

A THESIS SUBMITTED IN PART FULFILLMENT FOR
THE DEGREE OF MASTER OF MEDICINE IN EAR,
NOSE AND THROAT-HEAD AND NECK SURGERY
(ENT/HNS) AT HE UNIVERSITY OF NAIROBI.

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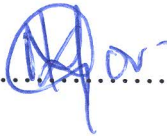
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DECLARATION

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DEDICATION

This work is dedicated to my dear parents, Mr. and Mrs. Elkana K. Kipingor, My wife Anne and son kigen, Mr. and Mrs. Ratemo, Billy and Babra for their inspiration and encouragement.

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Abbreviations

KNH	:	Kenyatta National Hospital
EUA	:	Examination Under Anesthesia
DL	:	Direct Laryngoscopy
ML	:	Micro Laryngoscopy
VC	:	Vocal Cord
FVD	:	Functional Voice Disorder
CNS	:	Central Nervous System
HOV	:	Hoarseness of Voice
GERD	:	Gastro Esophageal Reflex Disease
ENT/HNS	:	Ear Nose and Throat / Head Neck Surgery
GA	:	General Anesthesia
URTI	:	Upper Respiratory Tract infection
LA	:	Local Anesthesia
LPR	:	Laryngo-pharyngeal Reflux Disease

SUMMARY

This was a prospective study on the Etiology of Chronic Hoarseness of Voice (HOV) and demographic characteristics of patients attending Kenyatta National Hospital (KNH) Ear, Nose and Throat, Head and Neck Surgical Department (ENT/HNS) and Ward. 126 patients inducted in the study had chronic Hoarseness of voice for two or more weeks.

The patients age ranged from 2.16-80yrs (mean of 38.15yrs).The male to female ratio was 1.2:1. The commonest causes of Chronic Hoarseness of voice were due to inflammations or infectious origin predisposing to chronic Laryngitis(56.3%).Among this group were Vocal or singers nodules(15.1%),Laryngitis due to GERD/LPR(14.3%),Chronic simple Laryngitis(9.5%) and TB Laryngitis(7.1%). Neoplasm (malignant) constituted 25.4% of the total patients while FVD was found to be 12.7%.The Duration of Hoarseness ranged from 2weeks to 52yrs (mean-29.73 months).One patient presented with HOV secondary to a large congenital web after 52 years. The mean without this patient was 24.5 months. 69.8% of patient's with Chronic Hoarseness of voice were referrals. Apart from the change of voice other common associated symptoms were throat pains, Odynophonia and cough.

INTRODUCTION

Hoarseness of voice (HOV) is a dysphonia which is perceived as a deviant voice quality or timbre with two main components namely breathiness and roughness or harshness. (1:5). It is the commonest voice complaint seen patients presenting at Kenyatta National Hospital ENT/HNS Department. Dysphonia is the most consistent symptom of laryngeal cancer and other benign conditions of the larynx (35), hence early detection is of paramount importance.

In this study, patients who had HOV for two weeks and above were inducted and 25.4% were due to cancer of the larynx. The average duration the patients took before undergoing any medical examination or treatment was 29.7 months. This could worsen the already high malignancy rate as compared to a study by Moore et...al (35) where 17% of patients with dysphonia had suspicious malignant lesions.

1. REVIEW OF LITERATURE

Historical Background

According to Negus (1945) the human voice or its pathology has been around since the creation of man or since the evolution of the voice box, from the primitive lung fish where it served as a protection to the air sacs from water.

Research or studies into voice production was first recorded by Leonardo da Vinci (1452-1519) where he dissected laryngeal preparations from human cadavers. His note books were studied by Panconcelli-Calzia (1943) where he wrote “.... A means to ascertain how the voice is at the exit of the windpipe. One removes the windpipe and lungs of a man. If the lungs filled with air are rapidly compressed, one can immediately recognize how the pipe named the trachea produces the voice”(2).

Manual Garcia (1845), A music teacher first observed the movement of the vocal cords in his students using a dental mirror and the sun as the light source, giving rise to the first indirect laryngoscope. Approximately 100 years later Farnsworth (1940) was able to study the dynamics of vocal fold in slow motion by analyzing high speed cinematographic films produced in the Bell telephone laboratory.

Hirano (1974 – 1975) did studies using light and electron microscopy, which showed the human vocal fold to be a complex structure, which is multilayered consisting of an epithelium, three

layers of connective tissue and vocalis portion of thyroarytenoid muscle. Each layer had distinct structural and mechanical properties that are essential to the functional integrity of the vocal folds as a vibrator. (2, 6, 7, 12).

The voice is as a result of the vibratory nature of the vocal cord. The resonating chambers of the larynx mould it into an intelligible speech.

Hoarseness of voice is defined as a coarse, scratchy sound caused by abnormalities of the vibratory margins of the vocal fold. It is perceived as a deviant quality with breathiness and roughness or harshness. Chronic HOV means a persistent hoarse voice for a period of more than two weeks. It is not a syndrome or a disease process but a symptom, which in some instances does not relate to the gravity of the underlying pathology but it could be the only symptom of early vocal cord carcinoma.

Anatomy and Physiology of the Larynx or voice box (voice production):-

The larynx or "Voice Box" is an organ of phonation according to Negus at ...al(1949), the "voice box" earlier evolved in primitive lung fish as a few splinter muscle fibers to protect the air sac from water. Later in the evolutionary scheme, the Larynx began to function for the purpose of phonation.

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Position and Extent

Anatomically, the Larynx extends from the root of the tongue to the trachea. It projects ventrally between the great vessels of the neck and is covered anteriorly by the skin, the fascia and the depressor muscles of the hyoid bone. Above, it opens into the laryngeal part of the pharynx, of which it forms the anterior wall. Below, it continues with the trachea.

Site

In adult males it is situated opposite the 3rd, 4th, 5th and 6th cervical vertebrae but it occupies a higher position in children and in adult females. In infants of between six and twelve months the tip of the epiglottis is a little above the level of the cartilaginous disc between the dens and the body of the axis. (1, 2, 12, 30, 31)

Average measurements in Adults (Europeans) are:-

	Male	Female
Length	44mm	36mm
Transverse diameter	43mm	41mm
Anterior posterior diameter	36mm	26mm

The growth of the Larynx in size before puberty is almost the same in both males and females, but after puberty the growth of the female Larynx is negligible. For males significant change in size is noted with all cartilages enlarging and the thyroid cartilage projecting in the anterior median line of the neck, while the anterior – posterior diameter is nearly doubled. The skeletal-cartilaginous framework of the larynx consists mainly of several basic anatomical components: the laryngeal cartilages, the intrinsic and extrinsic muscles, and the mucosal lining. (1, 2, 31)

The cartilages are connected by joints, ligaments, membranes and moved by the intrinsic as well as extrinsic muscles. The mucosal lining of Larynx is ciliated columnar epithelium except on the lingual surface and upper half of the laryngeal surface of the epiglottis, the upper parts of aryepiglottic folds and vocal folds which are lined by stratified squamous epithelium. (1, 2, 31)

Blood Supply

Blood supply of the larynx is mainly received from the superior and inferior Laryngeal arteries, which are branches of the superior and inferior thyroid arteries respectively.

The superior laryngeal artery enters the larynx through the thyro-hyoid membrane, while the inferior thyroid comes along the recurrent laryngeal nerve and enters the larynx at the junction of cricopharyngeus and esophageal muscle fibers. The laryngeal arteries anastomose freely.

The venous drainage goes via the superior laryngeal vein into the superior thyroid vein and into the internal jugular vein. The inferior laryngeal vein goes via the inferior thyroid vein and into the thyrocervical trunk of the subclavian vein. (1, 2)

Lymphatics

Lymphatics from the part above the vocal folds drain along the superior thyroid vessels to the antero-superior group of deep cervical nodes.

Those from the part below the vocal folds drain into the postero-inferior group of deep cervical nodes. A few of them drain into the pre-laryngeal nodes. (1, 31)

Nerve supply of larynx

All innervations of the larynx are carried via the vagus nerve inferior to the jugular foramen. As the vagus passes through the neck it gives off the superior and recurrent laryngeal nerves. Both of these branches contain motor and sensory fibers of the larynx.

The superior laryngeal nerve divides into the external and internal laryngeal nerves. The external branch is motor and innervates the cricothyroid muscle and the inferior constrictor muscle of the pharynx. The internal branch is a sensory to the folds and the mucosa above it.

The recurrent laryngeal nerves are motor to all intrinsic muscles and sensory to the mucosa below the vocal cords. (31)

THE PHYSIOLOGY OF VOICE PRODUCTION

The phonatory system can be divided into four parts: -

- i. The voice activating air stream (the respiratory system).
 - ii. The voice generator (the larynx with the vocal folds), which cause air to vibrate and produce tone.
 - iii. The voice resonator (the pharyngeal and oral cavity).
 - iv. The co-ordination and controlling function (the central and peripheral nervous system)
- (1,2,3)

I THE VOICE ACTIVATING AIR-STREAM:

During phonation there is a difference in pressure above and below the glottis. This pressure difference provides the energy that overcomes the resistance of the adducted cords and causes them to vibrate.

The weak closure of the glottis due to different pathologies causes a high flow of air and sometimes audible as a breathy voice (Hoarse) with a rush of air.

The strong glottic closure causes either a high subglottic pressure, or a low flow of air, or both. This is audible as a hyperkinetic or croaking voice. (1, 3,)

II THE VOICE GENERATOR OR THE VIBRATING GLOTTIS:

The expiratory air-stream brings the vocal folds into vibration, resulting in different intensities, tonal qualities and pitch of the human voice. (1, 2, 3, 12)

This is caused about by:-

- The movements of cricothyroid articulations, which stretch or shorten the vocal ligaments.
- The movements of the arytenoid cartilages, which are in the centre of intrinsic muscles, cause them to rotate and glide over the articulatory surface of the cricoid cartilage.
- Conus elasticus or crico-vocal membrane which is a tendinous membrane that covers the inner surface of the intrinsic musculature of the vocal folds. It inserts on inner side of the cricoid and ends on the free margin of the vocal ligament.

The co-ordinated activity of the intrinsic laryngeal muscles causes the vocal folds to have a certain firmness, length and degree of closure (firmly or loosely adducted folds) during phonation.

When close together the vocal folds narrow the airway and the site is called the glottis. The folds act like a flutter valve, which are alternately pushed apart by air pressure and sucked together by air-stream. The vibrating cycle (consisting of an open and closed phase) repeats itself in rapid succession of 80 – 800 cycles or more per second.

The closing phase is caused in part by the 'Bernoulli effect' which states that "when the air speed in the narrowing between the glottis is at its highest the pressure exerted on the walls of the glottis is minimal giving rise to abrupt closing".

This causes a shock wave, which excites the resonating cavity in rapid succession. The more abrupt or steep the sound wave the more harmonic the overtones are generated (1, 2, 5)

According to recent research on the structure and mechanics of vocal folds as reported by Kahane et al., reveals the cords to be more complex than previously thought. It is noted that the

structure suits them well for transducing aerodynamic forces and maintaining highly specific physical conditions during sound production. (5, 6, 7,)

Any small alteration in the structure or visco-elastic properties of the vocal folds appears to introduce significant disequilibrium in the system and results in dysphonia or hoarseness.

HISTOLOGY OF THE VOCAL CORD

Hirano et al., (1974-1975) studied in detail light and electronic microscopy of the human vocal folds and showed that the cords are multilayered consisting of five layers namely the epithelium, the three connective tissue layers (lamina propria) and the vocalis portion of the thyroarytenoid muscle.

He noted that each layer has a distinct structure and mechanical properties that are essential to the function and integrity of the vocal folds as a vibrator. (1, 2, 5, 6, 7)

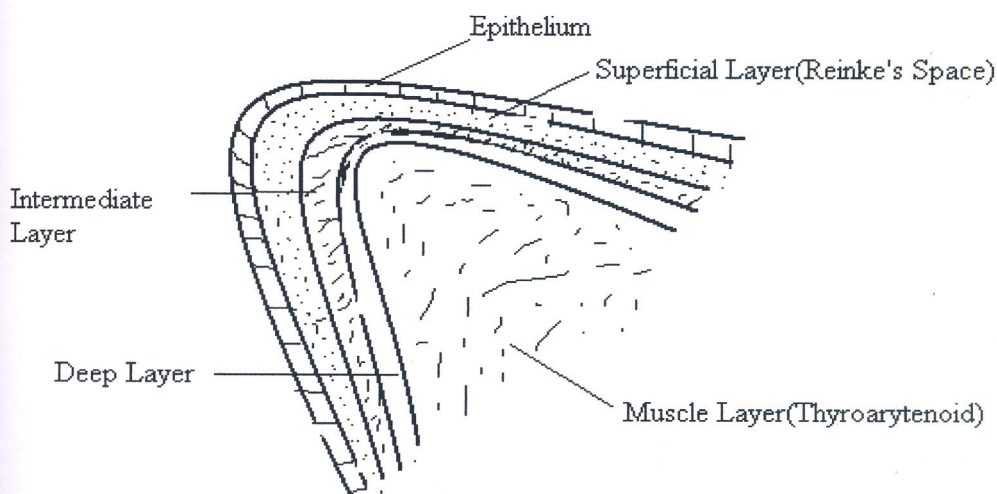


Fig.1. A schematic drawing of the layered microstructure of the vocal cord.

1) The Epithelial Layer:

It forms the outermost layer of the mucosa and the sub epithelial connective tissue of the lamina propria. There are two types of epithelium that cover the vocal folds namely: -

- a) The superior and Inferior parts of vocal fold, which are covered by respiratory epithelium (pseudo- stratified ciliated columnar with goblet cells).
- b) The vibrating edge which is covered with non-keratinizing stratified squamous epithelium that is separated from the respiratory epithelium by a small zone of transitional columnar epithelium.

The epithelium is anchored to underlying connective tissue via a thin basement membrane.

2) Sub epithelial connective tissue (Lamina Propria): -

It is situated beneath the epithelium and superficial to the muscle layer lie three layers of connective tissue called the lamina propria. According to Hirano et...al (1981) the three layers are distinguishable from one another based on the distribution of the fibrous components i.e. elastic and cartilaginous fibers. He named them the superficial, intermediate and deep layers respectively (1, 2, 3, 6, 7, 27.)

The superficial layer is situated below the epithelium and corresponds to Reinke's space.

It contains loosely interwoven elastic and collagenous fibers.

The intermediate layer comprises mainly of the elastic fibers and together with the deep layer form the vocalis ligament.

The deep layer largely contains collagen fibers packed in bundles and organized in

Parallel form to the vocal muscle.

BLOOD SUPPLY:-

A study by Mihashi et... al, (1981) on blood supply of the vocal cords using softex contact micro angiography, found regional differences in distribution of blood vessels. Blood vessels in the free (vibrating) edge entered the vocal fold from either the anterior or posterior end and ran perpendicular to the longitudinal axis. Blood vessels in lamina propria ran perpendicular to those in the mucosal surface. They also exhibit branching and form a rich arterial and venous networks. Blood vessels to vocalis the muscle fibers enter from the deep surface of the muscle, passing longitudinally and exhibit great arborization.

Mihashi also noted a distinct vascular pattern in the mid-portion of the membranous vocal fold, this is the area with the greatest movement during vibration. Blood vessels were found to be sparsely distributed, with numerous branching and many arterio-venous anastomoses. This arrangement helps reduce resistance to vibratory activity as well as providing supply to dissipate heat generated during vocal fold vibration. (3)

Biomechanical properties of vocal cord:-

On mechanical basis (i.e. stiffness) the five layers of the vocal folds are categorized into:-

- a) Cover - epithelium and superficial layer of the lamina propria.
- b) Transition – intermediate and deep layer of the lamina propria.
- c) Body - vocalis muscle fibers.

The vocal cords move together and apart in a wave form from bottom to top with a frequency of 80 to 1000 times per second. The cover is less stiff, the transition layer is intermediate, and the body is the stiffest. The ratio of stiffness from cover to body is 1:8:10 respectively. The cover is the most mobile than other portions of the vocal fold. This factor is very important because it

covers the glottal cavity and therefore readily influences the properties of the trans-glottic airflow. (1, 2, 3, 6, 7)

III THE VOICE RESONATORS

These are the pharyngeal cavities especially the oropharynx. These are the laryngeal entry points immediately above the glottis. The middle part has the velo-pharyngeal valve and the outermost part is between the lips.

It is also noted that firm walls transmit sound without loss of high frequency components where as soft walls absorb parts of the sound energy spectrum i.e. the soft palate or velar valve is a soft spot that can be varied at will. (1, 5)

IV INTEGRATING AND CONTROLLING BY THE CENTRAL NERVOUS SYSTEM (CNS): -

Oral communication like song and speech involves not only the intrinsic musculature of the larynx but the soft palate, the tongue, the mouth, the muscles of neck, the diaphragm, the trunk and the pelvis (for breath support), all these take part in expressive phonation. This requires the control of CNS. Information from stretch muscles, ligament position of joints (static signals) or during movement (dynamic signals) and afferent signals from the mucosal surface of the respiratory tract are integrated in the CNS. It sends out signals for the necessary adjustments of muscular tone. It is noted that emotional tension affects breathing and phonation in patients causing habitual or psychogenic dysphonia and hoarseness.

In diagnosis and treatment of a patient with hoarseness or voice disorder, it is important to understand the role of emotion or stress on muscle tone, respiration and voice control. (4, 12, 25, 27)

EPIDEMIOLOGY;

Voice disorders in general affect millions of people throughout the world and is often associated with significant morbidity. In USA alone, 7.5 million persons every year suffer from voice related disorders and have been targeted as a national priority for investigation. In the united Kingdom (U.K.), over 50,000 patients are referred by general practitioners alone to otolaryngologist with chronic hoarseness of voice as reported by Garding et...al. (2000) (10). In Kenya and rest of Africa no data is available. Epidemiological data relating to incidence and distribution in the population of voice disorders and especially hoarseness of voice are not documented. Prevalence according to various studies done, show variants i.e. in children prevalence of 6% is reported by Leske (1981) and Merge (1985). Another study by Sederhohn (1996) in "Hoarseness in 10year old children" she found a prevalence of 6%, which increased to 21% in densely populated areas. In the same study boys were more affected than girls. (5, 28) In adolescence and adults in the same study by Merge (1985) he found a variance in a certain age groups i.e. between the ages of 14-44 years a prevalence of 1% was noted but this increased to 6.5% in persons of 44-70 years. He also concluded that these values are low because mild cases go unnoticed. Other publications give a range of 3-6% prevalence in children and 3-9% in adults. (5, 28, 33)

Age: The age group of 14 – 44 years was noted to have a lower prevalence than an older age group. (5)

Sex: No apparent sexual predilection but in children, the boys are said to be more affected than girls. In a study by Baitha (1999) showed a male to female ratio of 2:1. (28, 35)

Race: No studies showing any particular racial predilection.

Etiology of Hoarseness of Voice:-

The etiological factors that result in hoarseness of voice are quite diverse and range from a simple upper respiratory tract infection to serious life threatening pathologies such as malignancy. In general voice disorders are grouped in two main groupings: Organic and Functional.

Organic Voice Disorders.

These results from a lesion or lesions that interfere with the normal anatomic structure of the larynx thus causing abnormal voice production or hoarseness of voice i.e. inflammations, trauma, and vocal nodules.

Functional Voice disorders.

It refers to abnormal voice production though with intact vocal apparatus i.e. the degree of pathology if any, is inappropriately small compared to the severity of the voice problem e.g. Post viral habitual hoarseness, conversion aphonia. (4, 5, 25, 27). A study done at the centre for voice disorders (Wake Forest University) 1989, on 100 consecutive patients with dysphonia 60% were found to be due to organic lesions and 40% functional. (5)

In another study, Brodnitz et ... al 1971 studied 2286 cases of all forms of voice disorders and found 80% to be due to voice abuse or by psychogenic factors and 20% to be due to organic disorders. Among the women with organic lesions 15% of them had identifiable endocrine causes. He acknowledged a higher incidence of organic lesions than 20%. (3, 25)

Examples of each disorder are as follows:-

I. Organic Lesions

This can be categorized into two groups: -

a. Primary Organic Lesions: -

- Congenital web
- Neuron motor disorders of peripheral or central origin.
- Trauma e.g. surgical or peripheral
- Cysts
- Polyps
- Infections e.g.
 - Common colds
 - Tracheo-bronchitis
 - Systemic disease
- Tumors
- Endocrine disorders e.g. myxoedema
- Congenital weakness i.e. sulcus glottidis

b. Secondary Organic Lesions:-

This is due to overloading which leads to abnormal adaptation of the Cords;

- Irritation of the mucosa; i.e. recurrent laryngitis

- Oedema
- Nodules (chronic nodular laryngitis)
- Chronic laryngitis with hyperplasia of the epithelium e.g.
 - Leukoplakia
 - Pachydermia
 - Contact ulcer
- Hyperplasia of muscular and connective tissue

It is important to note that abnormal or hoarse voice can be as a result of both organic and functional causes. For example, a granuloma in the vocal cord can be due to vocal abuse, gastroesophageal reflux (GERD), endotracheal intubations or chronic throat clearing.

Koufman and Isaacson et ... al (1991) concluded that functional voice disorders are mainly “hyper functional states” or “muscle tension dysphonias”. These terms suggest altered laryngeal biomechanics (5).

Unlike in adults voice disorders in children require a different approach because of the role of growth and development, which influences treatment and resolution of vocal abnormalities in children.

History:

“In the absence of an upper respiratory tract infection, any patient with hoarseness persisting for more than two weeks requires evaluation” Rosen et...al (1998) (24).

History can yield valuable information and especially helpful in narrowing differential diagnosis.

It will ascertain the mode of onset, duration of illness, patient's occupation, habits, associated complains, patient's vocal environment and associated symptoms of pain, dysphagia, cough, and difficulties in breathing will be noted. History can also pick those due to Gastroesophageal reflux Disease (GERD).

Medical and surgical history especially in the head and neck region that requires intubation is an important factor in voice pathology. Smoking or alcohol use and abuse as well as other irritants particularly at the work place like dust, moulds, dry air, etc can result in hoarseness of voice.

Other centers use a questionnaire developed by Sataloff et...al (1984) to supplement history taking especially for professional singers, hence helping them articulate their voice problems more clearly (3).

Examination:

A routine general physical examination is important to rule out signs of systemic disease such as hypothyroidism or neurological dysfunction like tremors, Parkinson's disease or multiple sclerosis.

A thorough Head and Neck examination, including assessment of hearing acuity, upper airway mucosa, tongue mobility and cranial nerve function is essential in evaluating a hoarse patient. (5, 12).

Laryngeal Examination

Several options are available for examining the laryngeal anatomy and function:-

- i. **Indirect Laryngoscopy;** It can show the presence or absence of many laryngeal or vocal cord lesions.

Advantages; -It is simple and if successfully done gives a good view of the larynx.

-It remains the basis of every laryngological examination.

Disadvantages

- Some larynges are difficult to view while others can be seen well only during phonation because of the obstructing epiglottis during respiration.

- ii. **Fibre Optic Nasolaryngoscopy;**

Advantages

- For patients with unusual anatomy or those with exceptionally strong gag reflex.
- Good for assessment of voice during speaking or even singing.

Disadvantages

- The resolution of subtle to moderate mucosal changes may be poor because the image is carried to the examiners eye fiber optically.
- It requires proper topical anesthesia for vocal folds to allow undeterred examination of vocal folds, subglottis and trachea.

- iii. **Direct Laryngoscopy;**

- This includes use of the microscope to clearly assess disruption of mucosa, hemorrhage and other smaller lesions over the vocal cords.

Advantages;

- Done under general anesthesia (GA) thus allowing taking of Biopsies and minor surgical procedures.

Disadvantages:

- DL is only justified for vocal restoration i.e. phonosurgery and biopsies as far as voice disorders are concerned.

iv. Videostroboscopy:

It is one of the most practical techniques currently in use for clinical examination of the larynx.

This is especially used for a select group of patients with abnormal vocal fold vibration contributing to vocal disorders which cannot be detected by the naked eye. (5, 6, 7, 26).

Stroboscopy was first used in 1878 by Oertel et ... al to examine the larynx but was abandoned because earlier equipment were bulky, it had no standardization of observations, poor technology and no recordings could be made. Recent technological advances have changed the status of the stroboscope, which has in turn increased our knowledge of the physiology of the vocal cords. For accurate videostroboscopic examination of the larynx three factors need to be understood, the process of phonation, the principles of stroboscopy and the operation of the equipment. The vocal cord typically vibrates during speech, singing or humming at a rate of 80 to 1000 times per second. These vibrations are too fast for the unaided eye to see and therefore cannot be evaluated with indirect mirror laryngoscopy. According to Bless et... al (1987), stroboscopy exploits the limitations of observation of the unaided eye. The eye can perceive no more than five distinct

images per second, and once presented the image lingers on the retina for 0.2 seconds after exposure. By using a pulsed light source to illuminate segments of the folds motion, the eye fuses the images into what it sees as motion, and the examiner perceives it as a slow motion movement.

Technique;

videostroboscopy is done using a 70 degree rigid telescope or a flexible nasopharyngoscope, others use a 90⁰ laryngoscope(i.e. Wolf) which gives a better lighting and visualization of vocal cords as compared to fiber-optic Naso Endoscopy, Woo et... al (1991) (5, 6, 7).

Clinical Applications;

- It provides a means of observing shape, movement, vibratory patterns and timing relationships between the opening and closing of the vocal cords.
- It helps to differentiate between functional and subtle structural abnormalities.
- It is a valuable means of evaluating fold pathology and the degree of infiltration by cancerous lesions.
- An immediate image of the presence or absence of pathology.
- Qualitative and quantitative data on vocal function of both normal and disordered larynx.
- It is advantageous for examining patients with vocal cord paralysis because the onset of any improvement can be observed earlier with greater accuracy.

- Its recordings i.e. video or electronic can be used immediately for evaluation or data for teaching students or audience.

Disadvantages;

- Interpretation of observed characteristics can be confusing. Bless et ... al 1987 demonstrated that “clinicians can take as little as four hours of training to observe all the characteristics present but he noted more complicated task in interpretation”.
- A definitive diagnosis may remain elusive in certain patients.
- In some patients who are very hoarse, their severe dyspnoea prevents an adequate stroboscopic recording of their larynx.
- Uni-dimensional view of the larynx is a problem in patients with anatomic and neurological disturbance of the larynx resulting in poor or imperfect results due to partial obstruction of the larynx.

Stroboscopic Findings;

The findings for selected patients are recorded using a video stroboscope rating form adopted from that proposed by Hirano (See appendix IV).

Treatment:-

The approach is towards the cause of hoarseness of voice whether organic or functional in nature and treatment includes medical therapy, voice therapy, Botulinum toxin injection or surgery.

(i) Medical Therapy: -

This is treatment of choice for patients with conditions like GERD, URTI, Allergies and substance abuse e.g. smoking, alcohol, neurological endocrine disorders. Remedies include change of lifestyle, use of anti reflux medication, antibiotics and antihistamines. Complications are limited to medical used.

(ii) Voice Therapy: -

This is a behavioral method of changing the manner of voice production. According to Prater et...al.1991 "The effectiveness of voice therapy depends directly on the degree of organic involvement of the laryngeal mechanism and the degree of motivation that the patient brings to the voice therapy process".

The therapy is an effective and appropriate method either as a sole therapy or in conjunction with other treatment modalities, Branski et ... al 2001. This therapy is best suited for patients with hyper functional, hypo function and dysfunctional voice disorders (22,)

Two categories of voice therapy: -

i. Direct Voice Therapy: -

This involves alteration of the patients speaking technique in an attempt to increase vocal efficiency and voice quality.

It requires 1 – 2 therapy sessions per week for 6 – 8 weeks.

ii. Indirect Voice Therapy: -

Historically it involves voice rest. It is controversial as first choice of treatment because it is not feasible for some category of patients to have 4 weeks of voice rest i.e. teachers. Other disadvantages are recurrence of hoarseness after resumption of voice use.

Advantages: -

- Some disorders tend to resolve.
- It educates the patient on dangers of vocal abuse and hygiene, hence preventing further injuries.
- It institutes modification of vocal behavior that results in recovery of normal function.

Types: -

- a. *Absolute vocal rest* i.e. for patients with focal fold hemorrhage
- b. *Voice Conservation*: It is limited voice use for 7 to 10 days, by avoiding extreme vocal use i.e. speeches, singing, abusive voice patterns and even limiting frequency or duration of conversation to less than 10 – 15 minutes
- c. *Aphonic Whisper*: It is to be avoided because it increases laryngeal tension (5, 25, 27).

(iii) Botulinum Toxin A Injection: -

This is the primary treatment for spasmodic dysphonia with reported high rate of success. Spastic or spasmodic dysphonia is a chronic voice disorder of unknown origin, Miler and Woolson et... al 1991. This results in excessive adduction of vocal folds during phonation i.e. they become tightly bound together. Recent evidence suggests an organic or neurological origin and it is associated with dystonias, blephorospasms, torticollis etc. (5, 15).

Mechanism of action: It blocks release of acetylcholine resulting in weakness or paralysis of the muscle.

Technique

Percutaneous intramuscular injection with or without EMG guidance, into either right or left vocal cord. Trans-oral injection by indirect laryngoscopy has been reported as alternate route.

Advantages: -

- Botulinum does not impair sensory function
- Paralysis or weakness of muscle is temporary lasting for a period of 3 to 6 months
- Adverse effects disappear fast
- Ability to affect individual muscles i.e. adductors only thus preserving abductors

Disadvantages: -

- Some patients develop dysphagia and aspiration.
- Difficulties in determining the optimal dose for each patient, because the response is patient specific

- Little is known about the diffusion properties of the toxin but there are reports of facial plane spread to other muscles.

IV) Surgery:

This mainly involves phonosurgical procedures designed to affect alterations of voice as classified by Cumming and Flint et ... al 1993 as: -

- Suspension micro-laryngoscopy for excision of benign and malignant disease using micro forceps or lasers.
- Vocal fold injection for augmentation and medialization.
- Laryngeal framework surgery or laryngoplastic phonosurgery.
- Laryngeal re-innervations procedures.
- Reconstructive or rehabilitative procedures after tumor resection.

Laryngeal frame work surgery has been further categorized by Ishiki et ... al 1989, into four types of surgical procedures based on functional alteration of the vocal folds: -

Type I	Medial displacement
Type II	Lateral displacement
Type III	Shortening or relaxation
Type IV	Elongation or tensioning procedures (2, 5)

The main aim of phono-surgical technique has been rehabilitation of the paralyzed larynx. Toshiro et ... al 1970, reports a universal failure of end-to-end anastomosis after injury to the

recurrent laryngeal nerve. Crumley et ... al 1979 and Flint et...1991, further supported that same position after observing that random process of axonal regeneration at the site of injury resulted into the simultaneous contraction of antagonistic muscle group causing synkinesis. (5).

Since the first reporting of phono-surgical procedure by Brunnings 1911, where he introduced the concept of vocal fold medialization by injecting paraffin gel within the body of paralyzed fold great achievements have been realized.

The materials used for medialization have become more biocompatible i.e. Teflon and absorbable materials like Gel foam which is used for temporary medialization. The introduction of autologous material like fat and collagen has further improved the procedure.

2. Justification of the Study:

Hoarseness of voice is one of the commonest vocal complaints at KNH. This study aims at establishing the commonest etiological and demographic patterns. HOV or Dysphonia is the most consistent symptom of cancer of the larynx and hence persistent symptom for over two to four weeks requires urgent investigation.

It has been noted that patients present late with HOV, with advanced disease i.e. cancer of the larynx, yet early detection is possible by investigating any chronic HOV. This study will also be used as a basis for further studies into voice disorders as well as to develop guidelines on early investigation and management of Dysphonia.

Aims and Objectives:-

Main Objective:-

- To determine the etiological factors of chronic hoarseness of voice in patients presenting at the KNH, ENT H/N department.

Specific Objectives:-

- (i) To determine the oncological and non-oncological causes frequently encountered.
- (ii) To determine the demographic pattern of patients presenting with HOV i.e. by age, sex, residence, social and economic activities. Past medical history and other associated risk factors.
- (iii) To determine the period taken before seeking medical help.
- (iv) To determine other associated clinical symptoms and conditions.

3. Methodology:-

Study Design:-

This was a cross-sectional prospective study.

Study Populations:-

This study was undertaken on the patients attending the KNH ENT H/N clinic or ward, with complains of HOV for more than two weeks.

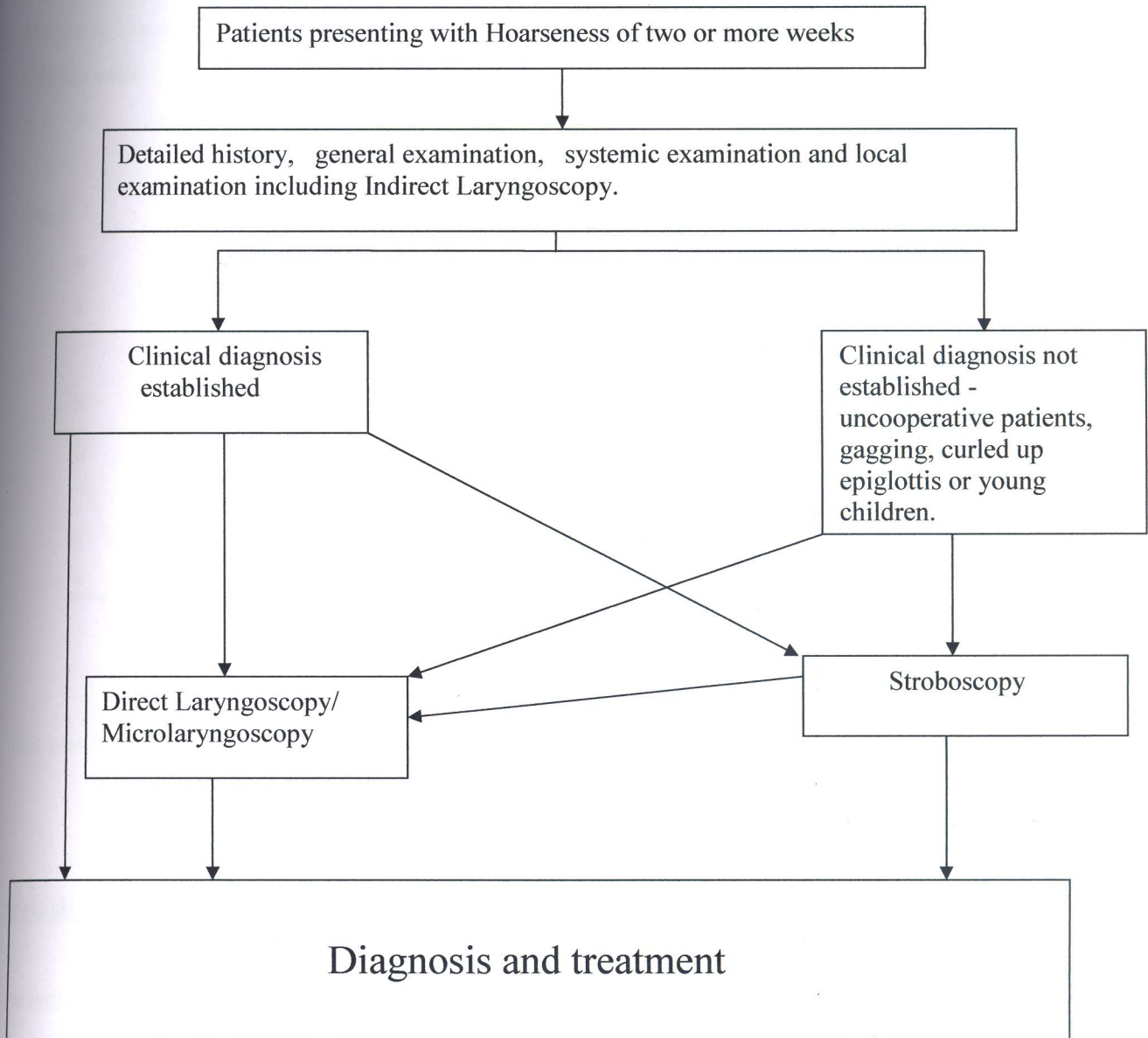
Materials and Methods:

Patients included in the study were those attending ENT clinic (KNH) with chronic or persistent HOV for more two or more weeks, as their primary complaint for diagnostic evaluation and management. They were requested to give an informed consent by the principle investigator. Those included in the study were investigated using a detailed proforma after a detailed history and physical examination.

The patients were subjected to a number of investigations as per flow chart below (Fig.2):-

- i. A detailed history of the vocal complaint (HOV) with reference to the role of local, systemic, emotional and socio-economic activities of the subject. This included detailed physical examination.
- ii. One or more of the following Laryngoscopy procedures:-
 - a) Indirect Laryngoscopy (IL)
 - b) Direct Laryngoscopy (DL) and microlaryngoscopy under GA.
 - c) Fiber optic laryngoscopy (FOL)
 - d) Videostroboscopy or Rigid Endoscopy.

Figure 2. Flow chart of Investigations



Sampling Technique:

In order to have had a statistically significant sample size, the King and Leslies (1965) formula (34) was used:-

$$N = \frac{(Z_{1-a/2})^2 \cdot P(I-P)}{d^2}$$

Where

n	=	Minimum sample size acceptable to the study
z	=	Standard errors from mean corresponding to 95% confidence level
a	=	Level of significance
p	=	Prevalence of commonest voice disorder (in the adult population 9%) in a study by merge et .. al (33)
d	=	Absolute precision (5%)
$Z_{1-a/2}$	=	1.96
	=	126

This was the minimum number of patients inducted in the study.

Inclusion Criteria:-

Patients that were included in the study were those who:-

- i) Had complaints of hoarseness of voice (HOV) lasting two weeks or more as their primary complaint and attending the KNH ENT clinic or ward.
- ii) Consented.

Exclusion Criteria:-

- I) Those who failed to give consent.
- II) Un-cooperative patients who declined examination procedures or withdrew from the study.
- III) HOV under two weeks.

Study period:

The study was undertaken between November 2004 and April 2005, a 6 month period.

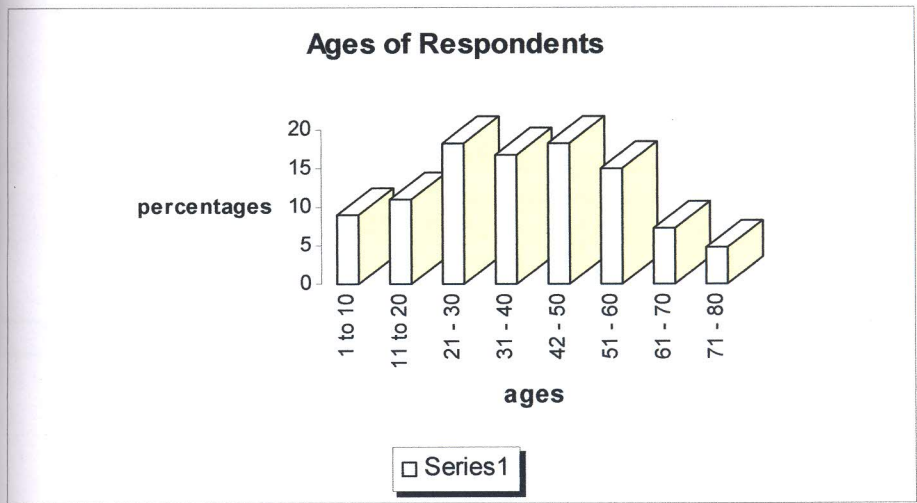
Ethical Considerations:-

- Patients information was kept confidential
- A voluntary informed consent was obtained from the patients before the study. Those who declined were followed up in the clinic like any other patients.
- The study commenced after a written approval from the ethical and research committee of KNH.
- Treatment of the patients was not affected by the study.

4. RESULTS.

A total of 126 patients were inducted into the study.

4.1 Age Distribution



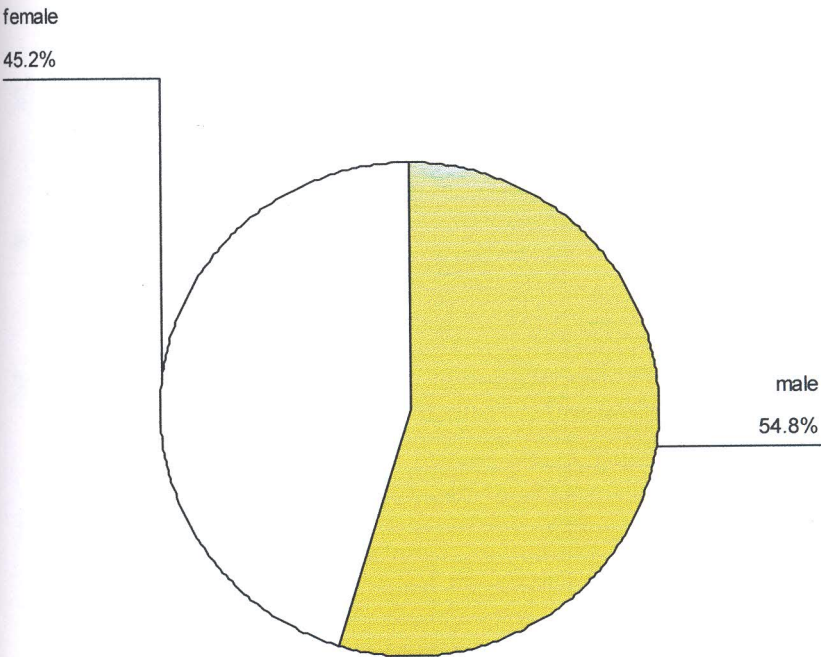
The patient’s ages in the study were between 2.2-80 years. The mean age was 38.15 years. The majority of patients were seen in age group of 21-60 years (69%).

Table I: Diagnosis * age in years Cross-tabulation

		age in years								Total
		1-10	11-20	21-30	31-40	41-50	51-60	61-70	71 & above	
diagnosis	chronic laryngitis	2	2	1	2	2	2			11
	leucoplakia				1			1		2
	Ca larynx				3	6	13	5	5	32
	vocal cord / singer's nodules	1		4	5	6	1	1		18
	TB laryngitis		2	4	2	1				9
	mutational falsetto (FVD)			1						1
	laryngeal polyp		1		2	1		1		5
	FVD		6	3	3	1	1	1		15
	Laryngitis-GERD/LPR	1	1	7	4	5	1			19
	Respiratory/laryngeal papillomas	7	1		1					9
	Vocal cord paralysis			2		1			1	4
	Congenital laryngeal web						1			1
Total		11	13	22	23	23	19	9	6	126

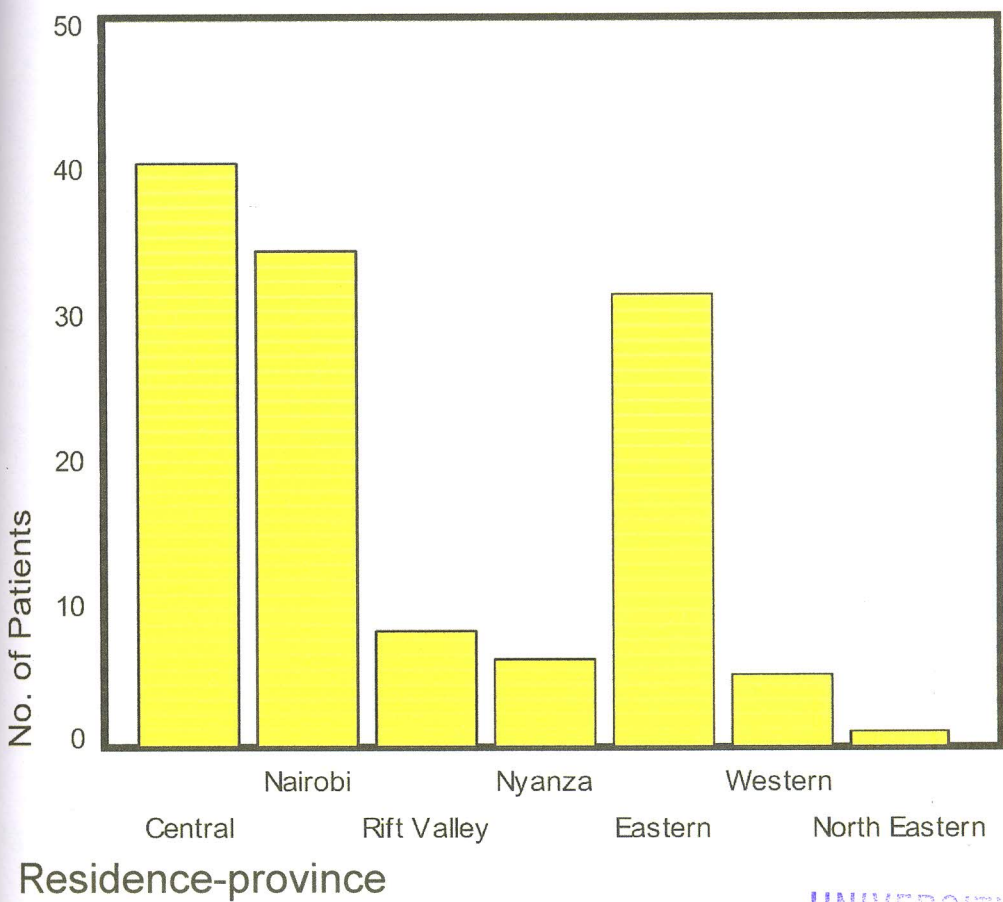
This table of diagnosis against age confirms that most patients are in the 21-60 age range (69%), with a peak age range between 31-50 years.

4.2 Sex Distribution



The male patients were 54.8% while the females were 45.2%.A M: F ratio of 1.2:1

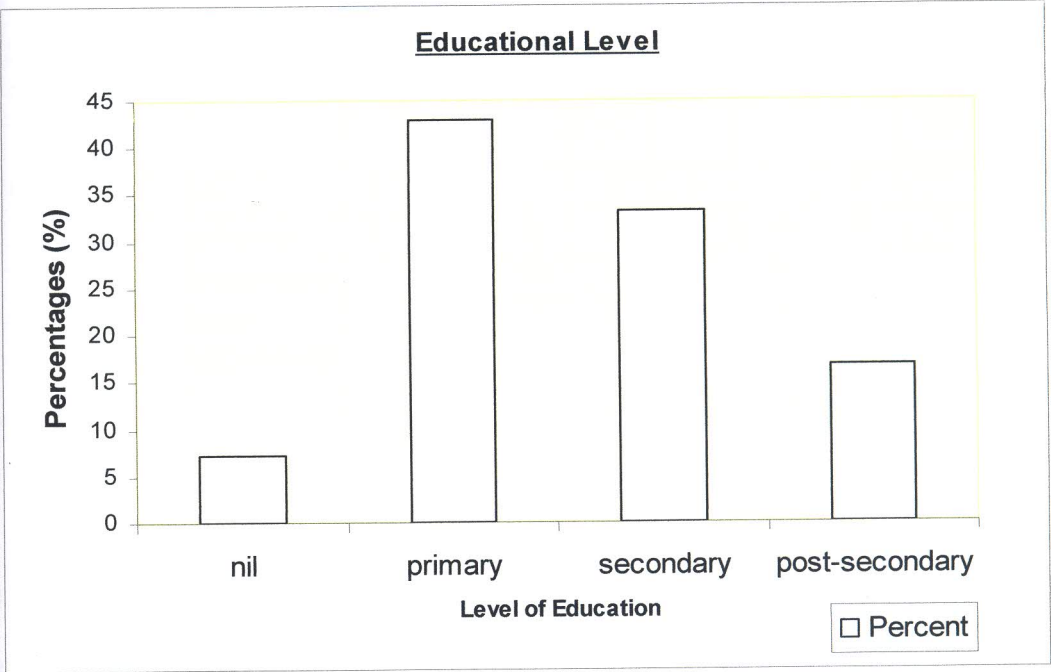
4.3 Usual Residence.



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The majority of patients was referred from Central province (34.3%), followed by Nairobi region (27.9%) and Eastern province (22.5%).North Eastern province had the least referral only a single patient (.8%).No patient was referred from coast province.

4.4 Education background.



The majority of patients in this study were of primary school level of education (42.9%) i.e. stopped school at primary level or pupils at primary school. Secondary level was 33.3% while post-secondary level was 16.7%. Nil or no formal education were 7.1%.

Table II: Education * age in years Cross-tabulation

		age in years								Total
		0-10	11-20	21-30	31-40	41-50	51-60	61-70	71 & above	
education	nil	3			1	1		2	2	9
	primary	8	6	5	4	11	10	6	4	54
	secondary		7	10	8	9	8			42
	post-secondary			7	10	2	1	1		21
Total		11	13	22	23	23	19	9	6	126

Majority of patients were of primary education level 42.9% as described in section 4.4. Nil education categories were 7.1%, it included 3 children below 10 years who had not started school. The rest in this category were adults above 31 years who never went to school.

4.5 Occupation.

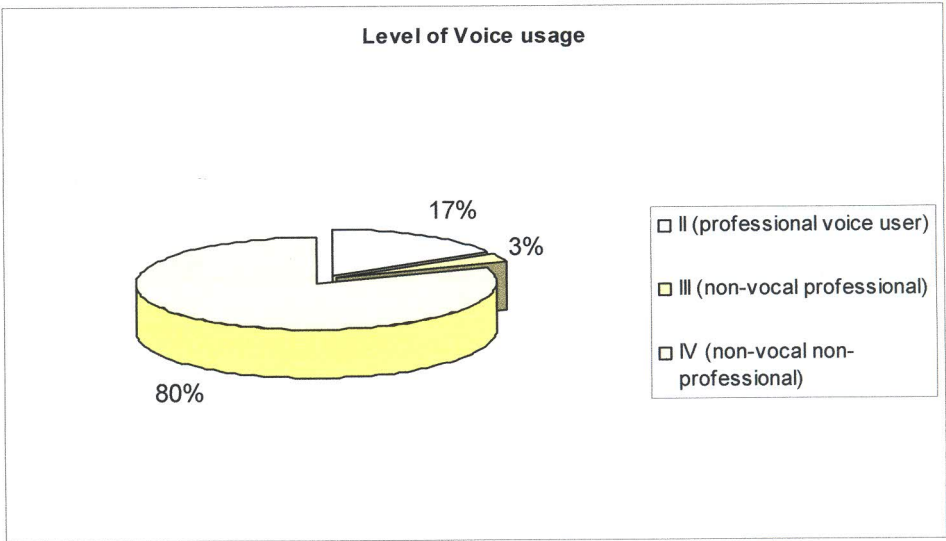
Table III: Frequency of occupation.

	Frequency	Percent
Traders	29	23
subsistence farmers	19	15.1
Manual Laborers	19	15.1
Teachers	15	11.9
Primary school pupils	14	11.1
unemployed	8	6.3
Post primary students	8	6.3
Administrators	3	2.4
Preachers	3	2.4
Pre-school child	3	2.4
Office workers	2	1.6
Lab Technician	1	.8
Physiotherapist	1	.8
Lawyer	1	.8
Total	126	100.0

The frequency table shows commonest occupation associated with HOV was trading (23%), Subsistence farming and Manual labor each at 15.1% and teaching (11.9%) respectively.

4.6 Level of voice usage.

4.6.1 Vocalist;



The commonest level of vocal usage was level IV (80%) corresponding to non-vocal non-professionals i.e. laborers, subsistent farmers, unemployed, office workers traders, primary school pupils and post primary students. Level II (17%) represents professional voice user's i.e. preachers, administrators and teachers. Level III (3%) are non-vocal professionals examples are lawyers, physiotherapist and lab technologist. No patient was found to have Level I (0%) vocal usage. This represents the Elite vocal performer like singers and actors.

4.6.2 Vocal environment.

Table IV: Frequency of Vocal Environment

Environment	No. of Cases	%
Dusty	54	42.9
Dry Air	24	19.1
Noisy	21	16.7
Normal	14	11.1
Smoky	12	9.5
Cold	1	0.8

The commonest vocal environment of the patients inducted in this study was Dusty with 54 patients (42.9%), followed by dry conditions with 24(19.1%). 9.5% of patients worked or lived in a Smoky environment while 16.7% were in Noisy areas. One patient (.8%) worked in extreme cold condition (Cooling plant).

Table V: Cross tabulation of occupation and Vocal Environment.

	Normal Environment	Smoky	Dusty	Dry Air	Noisy	Cold
Unemployed	4	1	5	2	0	0
Subsistence Farmer	1	2	16	8	0	0
Trader	4	6	20	8	10	0
Primary school Pupil	4	0	10	2	6	0
Post primary school Student	1	1	4	0	5	0
Administrator	1	0	2	1	1	0
Laboratory Technician	0	0	1	1	0	0
Preacher	1	0	3	1	2	0
Office worker	1	0	1	0	0	0
Physiotherapist	1	0	0	0	0	0
Manual Laborer	1	9	13	8	8	1
Lawyer	1	0	0	0	0	0
Pre-school child	1	0	0	0	0	0
Teacher	2	0	13	7	3	0
TOTAL	23	19	88	38	35	1

From Table III above, Dusty environment is persistently found across most professions especially those working as subsistence farmers. It accounted for 88 complaints (43.1%). Others were Dry air or dry conditions with 38 complaints (18.6%), Noisy environs (17.2%). Patients without any of the above conditions i.e. Normal environment were 23(11.3%). Note also that majority of Subsistence Farmers are working in dusty and dry conditions while Traders are in dusty and noisy areas.

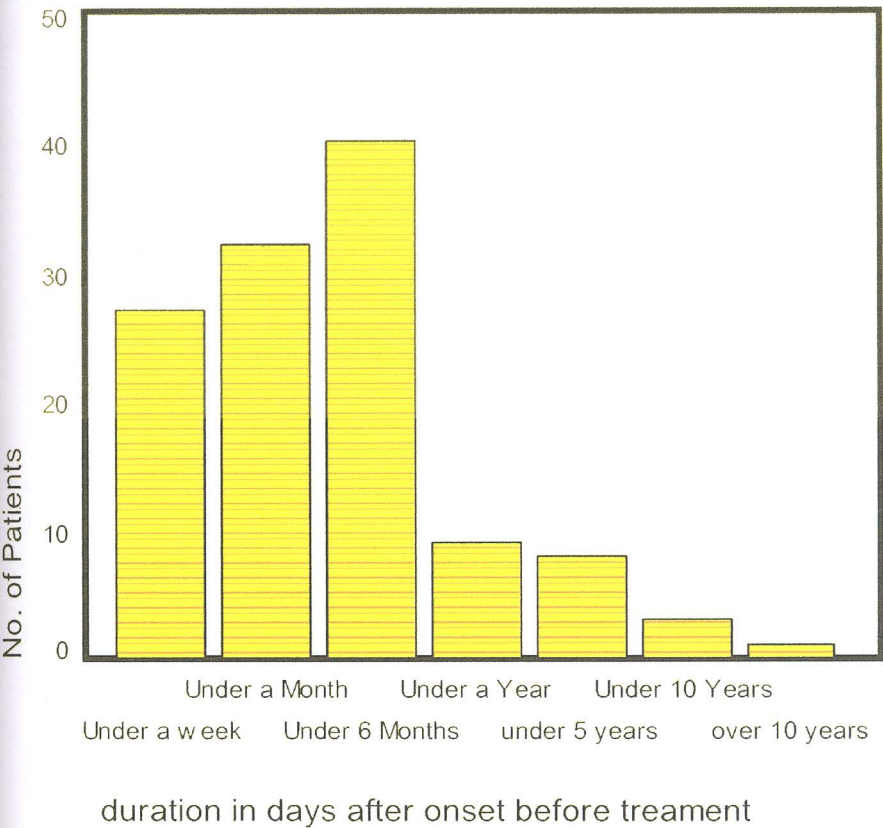
4.6 Habits.

Table VI: Diagnosis * habits Cross tabulation

		habits					Total
		nil	Alcohol	tobacco	alcohol & tobacco	alcohol, tobacco & pan	
diagnosis	Chronic simple laryngitis	8	2		1		11
	Leucoplakia	1	1				2
	Ca larynx	4	3	1	23	1	32
	vocal cord nodules/singer's nodules	15	2	1	1		19
	TB laryngitis	4	2		3		9
	laryngeal polyp	3			2		5
	FVD/mutational falsetto	16					16
	Laryngitis-GERD/LPR	15	1		2		18
	respiratory /laryngeal papillomas	8	1				9
	vocal cord paralysis	2	1		1		4
	congenital laryngeal web	1					1
	Total	77	13	2	33	1	126

Most patients inducted in this study (61%) were not consumers of alcohol or tobacco. Those who took alcohol and cigarette combined were mainly patients with cancer of the larynx.

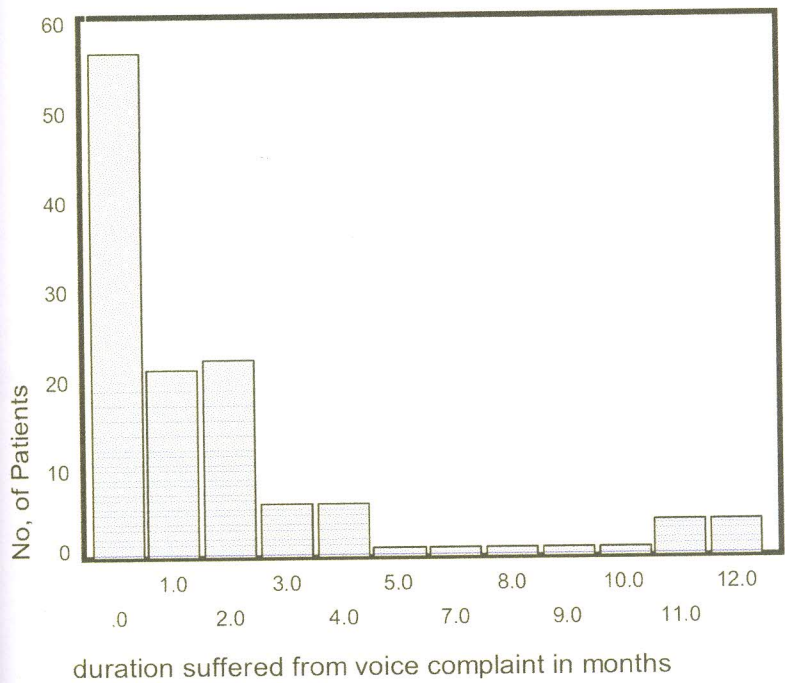
4.7.2 Duration of HOV after onset before any medical assistance (First treatment).



The bar chart illustrates the durations in weeks, months and years before the first treatment was given either at the primary, secondary or even at the Referral unit. Duration of HOV ranged from 1 day to 18980days (52yrs).Mean of 374.017 days (1.04yrs). Majority of patients presented in months i.e. under six months (81.7%).Calculating the mean without one patient who had HOV for 18980 days, the average was 217.66 days (7.3 months).

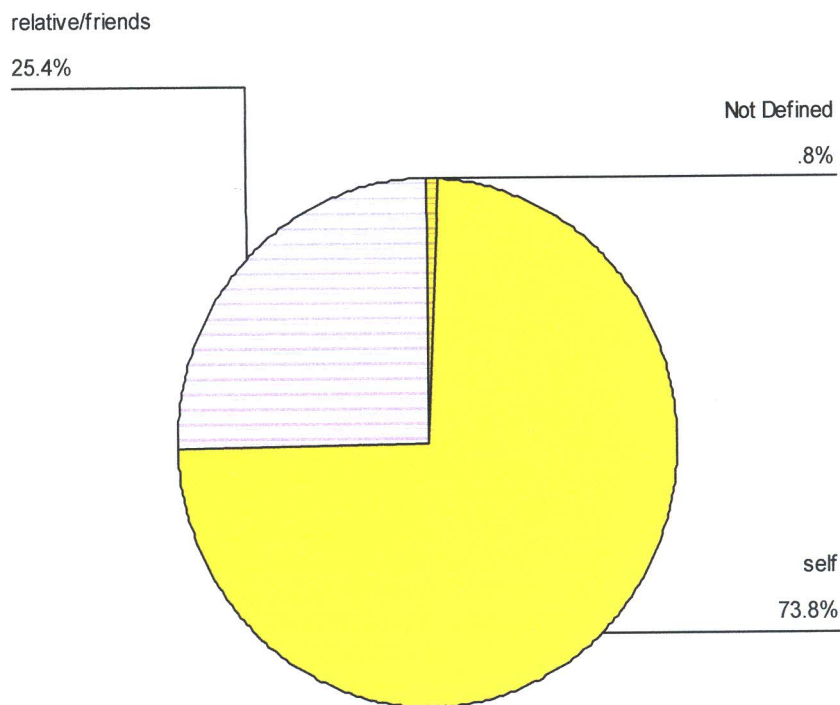
4.7 History

4.7.1 Duration of Hoarseness since onset (Referral centre).



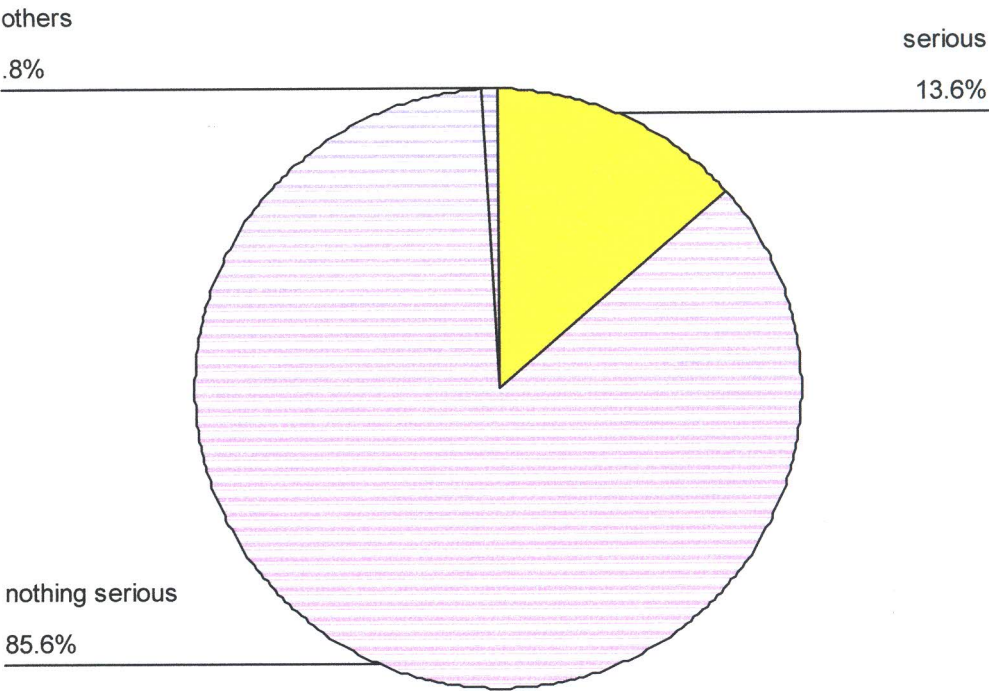
The Duration in months ranged from .5-624months with a mean of 29.728months. There is a significant peak under 10months (42.2%) but majority of patients presented below 50months (89.5%). One patient in the group of 12 months and above presented at 624months (52 years) with a laryngeal congenital web. Without this patient the average duration becomes 24.5 months (2 years).

4.7.3 Notice of voice change.



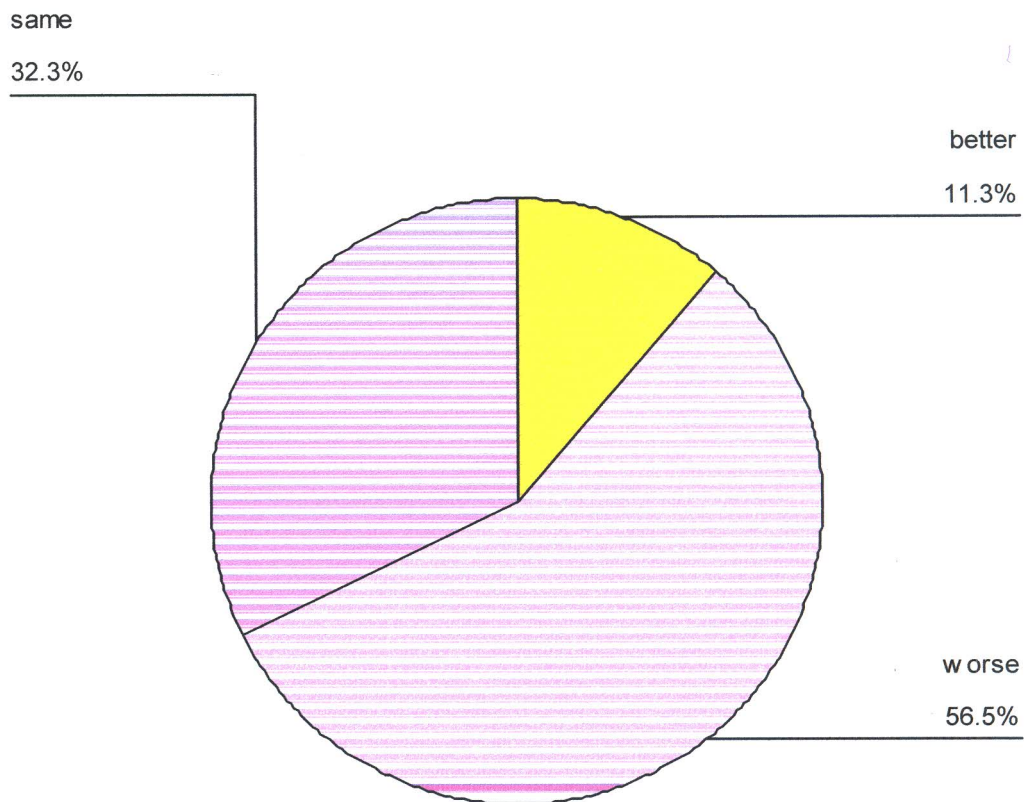
The pie chart shows majority of patients (73.8%) noticed changes in their voices, while 25.4% were alerted by their relatives or friends. One patient (.8%) could not remember if it was a relative or self.

4.7.4 What the patient thought about the voice change.



Most patients (85.6%) considered nothing serious at onset of voice pathology. The remainder (13.6%) thought of it as a serious medical condition. One patient did not know.

4.7.5 How was the voice since onset?



Significant number of patients (56.5%) believed their vocal complaint was worse than the period of its onset. 11.3% thought it was better and 32.3% of them said it was same since its onset.

4.7.6 Associated complains.

Table IV: Frequency table of commonest associated Symptoms/signs.

	No. of complains	% of patients
cough	38	30.2
Throat pain	35	27.8
None	29	23.0
Odynophonia	27	21.4
painful swallowing	17	13.5
Epigastric pains	17	13.5
airway obstruction	14	11.1
Retrosternal pains	11	8.7
Difficulty Swallowing	10	7.9
Haemoptysis	2	1.6
Stridor	1	0.8
Regurgitation	1	0.8
throat clearing	1	0.8
Aphonia	1	0.8
Headache	1	0.8
Aspiration	1	0.8
Abdominal Pains	1	0.8

The commonest associated symptom was cough (30.2%), Throat pain (27.8%), Odynophonia (21.4%), Epigastric pains and Dysphagia were equal at 13.5% respectively. Note also that patients that did not have any associated symptoms were 23.0% of total patients seen.

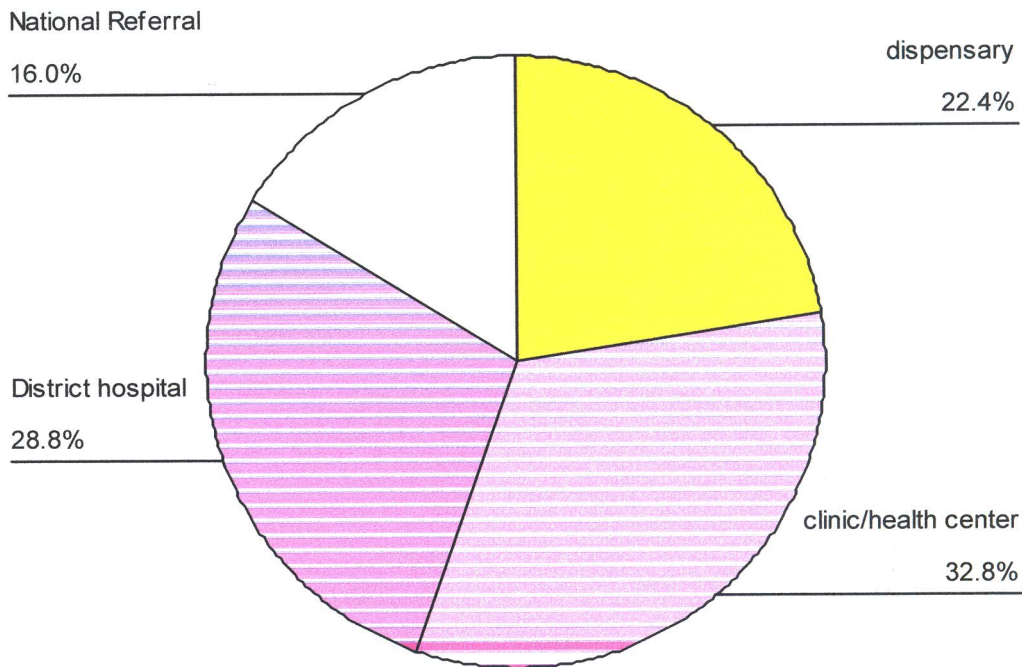
4.7.7 Patients associated medical conditions that could have contributed to their voice disorders.

Table V: Frequency table of associated medical conditions.

	Frequency	% of Patients
Cerebral Vascular Accident	1	.8
Goiter	1	.8
Trauma (severe head injury)	1	.8
Rheumatoid arthritis	1	.8
Thyroidectomy	1	.8
Diabetes Mellitus	2	1.6
Allergies	4	3.2
Gastrointestinal disorders	6	4.8
Respiratory diseases	17	13.5
None	92	73.0

The frequency table shows most patients (73%) had no associated past medical conditions that could have contributed to the voice disorder. Respiratory infection was found in 13.5% of patients with Hoarseness, while those with gastrointestinal disorders were 4.8%.Allergic disorders were also common in 3.2% of patients.

4.7.8 Medical center first attended.



There is almost an equal distribution among Health care facilities. Clinics and Health centers were most attended (32.8%). District Hospitals (28.8%) and Dispensaries (22.4%) were also frequented as compared to Kenyatta National referral Hospital (16%).

4.8 EXAMINATION.

4.8.1 Indirect Laryngoscopy (IL.).

Table VI: Frequency table of IL findings.

	Frequency	percent
Gagging/Overhanging epiglottis/Difficulty to Examine	35	27.78
Growth/Mass in the Vocal Cords	15	11.90
Vocal Cord Nodules	14	11.10
Irregular / Congestion of posterior commissure/Arytenoids/Epiglottis.	13	10.30
Normal Finding	10	7.90
Congestion of Vocal Cords	7	5.56
Bowing of Cords	4	3.20
Vocal Cord Polyps.	3	2.40
Thickening of Cords	2	1.60
Vocal Cord Paralysis	2	1.60
Glottic papillomas	2	1.60
No IL Done	19	15.10

IL was done in 107 patients. IL examination was possible in 57.12% of patients while 27.78% were difficult to examine due to Gagging or anatomical obstructions. 11.90% were attributed to vocal cord masses followed closely by vocal cord nodules at 11.10%. Prominent feature noted in this study was congestion of posterior Commissure (10.30%). No IL was done in 19 patients (15.10%) i.e. young children or adults who refused but accepted other forms of examination.

4.8.2 Findings of EUA.

Table VII Frequency table of lesions seen during EUA.

	Frequency	%
Cancer of the Larynx	32	49.2
TB Laryngitis	9	13.9
Respiratory/laryngeal papillomas	8	12.3
Laryngeal/Subglottic Polyps	5	7.7
Congestion of Vocal Cords	3	4.6
Vocal Cord Nodules	3	4.6
Vocal cord paralysis	2	3.1
Leukoplakia	1	1.5
Thickened Vocal Cords	1	1.5
Oedema of Arytenoids	1	1.5
TOTAL	65	100

65 Patients were taken to theater for EUA and Biopsy. 32 patients (49.2%) were found to have cancer of the Larynx. The rest of the lesions were of inflammatory or infectious nature. Note that TB of the larynx (13.9%) and papillomas (12.3%) was also common in this group of patients.

4.8.7 Videostroboscopy Findings.

Table VIII: Frequency of Stroboscopic findings.

	Frequency	%
Vocal Cord Nodules	10	34.5
Difficult to examine/Gagging	1	3.5
Edematous Arytenoids	2	6.9
Leukoplakia	1	3.5
Bowing of V.Cords (poor approximation).	11	37.9
Posterior commissure Lesion (mass/granulation tissue)	2	6.9
Congestion of V.Cords	1	3.5
Congenital Web	1	3.5

29 Patients were examined using a stroboscope. 10 of them had V. Cord nodules while the other 11 were found with Bowing of Cords (Poor Approximation).One patient had Congenital Web.

5.0 DIAGNOSIS.

Table IX Etiological Factors of 126 patients inducted in the study.

Etiology		Frequency	Valid Percent
Inflammatory/infections	chronic laryngitis		
	• Specific:-TB laryngitis	9	7.1
	• Non Specific		
	Chronic simple Laryngitis	11	8.7
	vocal cord/Singers nodules	19	15.1
	laryngeal polyp	5	4.0
	Respiratory/ laryngeal papillomas	9	7.1
	Laryngitis-GERD/LPR	18	14.3
Neoplastic	Ca larynx	32	25.4
Neurological	vocal cord paralysis	4	3.2
Congenital Disorder	congenital laryngeal web	1	.8
Functional Voice Disorder	FVD	16	12.7
Others	leucoplakia	2	1.6
Total		126	100.0

The commonest cause of HOV in this study was of inflammatory or infectious nature constituting 56.3% of all cases. Cancer of the Larynx was second (25.4%) and Functional Voice Disorder third commonest at 12.7%.

DISCUSSION.

This is a prospective study of the Etiological and Demographic patterns of Hoarseness of Voice in Kenya. The results show varied causes. The commonest cause of Hoarseness of Voice at the Kenyatta National Hospital was found to be due to inflammation or infections of upper aerodigestive system (56.3%), followed by Malignant neoplastic changes of the Larynx (25.4%), Functional Voice Disorders (12.7%), Vocal cord paralysis (3.2%) and Congenital Laryngeal web (.8%). Others were Leukoplakia which was found in 2 patients (1.6%). There were few comparative studies found in the literature search about the etiology of HOV. These sentiments were echoed by Mehta (1985) as reported by Baitha et...al (34) while doing a study of the Clinical profiles of Hoarseness of Voice. Among those with inflammatory or infectious origin were TB Laryngitis (7.1%), chronic simple laryngitis (8.7%), vocal /singer's nodules (15.1%), Laryngeal polyps (4%), Laryngeal /Respiratory papillomas (7.1%) and Laryngitis due to GERD/LPR (14.3%).

The population of patients studied was 126 with an age range of between 2.2 to 80 years and Mean age was 38.2 years. The majority of patients had a peak age distribution of 21-60 year (68.3%) and M: F ratio of 1.2:1. In a study by Baitha et...al. (34) of 110 patients with HOV, he found an age range of 6-71 years and peak distribution of between 21-50 years (61.81%) with a Mean of 40.4 years. The Male: Female ratio was 2:1. Nwaorgu et...al (37) in a study of 124 patients with HOV, Found M: F ratio of 1.4:1 with an overall mean age of 46.98 years and age range of 16-84 years. Despite concentrating on adults above 16 years the mean age and M: F ratios still compares closely with our results. Majority of the patients in his study were above 20 years (81%), the rest (19%) were below this age. This is confirmed by the peak age distribution

of our patients between 21-60 years. Possible explanation is that most people are in their most productive period of life or other pathologies are becoming more prominent i.e. cancer of the larynx in this study was found in patients above 31 years.

GEOGRAPHIC DISRIBUTION

Usual residence of majority of the patients was Central province (34.3%) followed by Nairobi region (27.9%) and Eastern province (22.5%).Others were Rift Valley, Nyanza, Western and North Eastern provinces. This pattern of distribution is most likely due to the close proximity of Kenyatta National Hospital or presence of ENT trained personnel within those referring centers. No patient was referred from coast province. This could be due to presents of ENT surgeons or distance from the study centre.

EDUCATION LEVEL

In terms of Education level, majority of our patients were of primary education level (42.9%) and secondary (33.3%).Post secondary (16.7%) and nil education (7.1%) constituted the least number of patients. It is important to note in Table II (Cross-tabulation of Education and age) that there is a mixture of children and adults in each education category except in post-secondary level where we have adults only. Among the children, some were attending school while others had not started school. The category described as nil education for example had three children below 10 years who were pre-school age, while the rest were above 31 years who did not enroll for any basic education. The Voice pathology appears distributed across all education levels with

the majority being of primary school level. Most patients were non-vocal non-professionals (80%) with professional voice users being only 17%. It appears in this study that education level is not important because all levels are affected and more so those who stopped school at primary level and working as traders or subsistence farmers.

LEVEL OF VOICE USAGE

Patients were also assessed on their level of voice usage and vocal environment. According to Koufman (5) the morbidity associated with voice disorders is highly variable and depends to a great extent upon the patient's level of vocal usage. Four levels were adopted by Koufman et...al (5) for convenience in refining an approach to voice disorders. This same approach was applied in this study. There was no level I patients in this study i.e. elite vocal performer like actors or musicians. Majority of the patients were level IV voice users (80%). These are non-vocal non-professionals which comprised of manual laborers, subsistence farmers and traders. This group comprised the majority of our patients (Table I). Level II (17%) represented professional voice users like teachers, administrators and preachers. Level III (3%) were non vocal professionals like physiotherapist, Laboratory technicians and Lawyers.

The commonest vocal environment of the patients from this study was Dusty (42.86%), Dry air or Dry conditions (18.25%), Noisy (16.67%), Normal (10.32%) and Smoky conditions (9.52%). This again correlates with the fact that majority of our patients were subsistence farmers, traders, primary school pupils, teachers and manual laborers. Cross tabulation of occupation and vocal environment illustrates further the effects of dust on the voice being the leading complaint (Table

V). It also shows that traders work in a dusty and noisy environment. Primary school pupils also school in same environment like traders. Subsistence farmers mainly farm in dusty conditions and dry air while laborers work in dusty, Smokey, dry air and noisy environments. Normal environment described in Table V is that condition without the extremes of above conditions i.e. dust or noise.

OCCUPATION

The commonest occupation related to HOV was being a Trader (22.2%), subsistence farmer (15.1%), Manual laborer (15.1%) or a Teacher (11.9%). Dysphonia was also common among primary school pupils (12.7%) or Post primary students (6.3%). In a study done by Marddern et...al (37) he found the prevalence of dysphonia in school-Aged going children at 6% to 23% which explains our pupil frequency of 12.7%. In a study by Baitha (35) the commonest predisposing conditions was working as a laborer (36.35%) followed by House wives (21.81%). The high prevalence of laborers was attributed to the rural setting of his study. Occupation appears to predispose one to the level of voice use or vocal environment that increases the chance of getting a voice disorder. For example as seen above the commonest occupation related to HOV is Level IV which corresponds to non-vocal non-professional group comprising of Traders, subsistence farmers and manual laborers. This level of voice exposes one to extremes of the environment.

CLINICAL PRESENTATION/EXAMINATION

The symptoms that were mainly associated with Hoarseness of voice were Cough in 30.2% of patients, Odynophonia (21.4%) and Throat pains (27.8%). Other symptoms were odynophagia, airway obstruction, epigastric pains, retrosternal pains, stridor, throat clearing and haemoptysis (see Table IV). This result compares with those of Baitha et...al (34) who found cough as commonest associated symptom (30%) followed by throat pains (18.18%) and Odynophonia (15.45%) respectively. Also signs of clinical septic foci in the oral cavity and oropharynx were noted during the study. This included some patients who had inflamed oropharyngeal mucosa, tonsillar region or even a postnasal drip.

During history taking some patients were found to have other medical conditions that could have either contributed directly or indirectly to the voice problem in 27% of patients. The commonest associated condition was Respiratory diseases (13.5%) followed by gastrointestinal disorders (4.8%). Others were Allergies (3.2%), Diabetes mellitus (1.6%), cerebral vascular accident (.8%), Head injury (.8%) and Thyroidectomy (.8%). The rest of the patients (73%) had no associated medical condition.

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The duration of hoarseness of voice since onset of the symptom was between .5-624 months with a mean of 29.728 months. Majority of patients presented before the duration of 50months (89.5%) with a sharp peak at 10months or below (42.2%). In Nwaorgu's study the mean duration before presentation was 23.29 months with majority of patients presenting before 6 months (45.2%) of onset of HOV. This results correlate closely as compared to that of Baitha where the

range was put at 1 day to 5 years and a mean of 3 months although he had a lower sample of 110 patients.

The patients were again asked about what they thought about their voice disorder and the majority said nothing serious in 85.6% (see part 4.7.4.). Only 13.6% believed that their voice condition was a serious one. The long delay before seeking medical assistance is apparent from this study. This could be due to several factors:

1. As mentioned above most patients do not consider HOV as a serious symptom and often relate it to URTI.
2. Lack of disease awareness on the part of the patients. There is tendency for patients to seek medical attention only when complications such as throat pains and upper airway obstruction set in.
3. Low index of suspicion on the part of medical personnel who encounter these patients before referring them for specialized treatment.
4. In our Health system, Patients first go through a number of primary and secondary centers before subsequent referral to Kenyatta National Hospital.
5. Lack of finances or low levels of poverty.

The mode of diagnosis of the causes of HOV was based on detailed History and physical Examination. A clinical diagnosis was arrived at in some cases on initial examination while others required further work up like Endoscopy, Direct Laryngoscopy or even Stroboscopy to get

a diagnosis (see Fig.2). From the flow chart some patients were diagnosed via all the above investigations while others were diagnosed by clinical examination and indirect laryngoscopy only. Among the methods of investigation, IL and Stroboscopy were quicker, simple to use and with fewer complications to the patient. Flexible Endoscopy could not be used due to technicalities. There are some differences in findings between IL and EUA. For example the numbers of laryngeal masses in IL are 15 yet in DL there are 32 malignancies. A possible explanation is in IL findings were 27.7% of 107 patients were difficult to examine due to gagging or anatomical obstruction. In 57.12% of patients it was possible to identify a lesion on IL. 19 patients were not done IL examination, this included young children and a few adults who refused that form of investigation but accepted others like stroboscopy or direct laryngoscopy.

Direct Laryngoscopy was done in 65 patients under general anesthesia. The main findings were 32 patients (49.2%) were found to have cancer of the Larynx .Other important findings were TB laryngitis 9 patients (13.9%), Respiratory papillomas (12.8%), Laryngeal polyps (4.6%) and vocal cord nodules (4.6%).

Stroboscopy was done on 29 patients most of which had a shorter duration of HOV. Another factor that influenced the use was the cost of the test. It was very good in diagnosing especially those patients with functional voice problems that were difficult to examine under General anesthesia. The main findings were vocal cord nodules and bowing of vocal cords each 10 patients.

The diagnosis of the commonest conditions causing Hoarseness of voice was due to inflammatory or infectious conditions accounting for 57.14% of all patients. Cancer of the larynx was second commonest at 25.4% while FVD was 12.7%. In Nwaorgu's study of 124 patients with Hoarseness and all above 16 years of age, cancer of the larynx was found to be 24.2%. Other findings were congenital laryngeal web (.8) and Leukoplakia (1.6%).

CONCLUSION

The etiological factors of Hoarseness of voice were due to *inflammatory or infectious* origin (56.3%). This included TB Laryngitis(7.1%), chronic simple laryngitis(8.7%), vocal cord/singers nodules(15.1%), Laryngeal polyp(4.0%), Respiratory/laryngeal papillomas(7.1%) and Laryngitis due to GERD(14.3%). *Neoplasm* as a result of cancer of the Larynx(25.4%). *Neurological* due to vocal cord paralysis(3.2%), *Congenital* where one patient was found with a congenital web of the vocal cord(.8%). *Functional Voice Disorder*(12.7%) and *Others*(1.6%) namely Leukoplakia.

There was a male predominance of 1.2:1, with a mean age of 38.2 years. The age range was 2.2-80 years, with peaks between 2nd and 6TH decade. The mean duration of HOV before presentation at the study centre was 29.73 months. The mean duration before any medical treatment was 374 days or 1.04 years.

Hoarseness of voice was commonest in patients from central province followed by Nairobi province and Eastern province respectively in descending order. The commonest level of voice use was that of non-vocal non-professional level (80%), while commonest vocal environment

amongst all the patients was Dusty (42.86%), Dry conditions (18.25%) and Noisy (16.67%).

Traders were the commonest affected group (22.2%) followed by Subsistence farmers (15.1%) and Manual laborers (15.1%).

RECOMMENDATIONS

All patients with chronic Hoarseness of voice for more than two weeks should be investigated properly using Indirect Laryngoscopy and either flexible Endoscopy, stroboscopy or Direct Laryngoscopy.

Stroboscopy is highly recommended for patients suspected to have functional voice disorders and other tiny lesions of vocal cords that are difficult to detect with other methods of investigation e.g. IL or DL.

The Health care personnel within the primary or secondary Health systems should understand the importance of early referral to a well equipped unit for early diagnosis of the causes of Hoarseness of voice.

Trained ENT personnel i.e. clinical officers, distribution within the primary health care system could play a major role in reducing the long duration of chronic HOV.

A public awareness program to enlighten the public about voice disorders and especially chronic persistent dysphonia is recommended so as to avoid long delays before treatment and potential advancement of the causative pathology.

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APPENDIX I: CONSENT EXPLANATION

My name is Dr Kipinger. I am carrying out a research on chronic hoarseness of voice lasting two or more. The main aim of this study is to enable us find the causes and if any predisposing factors that result in a persistent hoarse voice. All information gathered shall be used solely for the purposes of medical research. You are at no obligation to either accept or refuse to be enrolled in this study. Your acceptance or refusal to participate in this study will in no way affect the management of your disease and that you shall not be discriminated

You will be enrolled upon giving consent and also allocated a study number. You will undergo normal History taking, Physical examination and Blood tests if you will be examined in theatre. The methods to be used in this study include indirect laryngoscopy, Flexible nasoendoscopy, Videostroboscopy and Direct laryngoscopy. The above examinations are done in the clinic using local anesthetic spray on the throat except Direct Laryngoscopy, which requires examination under general anesthesia in theatre. Biopsy for histology will be taken where applicable. The usual consent for examination under general anesthesia will be required. The risks are same as those of patients undergoing surgery. There will also be no added costs.

Data collected about your voice will be used under your study number and it will not appear in the final report. Please feel free to ask any questions which are not clear to you or may arise from my explanation above. If you wish, feel free to drop out this study at any stage.

If there will be any problems arising thereafter, feel free to report to ethical committee of Kenyatta National Hospital or the Head of Department. Sign the consent below if you wish to be part of this study.

APPENDIX II: CONSENT

IP NO.....

STUDY NO.....

I _____ of _____ Hereby consent to be included in the Hoarseness of Voice (HOV) study. This study shall include clinical examination, indirect and direct laryngoscopy, videostroboscopy and flexible nasoendoscopy where they apply, to find the cause of HOV.

I understand that all the information gathered shall be confidential and used solely for medical research. I am under no obligation to accept or refuse to be part of this study and that my decision shall in no way affect any treatment I may receive in this institution.

Signature of Patient / Next of Kin _____

Date _____ / _____

Signature of Doctor _____ Date _____ / _____

KukuBali kwa Mgonjwa / ama Mchungaji kwa utafiti wa Kupoteza sauti:-

IPNO _____

Nambari ya Utafiti _____

Mimi _____ Kutoka _____ Nina kubali kuwa mojawapo wa wagonjwa watakao husika na utafiti wa kupoteza sauti. Utafiti huu utahusu historia ya ugonjwa, uchunguzi wa daktari kwa kliniki na chumba cha upasuaji, na machini ya kuchunguza sauti kama inatajikana, kujua chanzo cha sauti mbaya.

Nimekubaliana kwamba matokeo yatatumwa kwa min ajili ya utafiti wa sayansi ya matibabu, na yatakuwa ya kibinafsi. Nime eleza pia ya kwamba kuhusika kwenye utafiti ni kwa hiari yangu mwenyewe na si kwa lazima. Ninaweza kujitoa kwenye utafiti wakati wowote na niendelee kupata matibabu kama wagonjwa wengine.

Sahihi ya Mzazi/Mchungaji/Mgonjwa _____

Tarehe _____

Sahihi ya Daktari _____ Tarehe _____ / _____

APPENDIX III: PATIENTS PROFORMA

A. SOCIO-DEMOGRAPHIC DATA.

1. Study No. _____
2. IP.No. _____
3. Sex. _____
4. Date of birth. _____
5. Usual Residence: Town _____
Location _____
Sub location _____
District _____
6. Marital status: Married _____
Single _____
Other _____
7. Education -nil _____
Primary _____
Secondary _____
Post-secondary _____
8. Occupation –Unemployed _____
Subsistence farmer _____
Trader _____
Profession. (Specify) _____

9. Level of voice usage: 1. Vocalist:

- Level I (Elite vocal performer) _____
Level II (professional voice user) _____
Level III (Non-vocal professional) _____
Level IV (Non-vocal non-professional) _____

2. Vocal Environment:

- I) Smokey _____
II) Dusty _____
III) Dry Air _____
IV) Noisy _____
V) Others (specify) _____

B. HABITS: -

10. Which of the following habits do you have?

- a) Take alcohol b) Chew tobacco/Smoke tobacco
c) Chew pan d) others (Specify) _____

11. If you drink

- a) What type of alcohol do you use?
i) Beer ii) Spirits
iii) Distilled local brew (chang'aa). iv) Un-distilled local brew (busaa)
b) How much do you drink each time (estimate)?
i) Bottles of beer ii) Tots of spirits
iii) Others (Specify)0
c) How long have you been drinking alcohol?
i) Months ii) Years

12. If you use tobacco

- a) What type of tobacco do you use?
i) Cigarettes ii) pipe iii) snuff
iv) Others (Specify)
b) How often do you use tobacco?
i) Daily ii) once a week
iii) Once a month iv) Occasionally
c) How much tobacco do you use (estimate)?
i) Number of cigarettes per day
ii) Number of pipes smoked per day
iii) Number of tins of tobacco per month
d) How long have you smoked?
i) Months ii) years

13. If you have habits other than tobacco and alcohol use

- a) Specify the habit you indulge in
b) Specify frequency

NB:

1 Unit of alcohol = 8gm = ½ pint of beer = 1 measure of spirit =1 glass of wine
: No. of pack years of smoking = No. of cigarette Sticks per day x duration in years / 20

C. KNOWLEDGE

14. How long have you suffered from this voice complaint?

- i) Weeks _____
- ii) Months _____
- iii) Years _____

15. How did you notice change in your voice?

- i) Self _____
- ii) Relatives/friends _____
- iii) Medical persons _____
- iv) Others (specify) _____

16. What did you think of the voice complaint when first noticed?

- i) Serious _____
- ii) Nothing serious _____
- iii) Others _____

17. How worse is your complaint since first onset?

- i) Better _____
- ii) Worse _____
- iii) Same _____

18. What are the associated complains?

- Pain _____
- Airway Obstruction _____
- Difficulty in swallowing _____
- Painful swallowing _____
- Pain while speaking _____
- Cough _____
- Neck Swelling _____
- Heart burns _____
- Retrosternal Pains _____
- Others _____

19. Do you have any past or present medical condition that could contribute to the onset of your complaint?

- Respiratory Diseases _____
- Allergies _____
- Neurological Disorders _____
- Thyroid dysfunction _____
- Hospitalization _____
- Surgical Episodes (Head/Neck) _____
- Medications and Drugs _____
- Trauma (Head/Neck) _____
- Gastrointestinal disorders _____

20. How long after onset of complaint did you seek medical assistance? (Specify)

- i. Days _____
- ii. Weeks _____
- iii. Years _____

21. Where did you go first for check up?

- i) Dispensary _____
- ii) Clinic/Health Center _____
- iii) District Hospital _____
- iv) Referral Hospital _____

22. If referred, after how long did you go?

- i) Days _____
- ii) Weeks _____
- iii) Months _____
- iv) Years _____

23. Did you come here on referral or on your own? _____

D.EXAMINATION

24. Indirect Laryngoscopy Findings _____

25. Flexible Endoscopic Findings _____

26. If done, EUA Findings _____

27. Videostroboscopic Findings as per attached rating form. (See appendix) _____

28. Diagnosis _____

APPENDIX IV: STROBOSCOPIC RATING FORM.

Name: _____ Date _____

Sex: _____

Voice Quality _____

1. Symmetry

1. Symmetrical _____

2. Asymmetrical

i. In Amplitude (+-) R < > L _____

ii. In Phase (+-) R < > L _____

2. Regularity (Periodicity)

1. Regular _____

2. Irregular _____

3. Inconsistent (sometimes regular, sometimes irregular) _____

3. Glottic Closure

1. Complete _____

2. Inconsistent (sometimes regular, sometimes irregular) _____

4. Amplitude

Right (1) Great (2) Normal (3) Small (4) Zero

Left (1) Great (2) Normal (3) Small (4) Zero

5. Wave

Right (1) Great (2) Normal (3) Small (4) Absent

Left (1) Great (2) Normal (3) Small (4) Absent

6. Non-Vibrating Portion

Right or left (1) None (2) Occasionally, Partially (3) Always, partially (4) Occasionally, entirely (5) Always, Entirely

7. Ventricular Folds

Hyper adduction

1. Present

2. Absent

8. Other Findings

1. None

2. Noted