A STUDY ON PREVALENCE OF HEARING IMPAIRMENT

AND

EAR DISEASES IN KELANTAN

By

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LISTS OF ABBREVIATIONS

CSOM	Chronic suppurative otitis media
Dry Perf of TM	Dry perforation of tympanic membrane
dB	Decibel
EB	Enumeration Block
ENT	Ear Nose Throat
LQ	Living Quarters
Lt.	Left
NICU	Neonatal intensive care unit
No.	Number
OAE	Otoacoustic emission
OME	Otitis media with effusion
ORL-HNS	Otorhinolaryngology - Head Neck Surgery
PTA	Pure tone audiometry
Rt.	Right
TRT	Tinnitus Retraining Therapy
WHO	World Health Organization

ABSTRACT OF DISSERTATION

ABSTRACT IN BAHASA MALAYSIA

Objektif

Objektif utama kajian ini adalah untuk menentukan kadar peratusan masalah pendengaran dan penyakit telinga di kalangan penduduk negeri Kelantan.

Metodologi

Kajian dilakukan secara keratan rentas di sembilan buah daerah dalam negeri Kelantan. Di setiap daerah, blok-blok penempatan atau mukim telah dipilih secara rawak yang meliputi kawasan bandar dan kampung-kampung. Dari setiap mukim, sebanyak 8 rumah kediaman telah dipilih juga secara rawak. Semua anggota rumah yang bersetuju untuk terlibat, akan ditanya soalan berkenaan masalah telinga dan pendengaran, dan diikuti dengan ujian pendengaran dan juga pemeriksaan telinga di kediaman masing-masing. Ujian pendengaran pula mempunyai dua peringkat. Ujian saringan pertama dengan alat "Otoacoustic Emission" dan yang kedua adalah ujian distraksi serta ujian "Pure Tone Audiometry" berdasar umur-umur yang tertentu.

Keputusan

Dalam kajian ini, seramai 502 peserta yang telah dilawati. Untuk masalah penyakit telinga, hanya 500 peserta yang berjaya diperiksa dan kadar peratusan penyakit telinga adalah **11.8%**. Tahi telinga tersumbat merupakan masalah

telinga utama diikuti oleh penyakit kronik supuratif otitis media. Manakala masalah pendengaran pula, hasil saringan ujian pertama, sejumlah 490 peserta yang diuji dan peratusan masalah pendengaran adalah **30.2%,** tetapi selepas menjalani ujian saringan kedua, sejumlah 484 peserta yang diuji, kadar peratusan menurun kepada **16.8%.** Masalah pendengaran dikalangan peserta berusia 50 tahun dan keatas merupakan masalah pendengaran yang utama diikuti dengan masalah pendengaran disebabkan oleh pendedahan kepada bunyi bising.

Kesimpulan

Hasil daripada kajian ini, menunjukkan bahawa sebilangan penduduk Kelantan menghidapi penyakit telinga dan masalah pendengaran dan perhatian yang serius perlu diberikan untuk mengatasi masalah ini. Diantaranya adalah pendidikan dan pengetahuan tentang cara-cara penjagaan telinga yang betul dan program-program untuk mengesan masalah pendengaran pada peringkat awal perlu ditekankan.

ABSTRACT

Objective

To determine the prevalence of hearing impairment and ear diseases in Kelantan.

Methodology

It was a prospective population based cross-sectional study. The study was conducted in the chosen subjects that based on two-stage stratified random sampling in nine districts in Kelantan. Enumeration blocks (EB) were selected from each district. Eight living quarters were selected from each EB. All households who live in the living quarters and consented to get involved in the study were screened for hearing impairment and ear diseases by using questionnaire, ear examination and audiological test at their house. Each participant was subjected to otoacoustic emission test. Subjects were then underwent behavioral test according to their age. The behavioral tests include distraction test and pure tone audiometry (air conduction only).

Result

A total of 502 participants were screened. For the ear diseases, 500 were able to be examined and the prevalence was 11.8%. Impacted wax was the most common ear disease found followed by chronic suppurative otitis media. Whereas for the hearing impairment, the prevalence based on OAE was 30.2% and this figure was reduced to 16.8% when the participants were screened with

behavioral tests. Presbyacusis was most common finding of the cause of hearing impairment followed by noise induced hearing loss.

Conclusion

Result from the study has shown that significant prevalence of ear diseases and hearing impairment among population of Kelantan and effort should continue even harder to tackle the problems. Providing education toward good ear care and screening program to detect hearing impairment as early as possible and thus early rehabilitation should be carried out.

Chapter 1

INTRODUCTION

1.0 INTRODUCTION

1.1 Introduction and literature review

Morbidity of deafness and hearing impairment are well known to the sufferer and common throughout the world but the condition remains to be a hidden problem. It is estimated that at least 250 million people have hearing loss globally which account about 4% of the world population (Kumar, 2001). Majority of them live in part of world which are the developing countries with limited facilities and resources needed for investigation, management and proper diagnosis.

Inappropriate health care, low education level, low socioeconomic status are all lead to the inability to cope with such a significant problems, hence cases were unidentified and poorly managed (Prasansuk, 2000). Those who suffer from malnutrition, ear infection, and poor knowledge of ear care would eventually develop hearing impairment and chronic ear disease. The condition went on unnoticed and untreated, will later on impair patient's ability or performance either at academic level, occupations and interpersonal relationship.

Furthermore, diminished ability to hear and to communicate is really frustrating, but the strong association of hearing loss with depression and functional decline adds further to the burden on individuals who are hearing impaired. This overall effect will have the impact on socioeconomic of oneself and also general population on wider spectrum.

In other hand, it is stressed that majority of the hearing impairment and ear diseases are avoidable or at least can be reduced from worsening if the proper screening and management could be carried out at initial stage of identification.

With regards to pediatric age group, deafness is a serious handicap especially if develop at birth or early life that can lead to social and communication isolation. It is considered as significant if the degree of hearing loss would have an impact on normal speech and language developments. Failure to detect moderate bilateral permanent hearing loss (> 40 dB) in early childhood may result in life-long deficits in speech, poor academic performance, personal-social maladjustment and emotional difficulties. For example, in Swaziland, from approximately 30000 children enrolling annually at school for the first time, 20% had drop out after only one year of schooling. This has been related to disability of hearing impairment (Swart et al, 1995).

Thus, early identification and rehabilitation can prevent such potential problems (Cunningham and Cox, 2003), (Olusanya et all, 2003). In United States of America, it has been estimated about 5000 infants are born with moderate to profound, bilateral hearing loss every year (Thompson et al, 2000).

It has been estimated around 126-500 thousand babies are born with a significant hearing loss and not surprisingly majority of them which up to 90% come from developing countries. Hearing loss becomes the most common congenital abnormality in newborn as compared to other condition which is

screened at birth. A 'critical phase' for the language development is seems to be important which range from birth until five years of age whereby for the first six months of life, normal hearing status is important for language acquisition. That is the reason to strongly emphasize of early detection of significant bilateral hearing loss in infants before three months of life which followed by appropriate management not later than six months of age (Olusanya et al, 2003).

Colorado Infant Hearing Advisory Committee in 2000 has proposed guidelines for infant hearing screening, audiologic assessment and intervention to assure the screened infants will receive an appropriate and timely follow-up. The two primary aims of the guidelines are to screen all newborns by the age of three months and to early intervene those diagnosed with hearing loss by the age of six months. A study conducted at their centre has shown that infants who were diagnosed and intervened by the age of six months are able to gain language milestone in the normal limits.

A programmed set up by the World Health Organization (WHO) for the Prevention of Deafness and Hearing Impairment aiming at the developing the technology, educating hearing care and protection, improving the services in order to prevent deafness and hearing impairment. Prevention programmes includes primary, secondary and tertiary prevention. In primary prevention, it is to prevent any risk factors or diseases that could impair the hearing status and ear itself. Whereas for secondary prevention, the aim is to prevent an already impaired hearing status from progressing to a disability. Lastly, tertiary

prevention aiming at preventing a disability progressing to a handicap and at same time providing rehabilitation to the patient (Anonymous, 1997).

The other aspect of hearing disability is the presence of tinnitus which could present as the only symptoms or with other ear symptoms. It is an auditory phantom sensation (ringing of the ears) experienced when no external sound is present. Majorities are associated with presbyacusis or noise induced hearing loss. Chronic tinnitus is more common among elderly (12% after age of 60) if compare to younger age group. Up to 3% in general population, the presence of tinnitus is adequate enough to disturb the quality of life by interfering with sleep, concentration at work and hearing itself (Eggermont, 2004).

On the other hand, for many people the tinnitus is a common and fleeting experience. Until recently, there is no medical therapy yet to cure tinnitus. Those with severe tinnitus could get help from an effective tinnitus management programme so called "Tinnitus Retraining Therapy" (TRT) that utilizes the combination of audiologic testing, directive counseling and usage of sound therapy to relieve the tinnitus (Tucker et al, 2004).

1.2 Definition of Hearing Impairment

Hearing impairment can be classified into conductive, sensorineural and mixed hearing impairment (combination of conductive and sensorineural hearing impairment). In the conductive type, it is usually caused by either

disease of external or middle ear. Common external ear diseases seen are impacted ear wax and otitis external whereas chronic suppurative otitis media (CSOM) being the most common causes of middle ear problem especially in children. Others are otitis media with effusion (OME) and dry perforation of tympanic membrane.

In these individuals, the pattern of pure tone audiometry will show an air bone gap of 10 dB or more and the bone conductive threshold will be normal. Majority of permanent hearing loss are of sensorineural type. This is related to the deformity of cochlear or retro cochlear. Commonly seen in elderly with presbyacusis, noise induced hearing loss, post viral infection or tumor such as acoustic neuroma. The air bone gap is 10 dB or less, and average bone conduction is greater than 25 dB. The difference between the two types is that the conductive type may be amenable to surgical intervention to correct the deformity and improved the hearing impairment. On the other hand, those with sensorineural types, the intervention merely rely on rehabilitation which centered on the use of hearing aid with intention to reduce the disability, whereas cochlear implant reserved for those with profound or total hearing impairment.

WHO has considered 'impairment' to be a measure of defective auditory function whereas 'disability' is the consequences of auditory problem experienced and complained of by the individual in performing basic tasks for example difficulty communicating in a noisy environment, meanwhile 'handicap' include the non-auditory consequences such of hearing impairment and hearing

disability would had impact on a person from doing a 'normal' role in daily life (examples: occupational, psychosociological and economical) (Anonymous, 1997).

According to WHO classification, the degree of hearing impairment has been design as such:

Degree of Hearing Loss	Decibel(dBHL)
Normal	0-25
Slight impairment	26-40
Moderate impairment	41-60
Severe impairment	61-80
Profound impairment including deafness	More than 80

Some center use a slight different value to classify the degree of hearing impairment for example, Hospital Universiti Sains Malaysia, Kelantan practice as below:

Degree of Hearing Loss	dBHL
Normal	0 - 25
Mild	26- 40
Moderate	41 - 70
Severe	71 - 90
Profound	> 90

The term "disabling hearing impairment" in adult means a permanent unaided hearing threshold level of 41 dB or more in better ear. While in children under 15 years of age is a permanent unaided hearing threshold level of 31 dB or more in the better ear. The average of four frequencies of 0.5, 1, 2 and 4 kHz, is to be taken as hearing threshold level.

1.3 Worldwide Prevalence of Hearing Impairment

In Malaysia, there is no data available to date with regard to the prevalence of hearing impairment and ear diseases. A study done by Noor in 2000 at district of Tumpat, Kelantan revealed around 18.76% prevalence of ear diseases and 17.31% of hearing impairment. In relation to ear diseases, impacted wax was the most common findings (14.82%) followed by chronic suppurative otitis media (CSOM) (4.74%). Others were otitis externa, dry perforation of tympanic membrane, otitis media with effusion (OME), acute otitis media, foreign body, auricular tags and congenital microtia (Noor, 2000).

A bigger data of the whole Kelantan, in fact Malaysia needed to be gathered so that an appropriate management or planning in bigger scale can be carried out properly to address the problems. Our neighborhood country, Thailand had their prevalence of sensorineural hearing impairment gathered through the country from 1988 until 1999 showing the rate around 3.5-5 %. It involved five different studies across the provinces in Thailand (Prasansuk, 2000).

A survey done among children in rural area of Southern India show a prevalence of CSOM at around 6% which include tubotympanic and atticoantral diseases (Rupa and Joseph, 1999). Another study in Saudi Arabia children show the prevalence of hearing impairment around 1.3% associated with CSOM (Siraj, 2001).

In Aboriginal people in Australia with the population of around 100,000 and children make up almost half the number, as many as 50% of them are suffering from CSOM hence high prevalence of conductive hearing loss. Otitis media usually started within three months of age which then progressed to CSOM in 60% of them and did not resolved throughout early childhood. This is due to difficult access to medical attention, low expectation of health and a complex biology that includes antibiotic resistant pneumococci (Coates, 2002).

Elderly population in all parts of world usually burden with the hearing impairment as natural ageing proses but the the presence of ear diseases were overlooked. In Nigeria, reviewed of 393 patients over 60 years of age for ear diseases revealed that impacted wax being the most common ear disease comprised of 34.4% followed by CSOM (8.8%). 88 patients has hearing loss which 71.6% had sensorineural type, 22.7% had presbyacusis, 1.1% had conductive type and 4.6% had mixed hearing loss (Foluwasayo et al, 2005).

In the South American region, Brazil has performed two National Campaigns of Deafness Prevention with the first campaign merely to educate

and provide information regarding problems of deafness and prevention strategies. During the campaign, 94,678 people taking part looking for information and 60,263 completely filled out questionnaires, and a surprisingly large number of abnormal examinations were found (63.37 %) and appeared very alarming at first view. In actual fact, significant numbers of the participants were hearing impaired (i.e., a total of 91.85% of those who submitted to a hearing screening), however it is probably due to the specific interest of hearing impaired persons searching for information.

The Ministry of Health has extended the compulsory vaccination against rubella to all children from 1 to 11 years old and to all women after childbirth. Furthermore, the vaccine against meningitis (Haemophilus influenzae) was also included in the national campaign of vaccinations, and review on the sales of ototoxic medications. The second campaign was to increase hearing education and awareness among school teachers concerning the hearing impairment in school children. Screening hearing test performed (using videotape test presentation of four animal pictures associated with four different frequencies) on 780,450 first grade students, resulted in a 33.85% failures who were then sent for complete audiological evaluation (Russo, 2000).

A large scale hearing impairment survey conducted in Sichuan, China of 126,876 subjects shows overall prevalence of 3.28%, out of that ageing has a higher prevalence of hearing loss up to 12.8%. As for the type of hearing loss, 73.03% were sensorineural, 20.395 were conductive and 6% were mixed

hearing loss. Presbyacusis, otitis media and genetic factor being the most common causes of the hearing impairment (Xue et al, 2001).

Children in rural Pakistan have an overall prevalence of hearing loss around 7.9% with 50% being conductive in nature. Acute and chronic otitis media being the most common ear disorders (Elahi et al, 1998).

1.4 Risk factors and causes of hearing impairment

Hearing loss can be caused by many conditions either local causes (due to ear diseases) or systemic diseases or part of any syndrome.

Causes of conductive hearing loss:

1. Chronic suppurative otitis media
2. Impacted wax
3. Acute or chronic otitis externa
4. Acute otitis media
5. Otitis media with effusion
6. Dry perforation of tympanic membrane
7. Cholesteatoma
8. Traumatic perforation of tympanic membrane
9. Otosclerosis
10. Ossicular chain discontinuity

Whereas risk factors or causes of sensorineural hearing loss can be classified into the cochlear and retrocochlear causes (Joint Committee on Infant Hearing, 1994):

The cochlear causes are:

1. Infectious: viral agents (mumps, rubella, measles, cytomegalovirus, herpes virus, mycoplasma pneumoniae, Lyme disease, toxoplasmosis, varicella zoster, Epstein-barr virus)
2. Traumatic: temporal bone fracture, inner ear decompression sickness, inner ear concussion, otologic surgery, perilymph fistula, lumbar puncture.
3. Systemic: Buerger's disease, slow blood flow of vetebrobasilar system, sickle cell disease, cardiopulmonary bypass, mitochondriopathy, red blood cell deformability, leukemia, myeloma.
4. Autoimmune diseases: polyarteritis nodosa, Cogan's syndrome, systemic lupus erythematosus, fheumatoid arthritis, Wgener's granulomatosis, relapsing polychondritis, temporal arteritis, dermatomyositis and polymyositis, scleroderma.
5. Endolymphatic hydrops, including Meniere's disease.
6. Metabolic: renal failure, diabetes mellitus, hypothyroidism.
7. Ototoxicity: aminoglycoside antibiotics, loop diuretics, salicylates, nonsteroidal anti-inflammatory drugs, vancomysin, erythromycin, azithromycin, oral contraceptives, interferon, quinine and derivatives, cisplatin.
8. Presbyacusis

Retrocochlear causes:

1. Meningitis
2. Sarcoidosis
3. Friedreich's ataxia
4. Guillain-Barre syndrome
5. Vogt-Kayonagi-Harada syndrome
6. Xeroderma pigmentosum
7. Tumours: acoustic neuroma, carcinomatous neuropathy, metastases in cebellopontine angle
8. Central deafness: Wallenberg's syndrome, cortical encephalitis, Alzheimer's disease

Other risk factors include:

1. A family history of hereditary childhood sensorineural hearing loss
2. Craniofacial anomalies including morphological abnormalities of pinna and external auditory canal
3. Births weight of less than 1500 grams
4. Severe depression at birth, which may include infants with apgar score of 0-3 at 5 minutes or those who fail to initiate spontaneous breathing by 10 minutes or those with hypotonia persisting to 2 hour of life
5. Hyperbilirubinaemia requiring exchange transfusion
6. Mechanical ventilation more than 10 days
7. Part of syndrome like Apert, Down's, Waardenburg, Pendred, Usher's syndrome
8. Prolonged noise exposure

Chronic otitis media, recurrent acute otitis media, otitis media with effusion and impacted wax are some of the common diseases associated with temporary hearing loss among infants, preschoolers and school children. A study of hearing impairment and ear diseases among 855 school children in rural area of South India revealed that the prevalence of hearing impairment of around 11.9%. It was higher in children with positive family history of hearing impairment as compared to those without and also in those born of consanguineous marriages.

CSOM being the most common causes of hearing impairment in those studied group with percentage of 28.6% followed by impacted wax with percentage of 16.5% (Phaneendra et al, 2002). A similar study carried out in Swaziland with sample size of 2430 school children, impacted wax being the most common cause of ear disease with prevalence of 7.4% followed by middle ear disorders of 3% prevalence.

Genetic also plays an important role that certain mutation in a single gene (monogenic forms) or a combination of mutations in different genes. Approximately 50% of cases are due to monogenic form of hearing loss. 0.1% of child born with prelingual hearing loss with half of them have genetically determined hearing loss. The patterns of inheritance are 75% autosomal recessive, 20% autosomal dominant and 5% X-linked. Post-lingual hearing impairment is more frequent than prelingual, affecting 10% of the population of years and 50% by the age of 80 years and have a multifactor inheritance (Willems, 2000).

A cross-sectional study of 2277 infants in Qatar to determine association of hearing loss and parental consanguinity has shown that hearing loss was more common in baby who's born to couple of consanguineous marriage. Out of 5.2% those with hearing loss, 60.5% have parental consanguinity compared to 25.3% those who not (Abdulbari et al, 2005).

Short stature has been linked to impose an impact on hearing impairment in sensorineural type. There is postulation that an event during fetal life will manifest later in adult life in certain disease. "Thrifty Phenotype Hypothesis" postulates that malnourished fetus makes metabolic adaptations in order to increase fuel availability to critical organs including maturation of cochlea. Study in Sweden among 495 male participants joining army, age 18 years old for the relationship of short stature (height 170 cm or shorter) and hearing loss. 46 (9%) participants were short statue. 68 (24%) of all participants had hearing loss majority with high frequency loss. Those with short stature has twice the possibility of hearing loss as compared to those of normal stature (Barrenas and Dahlgren, 2005).

Smoking has been linked with hearing loss. Active smokers were found to be 1.69 times more susceptible to have hearing loss compared to non smokers. It may exert it effect on antioxidative mechanisms or on the vasculature supply of the auditory system (Cruickshanks et al, 1998). Cigarrette smokes may aggravate certain diseases. Study has shown that in children with maternal smoking, there is higher prevalence of otitis media with effusion or recurrent otitis media.

Noise exposure either from recreational source or industrial of origin also has significant impact on the hearing impairment. The National Institute for Occupational Safety and Health estimates that more than 30 million workers are exposed to unsafe noise level at job place. Certain industrial area providing their workers with ear protectors, but the problem is there is no compliance to it. Exposure of up to 78 dB is safe to our ear but if the intensity is more than 80 dB and exposure is for eight hours or more per day, there will be significant effect on the ear to develop noise induced hearing loss.

1.5 Consequences of Hearing Impairment

Hearing is very important for acquisition of speech and language. The presence of hearing impairment in early age, the so called prelingual stage will retard the development of speech and language that later have significant impact on learning process and social life. Some of the parents sometimes tend to isolate their "handicapped" child and poor attention given to them compared to the normal siblings. This will lead to further social isolation. Poor understanding and parental refusal of accepting the fact that their child is hearing impaired made the early identification of problem delayed.

In those who acquired the hearing loss in later stage of life for example, post lingual stage, will found difficulties in doing the task that they are dealing with. In school children, the academic performance might be affected. If the parent did not realise the problem, they might be frustrated with the poor

academic performance. It is unfair if the child being scolded for inproper reason. This will lead to emotional difficulty to them. In children with treatable ear diseases, if this is not corrected or treated, it will lead to persistent hearing impairment and facing difficulties in adult life.

It is of much distressing to those with hearing impaired, if their job mainly dealing with other people, further more compounded by noisy surrounding. The delivered message will not be taken correctly; this in turn might affect the outcome of the discussion or any given task.

In certain job like army, factory workers or job with exposure to loud noise, the person are more likely to suffer noise induced hearing loss which goes unnoticeable in the earlier stage. But as the time goes on and the exposure persist, the hearing level will worsen. In severe cases, they may lose their job and this may jeopardize their socioeconomic status.

Having hearing impaired ear, difficulties will arise to communicate well with spouse or families. This also will exert emotional distress or sometimes quarrel between spouse, one blaming others being 'deaf'. This so common in elderly person with presbyacusis and worsen if compounded with ear disease that further lowering the hearing threshold.

1.6 The Important of screening programme

It is good to have an early identification of hearing impaired especially in young child with high risk, so that early diagnosis and intervention can be imposed. A screening programme should ideally identify the hearing impaired child as early as 3 months old and the intervention should be started as soon as 6 months old. But this ideal situation is difficult to achieve due to various reason. Poor parental understanding of complication of hearing impaired, stigma of having such 'handicapped' child, poor medical access and consultation due to poor economic background and many other reasons has been blamed to be a constraint to the achievement of this ideal situation.

It has been reported that one to two out of 1000 newborns suffers from either congenital or perinatally acquired hearing loss. This prevalence increased up to 10 to 50 fold in infant with risk factors. Those with moderate to severe bilateral hearing loss if goes undetected through the critical period of language acquisition within the first year of life, will result in a profound impairment of receptive, expressive speech and language development. Joint Committee on Infant Hearing has recommended screening all infants with risk factors during the neonatal period. This was the initial step that later followed by the universal hearing screening (Meyer et al, 1999).

The department of ORL-HNS of HUSM had carried out the task and challenge in performing a hearing screening of infants with risk factors in neonatal unit using the transient evoked otoacoustic emission on 401 babies.

The babies include those admitted to neonatal intensive care unit and also admitted for mild to moderate neonatal jaundice. The risk factors include exposure to ototoxic drug, hyperbilirubinaemia requiring exchange transfusion, birth weight less than 1500 grams, postnatal asphyxia, craniofacial anomalies, ventilated five days or more and syndromic babies. The prevalence of hearing impairment was 1% and the infant with the risk factor(s) were significantly associated with hearing loss. Therefore this early identification would help further intervention/treatment to reduce disability in later life (Mohd Daud et al, 2005).

The important of universal newborn screening cannot be over emphasized. The process of the screening has three separate components. Those components are 1) the birth admission screening, 2) the follow-up and diagnostic component done in the first week to three months of life after discharge and 3) intervention or rehabilitation services. There should not be any breakdown at any stage that would jeopardize the benefit to the child.

A few Texas hospitals have carried out such task on 52508 newborns over a period of three and half years. All were screened for hearing impairment using a physiologic test of auditory functions, either screening auditory brainstem responses or transient evoked otoacoustic emissions. 50721 had passed the screening, 1224 came for follow-up screening and it was found that 113 infants had sensorineural loss and estimated incidence of hearing loss in the screening was 0.3% (Finitzo et al, 1998).

There has been an effort to carry out hearing screening in primary care settings in children's aged between three and 19 years of age during a well-child visit. The Joint Committee on Infant Hearing not only advocates universal newborn hearing screening, but also recommends periodic hearing screening throughout childhood as an important means of detecting acquired hearing loss as well as congenital cases missed by inadequate or inaccurate newborn screening. Eights general practices in Birmingham and one in Tuscaloosa in Alabama had performed hearing screening on 948 children's using pure tone audiometers and the failures were those whose missed any frequency of 1000, 2000 or 4000 Hz in either ear at 20 dB level. 96 children's (10%) had failed the screening (Halloran et al, 2005).

1.7 Treatment and Rehabilitation

Upon identification and diagnosing of hearing loss in certain patients, an appropriate management needs to be planned. The treatment plans need to be individualized, so that the patient will be benefited most. For example, patients with hearing loss and at the same time had ear diseases which further worsen the hearing status, need to treat his ear condition first. Then the real value of hearing status can be appreciated. The understanding of the patients regarding the nature of hearing loss that they are suffering of should be sought out and treatment plan discuss and offer to patient.

For the newborn, as mention before, the presence of hearing impairment ideally should be identified as early as three months of age and intervention

started as early as six months of age. Majority of newborns with hearing impairment will have sensorineural type in nature. Many parents at initial stage could not accept that fact that their child is hearing impaired and the reality that the poor baby need to wear hearing aid too soon. The important of counseling and some time lengthy discussion with the whole family is a must. Not only the parents will involve in the rehabilitations, other members of the family should take part.

Young children's usually suffer hearing impairment in association with ear diseases such as CSOM, impacted wax and otitis media with effusion which is conductive type in nature. The treatment should be targeted to achieve disease free. The compliance to treatment should be emphasized to the child and parents. The parents and children need to be equipped with the knowledge of nature of the disease and the implication of hearing impairment on the school performance and social life.

Those with noise induced hearing loss sometimes did not notice the impairment that they are suffering from at the initial stage apart from symptoms of tinnitus. The fact that the condition will progress to sensorineural loss if there is no prevention taken. The affected individual should be advised the important of wearing an ear protection during work and regular hearing screening. They also need to be made understand the nature of their hearing status and the disease progression.

In elderly patients with age related hearing loss or presbyacusis, the need of hearing aid is depend on individual preferences. For those who not socially active, not seeing much people in daily activity, it is depend on personal needs, some does not border to be fitted with hearing aid. In some cases, even the level of hearing not much improved with hearing aid, it may offer some benefit in reducing the tinnitus experienced associated with presbyacusis. Those who outgoing, seeing a lot of people, engaged in business, social and religious activities, the help of hearing aid will be of some benefit.

Chapter 2

OBJECTIVES

2.0 Objectives

General:-

To study the prevalence of hearing impairment and ear diseases in Kelantan.

Specifics:-

1. To identify the causes of hearing impairment in Kelantan.
2. To determine the causes of ear diseases in Kelantan.
3. To determine the prevalence of tinnitus among adults aged more than 17 years old in Kelantan.
4. To correlate between ear disease and hearing impairment.

Chapter 3

METHODOLOGY

3.0 METHODOLOGY

This is a population based cross-sectional study. This is done as part of the National Hearing and Ear Survey for Malaysia and centralized under Institute of Public Health, Kuala Lumpur. This study was conducted for two months in April and May 2005 which covered nine districts in Kelantan.

3.1 Sampling method

A two-stage stratified random sampling was used. In the first stage, nine districts were selected in Kelantan and in each district, enumeration blocks (EB) were selected including urban and rural, both were randomly done. In the second stage, eight living quarters were randomly selected within the EB. This selection was done by the National Statistic Department based on the latest National statistic (2002). List of selected district as below:

District	No. of EB	
Bachok	1	Rural
Kota Bharu	3 1	Urban Rural
Machang	1	Rural
Rantau Panjang	2	Rural
Pasir Mas	1	Rural
Pasir Putih	1	Rural
Tanah Merah	1 1	Urban Rural
Tumpat	1	Rural
Kuala Krai	1 1	Urban Rural

3.2 Sample size

Sample size was randomly selected by the Probability Proportional to Size (PPS) method. It was calculated based on estimated prevalence of hearing impairment and level of confidence interval desired. The prevalence rate of disabling hearing impairment was estimated at 10% whilst those with severe or profound hearing impairment are 1%. The confidence interval is 95% with 5% level of precision. Based on the table of samples size for a confidence level of 95% provided by WHO protocol, at 1% expected prevalence, the worst acceptable prevalence can range between $\pm$0.31, sample size should be 3954. For a stratified random sample, the sample size is multiplied by the design effect: hence 3954 X 2= 7908.

Based on the non response rate of 20% for the National Health and Morbidity Survey II (1996), the sample is calculated at:

- 20% of 7908 + 7908 = 9490

This sample size is for the whole Malaysia for the National Survey.

For Kelantan, total number of sample size estimated will be as follow:

- There were 14 enumeration blocks (EB)
- Each EB will have eight selected Living Quarters (LQ)
- Each LQ was estimated to have an average of five family members
- Therefore the total number of sample size will be around

  14 x 8 X 5 = 560 respondents