



**UNIVERSITI PUTRA MALAYSIA**

***VALIDATION OF HEARING HANDICAP INVENTORY FOR  
ELDERLY SCREENING AMONG ELDERLY IN SEREMBAN,  
MALAYSIA***

**NORAINI BINTI CAMARUDIN**

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SCREENING AMONG ELDERLY IN SEREMBAN, MALAYSIA**

**By**

**NORAINI BINTI CAMARUDIN**

**Thesis Submitted to the School of Graduate Studies, Universiti Putra  
Malaysia, in Fulfilment of the Requirements for the Degree of Master of  
Science**

**November 2019**

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Master of Science

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**November 2019**

**Chair : Associate Professor Ir. Siti Anom Ahmad, PhD**  
**Faculty : Malaysia Research Institute on Ageing**

A diminished ability to hear and communicate with other individuals related to sensory-neural hearing loss among the elderly will lead to negative well-being, poor quality of life and increased risk of mortality. The importance of early detection of hearing impairment and further management from experiencing serious impact could increase their quality of life. Pure tone audiometry (PTA) is the formal audiometric and standard test used to assess the level of impairment of hearing with different frequency tests to classify the level of hearing. Alternatively, the Hearing Handicap Inventory for the elderly-screening (HHIE-S) is one instrument commonly used for hearing questionnaires aimed as a screening tool used to detect the level of hearing handicap by the elderly.

Although the original HHIE-S assessed social and emotional factors associated with hearing impairment, it has also been used to screen individual hearing levels. Limited accessibility to the hearing screening tool at the primer health care setting led the elderly with problem hearing impairment under detection. The limited number of PTA services in primary health care therefore the effective, sensitive, valid, basic and inexpensive hearing screening tools are required to detect hearing impairment in a large scale among elderly subjects in primary settings or hospitals where PTA tests are not available.

The aim of the study is to determine the validity of the use of the HHIE-S score for measured hearing handicap and compared with the PTA result. This is a cross-sectional study was carried out among the elderly aged 60 years and above randomly selected at Audiology Unit, in Tuanku Ja'afar Hospital, Negeri Sembilan between August and November 2018.

Respondents were consecutively selected based on the study inclusion and exclusion comprising socio-demographic characteristic, HHIE-S questionnaire. The PTA results from the best hearing taken from the patient report where the

procedure was done by an Audiologist. Logistic regression analysis was used to analyze the association between the variables. Total HHIE-S scores and the formal audiometric test were explored with sensitivity, specificity and predictive value, while the correlation coefficient combines HHIE-S scores and PTA test.

It involved 202 participants in this study by completing the questionnaire and doing PTA assessment. For the validity of the HHIE-S questionnaire, the HHIE-S score was compared with the PTA result the sensitivity was 87.9%, specificity was 78.4%, positive predictive value (PPV) was 80.3% and negative predictive value (NPV) was 86.6%. This study found the prevalence of hearing handicap measured by HHIE-S score was 75.7% and hearing impairment from PTA result was 81.7%. The HHIE-S score among the elderly were significant association with age, gender, usage of hearing aids for socio-demographic and the level of hearing impairment measured by PTA ( $r=0.704$ ,  $p<0.001$ ).

For the conclusion, this study highlighted the use of HHIE-S for hearing screening instruments for primary care prevention. The HHIE-S questionnaire appears a good screening instrument among the elderly with valid screening parameters when compared with the PTA. The advantages of the HHIE-S questionnaire as a screening tool can be used at the community level to detect the elderly with hearing impairment on a large scale. The HHIE-S questionnaire is recommended for use as a basic hearing screening instrument for elderly at the health clinic or hospital where PTA service is not available.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia  
sebagai memenuhi keperluan untuk ijazah Master Sains

**PENGESAHAN INVENTORI KECACATAN PENDENGARAN UNTUK  
Pemeriksaan Warga Tua dalam Kalangan Warga Tua di  
Seremban, Malaysia**

Oleh

**NORAINI BINTI CAMARUDIN**

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Kemerosotan kebolehpupayaan untuk mendengar dan berkomunikasi dengan individu lain akibat kemerosotan deria saraf pendengaran dalam kalangan warga tua akan membawa kepada kesejahteraan negatif, kurang kualiti hidup dan peningkatan risiko kematian. Kepentingan pengesanan awal kemerosotan pendengaran dan pengurusan selanjutnya daripada mengalami kesan serius akibat kecacatan pendengaran boleh meningkatkan kualiti hidup mereka. *Pure tone audiometry* (PTA) adalah ujian formal pendengaran dan piawai yang digunakan bagi menilai tahap kemerosotan pendengaran dengan ujian frekuensi berlainan untuk mengklasifikasikan tahap pendengaran. Alternatifnya, inventori kecacatan pendengaran untuk penyaringan warga emas (HHIE-S) adalah salah satu yang biasa digunakan untuk soalan kaji selidik sebagai alat pemeriksaan yang digunakan untuk mengesan tahap kecacatan pendengaran oleh warga tua.

Walaupun HHIE-S asalnya telah direka untuk menilai perkaitan antara faktor sosial dan emosi yang berkaitan dengan pendengaran, ia juga telah digunakan untuk pemeriksaan tahap pendengaran individu. Kebolehcapaian yang terhad terhadap alat pemeriksaan pendengaran di peringkat penjagaan kesihatan primer telah menyebabkan warga tua dengan masalah pendengaran di bawah pengesanan. Disebabkan oleh perkhidmatan PTA terhad dalam penjagaan kesihatan primer, oleh itu alat penyaringan pemeriksaan pendengaran berkesan, sensitif, sahih, asas dan murah diperlukan untuk mengesan ketidakupayaan mendengar secara besar-besaran antara subjek warga tua dalam perkhidmatan kesihatan primer atau hospital yang tidak terdapat perkhidmatan ujian PTA.

Tujuan kajian adalah untuk menentukan pengesanan penggunaan HHIE-S untuk mengesan kecacatan pendengaran dan dibandingkan dengan ujian PTA. Kajian ini merupakan satu kajian keratan rentas (*cross-sectional*) telah dijalankan melibatkan warga emas berusia 60 tahun dan ke atas secara rawak di Unit Audiologi, di Hospital Tuanku Ja'afar, Negeri Sembilan pada bulan Ogos hingga November tahun 2018.

Responden telah dipilih berdasarkan kriteria pemilihan dan pengecualian kajian. Data dikumpul menggunakan borang soal selidik berstruktur mengandungi ciri-ciri sosio-demografi dan soal selidik HHIE-S. Keputusan PTA daripada daripada tahap pendengaran terbaik yang diambil daripada laporan pesakit yang mana prosedur telah dilakukan oleh Audiologi terlatih. Analisis regresi logistik telah digunakan untuk menganalisis perkaitan antara pemboleh ubah. Jumlah markah HHIE-S dan keputusan ujian PTA telah diterokai dengan sensitiviti, spesififikasi dan nilai ramalan, manakala pekali korelasi menggabungkan markah HHIE-S dan keputusan ujian PTA.

Seramai 202 orang peserta telah terlibat dalam kajian ini dengan melengkapkan soalan kaji selidik dan melakukan ujian PTA. Untuk pengesahan soal selidik HHIE-S, skor HHIE-S telah dibandingkan dengan keputusan PTA, sensitiviti adalah 87.9%, spesifisiti adalah 78.4%, nilai ramalan positif (PPV) adalah 80.3% dan nilai ramalan negatif (NPV) adalah 86.6%. Kajian ini mendapati prevalen kecacatan pendengaran berdasarkan skor HHIE-S adalah 75.5% dan kerosakan pendengaran daripada keputusan PTA adalah 81.7%. Skor HHIE-S dalam kalangan warga emas mempunyai hubungkait signifikan dengan umur, gender, penggunaan alat bantuan pendengaran bagi sosio-demografi dan tahap kemerosotan pendengaran yang diukur berdasarkan keputusan PTA ( $r = 0.704$ ,  $p < 0.001$ ).

Sebagai kesimpulan, kajian ini mengemukakan penggunaan HHIE-S untuk instrumen penyaringan pendengaran bagi jagaan pencegahan primer. Soal selidik HHIE-S menunjukkan instrumen saringan yang baik, berkesan dan sah untuk pengesanan kemerosotan mendengar dalam kalangan warga tua dengan parameter keputusan adalah sah apabila dibandingkan dengan keputusan PTA. Kelebihan penggunaan soal selidik HHIE-S sebagai alat penyaringan yang boleh digunakan di peringkat komuniti untuk mengesan warga emas dengan kecacatan pendengaran dalam skala yang luas. Soal selidik menggunakan HHIE-S disarankan untuk digunakan sebagai instrumen penyaringan asas bagi penyaringan pendengaran di Klinik Kesihatan atau Hospital yang tiada kemudahan perkhidmatan PTA.

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

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## LIST OF ABBREVIATIONS

ARHL	Age-related hearing loss
ASHA	American Speech-language-hearing Association
CVD	Cardiovascular disease
dB	Decibel
DOSM	Department of Statistic Malaysia
HHIE	Hearing Handicap Inventory for The Elderly
HHIE-S	Hearing Handicap Inventory for The Elderly-Screening
HL	Hearing loss
ICC	Intraclass correlation coefficient
IQR	Interquartile range
ISO	International standard organization
MOH	Ministry of Health
MREC	Medical Research and Ethic Committee
ORL	Otorhinolaryngology
PTA	Pure tone audiometry
QOL	Quality of life
ROC	Receivers operating characteristic
SNHL	Sensory-neural hearing loss
TFR	Total fertility rate
TJHS	Tuanku Ja'afar Hospital, Seremban
UPM	University Putra Malaysia
WHO	World Health Organization

## CHAPTER 1

### INTRODUCTION

The proportion of people aged 60 years and above (older people) is increasing rapidly in the world's population, because of increased longevity and general population growth (United Nations, 2015). Malaysia as one of the developing countries is also experiencing rapid growth of the aged population. It is reported in the 2010 Census of Malaysia that 9% of the population are those aged 60 years and above. The estimated Malaysia population in 2020 is at 33.8 million with an annual population growth rate of 1.1% (Department of Malaysia statistic, 2019). The percentage of 65 years and over (old age) population increases from 2.00 million (6.3%) in 2017 to 2.10 million (6.5%) in 2018. This number has shown to increase by over 50% from the last 10 years in 2000 and is estimated to be more than double in 2020 (Hamid, 2015; Department of Statistics Malaysia, 2015). Department of Statistics Malaysia (2015) report for the past few decades this scenario is associated with increased life expectancy at birth in Malaysia (Rosli, Chan, Kadir, & Hamid, 2019) from 63.3 years in 1970 to 74.8 years in 2010.

Increased in the proportion among the aged group will lead to an increase in the associates most of elderly people with acute and chronic condition medication usage because of physiological changes of the ageing body system (Rosli et al., 2019; Lim et al., 2017; Fried et al., 2014). Hearing impairment or hearing loss is a concern because it is one of the related health problems among the elderly (Kady & Mohmoud, 2012). The most probable cause of hearing impairment in the elderly is age-related hearing loss and is caused by degenerative sensory cells. Sensorineural hearing loss (Bagin et al., 2014) or aged related hearing impairment is common of hearing impairment (Gopinath et al., 2017) because of degenerative processes among the elderly population.

It is a common feature in aged people and is characterized by a decline in auditory function (Yamasoba et al., 2013) such as poor frequency resolution and increased hearing threshold. The frequency of presbycusis changes as age increases in the different regions of the world (Bajin et al., 2014). The hearing impairment incidence is expected to increase geometrically with an increase in life expectancy (Lim et al., 2013) and the longevity of ageing populations, the number of people who suffer from the hearing impairment will increase (Öberg, 2016) in the coming decade.

They will undertake efforts; it includes the term quality mentioned as healthy and productive ageing. This quality will be achieved when the elderly can choose their own lifestyle. Based on the preference of the elderly to remain because of the independent lifestyle and common environment that creates peace in their heart, safety is the crucial issue that needs to pay attention. Diminished ability to good hearing and communication affects the individuals (Gopinath, Liew,

Burlutsky, McMahon & Mitchell, 2017) such as frustrated for their own self and other people in their environment. Hearing loss is also associated with many adverse effects like low self-esteem, poor quality of life, lack of family support and negative well-being.

## **1.1 Problem statement**

Hearing impairment is a global problem of the world population (Bagin et al., 2014) among the elderly especially because of the degenerative process. Approximately one-third of persons above 65 years (Shetty & Subanna, 2015) will be affected by disabling hearing loss (World Health Organization, 2015). Hearing impairment is concerned because of its impact on their safety, quality of life and ability to live independently. According to Mikkola et al. (2016) the diagnosis and treatment of hearing impairment may require several visits to different health care professionals, such as a general practitioner, otorhinolaryngology department and audiologist unit. The elderly or those with hearing loss, the condition remains undiagnosed, and even after diagnosis does, they have shown the hearing aids to be efficacious for sensory neural stimulation in the rehabilitation of hearing loss by successfully improving speech ability, good communication, and increased quality of life (Alfakir, Holmes, Koricos, Geeta & Martin, 2015).

Not all elderly realize that their hearing ability has reduced and are slowly adapting to their reduced ability, thinking that it is normal. Only when their hearing impairment becomes very severe and affects certain aspects in life, then make them realize the problem and perceived as hearing handicap prior seeking intervention. The hearing difficulty experienced by elderly must be identified and may use the hearing screening for further management of need and for better quality of life. By identifying psychosocial factors that will affect the hearing handicap among elderly people, especially those who have a certain level of hearing impairment and are struggling to cope with it to continue their normal daily lives, this study will contribute the convenience instrument to screen the elderly with hearing disability.

This study is so important to explore the need for a screening tool that is less costly and time effective, and comparable to a gold standard diagnostic procedure. We can use more advantage the screening tool in the community to increase the coverage, effective, and friendly to elderly. An effective and simple hearing tool can detect the elderly with hearing impairment on a large scale in the short of a time for further management to improve life quality.

Despite the negative impact of hearing impairment on the overall quality of life and the importance to early identify the hearing impairment among the elderly in universal elderly hearing screening among Malaysian population remains limited. The early detection of hearing impairment among elderly in Malaysia is still limited because of the possibility of limited facilities for hearing assessment, less awareness among the community and health care providers towards

hearing health care among elderly. The limited and less accessibility hearing screening tool in primary care has led the elderly with hearing impairment to under detection. Although the World Health Organization (2013) estimates that about 33% of adults older than 65 years old suffer from disabling hearing loss.

The pure tone audiometry (PTA) facility is a gold standard to assess the hearing threshold which the different frequencies tested to classify the level of hearing impairment (Calviti & Pereira, 2009) and only available in a few tertiary hospitals. The people with hearing impairment will refer to the early and effective intervention to reduce the risk of hearing handicap. This phenomenon needs a health care provider in a primary care setting aware of the importance of hearing health to detect hearing impairment among the elderly in the community. The effective, sensitive, valid, basic and inexpensive hearing screening tool is required in primary care because of the limited PTA services to detect hearing impairment in a large scale among elderly subjects which PTA test is not available. Therefore, screening and intervention guidelines should be developed in our country to improve hearing impairment management in elderly (Bagin et al., 2014).

As the WHO explains, many people with hearing loss may benefit from early detection and intervention (Ibid). In old ages, to lessen the disability burden of hearing loss, secondary and tertiary prevention approaches are more important compared to primary prevention (Bagin et al., 2014; Shalin, Basar & Glavin, 2012). The hearing impairment benefits from early identification, the problem can be corrected with effective intervention like hearing aids, assistive devices and cochlear implant, captioning and sign language training (WHO, 2013). Other forms of education and social support can be useful to address hearing loss. Using hearing aids is associated with an improvement in physical, emotional, mental (Ramdoo, Bowen & Dale, 2014) and social well-being (Gopinath, et al., 2017). According to Punch, Hitt & Smith (2019), Hearing handicap generally increases with increased hearing impairment. Hearing handicap may vary, depending on the attitudes and perception of the affected individual and those whom he or she interacts, and on the demand placed on one's ability to hear and understand speech in daily life. Findings from this research can provide baseline data for a more extensive study in the future. Measurement used can also be further developed and upcoming studies.

## **1.2 Significance of the Study**

Despite the higher estimation prevalence hearing impairment among the elderly in Malaysia, there were limited resources literature reported the prevalence of hearing impairment. This is because there was no specific hearing screening tool to assess and detect the hearing impairment in the elderly in a large-scale population. The psychosocial test such as the self-outcome instrument will provide more information related to a patient's quality of life resulting from the challenges of living with untreated hearing impairment because the true experience of the individuals is subjective and cannot be measured objectively through laboratories or machines.

Relevance these studies to the elderly hearing screening because of the high estimation of hearing impairment, also considering the negative impact of psychosocial safety and to live independently. The valid, simple, inexpensive and elderly hearing screening tool required to detect early the elderly with a hearing impairment. These will help to identify elderly people who would benefit from hearing evaluation with potential hearing treatment and eventually can improve quality of life. Hopefully, with these appropriate measures can be taken to cope with their hearing impairment, preventing it from becoming worse.

### **1.3 Research question**

1. Do socio-demographic factors and the hearing handicap associate with hearing level among the elderly?
2. What is the prevalence of hearing handicap and hearing impairment among the elderly?
3. Is there an association between socio-demographic and hearing handicap among the elderly?
4. Is there an association between hearing handicap and hearing impairment among the elderly?
5. What is validity in HHIE-S scores to differentiate between normal and hearing impairment by PTA?

### **1.4 Research Objective**

#### **General objectives**

The study aims to validate the Hearing Handicap Inventory for the elderly-screening (HHIE-S) questionnaire for hearing handicap compared with pure tone audiometry (PTA).

#### **Specific objectives**

1. To describe socio-demographic, HHIE-S score and PTA results among elderly.
2. To determine the prevalence of hearing handicap and hearing impairment among the elderly.
3. To determine the association between socio-demographic and HHIE-S score.
4. To determine the association between HHIE-S score and PTA result.
5. To validate HHIE-S and its relationship with PTA for the detection of hearing impairment among the elderly.

## **1.5 Research Hypothesis**

### **Null hypothesis**

1. There is no association between socio-demographic characteristics with perception towards hearing handicap amongst elderly subjects.
2. The perception of hearing handicap among the elderly has no association with the level of hearing impairment.

### **Alternative hypothesis**

1. There is an association between socio-demographic characteristics with hearing handicap amongst elderly subjects.
2. The hearing handicap among the elderly has an association with the level of hearing impairment.

## **1.6 Definition of Terminology**

### **An older or ageing population**

Mean people aged 60 years and older.

### **Age**

We will divide the respondents aged into Sexagenarian (60–69 years old), Septuagenarian (70–79 years old) and Octogenarian and above (80–89 years old and above).

### **Gender**

We divide the gender of the respondent into male and female.

### **Race**

The race of the respondent was divided into Malay, Chinese, Indian and others.

### **Educational level**

The educational level will be divided into no formal education and primary; no formal education; refer to persons who have never attended school in any of the educational institutions that provide formal education (Riyanti et al., 2014). Primary; refers to those whose highest level of education attained is from standard 1 to 6 or equivalent. Secondary; refers to those whose highest level of

education attained is from form 1 to 5 (including remove class), General Certificate O level or equivalent and includes basic skill programs in specific trades and technical skill, tertiary; refers to those whose highest level of education is above form 5. The race of the respondent was divided into the Malay, the Chinese, Indian and other.

### **Locality of residence**

The geographical area of the client, where urban refers to municipal areas or area includes towns and township. On the other hand, rural areas include villages or 25 kilometers from town.

### **Marital status**

One situation with regard to whether one is single, married, separated, divorced or widowed. Single is a person who never got married in a concordance with valid regulations. A married people are those who got married and widowed persons whose marriage ceased to exist by the death of one of the spouses or by declining a missing spouse dead respectively. While a divorced person is, those marriages were terminated.

### **Living situation**

With whom a patient life such as roommates, family members, as well as how many they live with.

### **Employment status**

The state of a worker in a company on the basis of the contract of work or duration of time of a working hour like employed, unemployed or government retired.

### **Health insurance coverage**

Insurance that covers the whole or a part of the risk of a person incurring medical expenses includes insurance for loosening from accident, medical expense, disability, accidental death and dismemberments.

### **Hearing aids usage**

An electronic usually worn in or behind the ear of a hearing-impaired person for amplifying sound.



## **Level of hearing loss**

Level of hearing loss based on WHO grading of hearing loss and divided into a mild hearing loss (26-40 dB), moderate hearing loss (41-60 dB), severe hearing loss (61-80 dB) and profound hearing loss (more than 81 dB) (Tarafder, Akhtar, Zaman & Rasel, 2015; Sjahalam-King & Newal, 2016).

## **Hearing handicap**

Hearing handicap means the effect of hearing impairment on the emotional and social aspects (Ventry, 1982) of an affected individual, which contribute to the restriction of the individual's participation in daily life activities as well the impact on family relationships and social interactions (Selvidoni & Conterno, 2017).

## **1.7 Report Organization**

This research was divided into several chapters.

### **Chapter 1: Introduction**

This chapter discusses the overview of the research project including problem statements, significant of the study and research objectives.

### **Chapter 2: A literature review**

This chapter reviewed the literature of the general workflow of hearing screening. The review will recover the HHIE-S score and PTA result to detect hearing impairment among the elderly.

### **Chapter 3: Research method**

This chapter has discussed the sequence of a major study, research design, and the summary of statistical analysis used to achieve the research aim.

### **Chapter 4: Result and Discussion**

In this chapter, associating HHIE-S with socio-demographic and PTA results, a correlation between HHIE-S score and PTA result was explored.

### **Chapter 5: Conclusion**

This chapter summarizes what was a major finding in this research project. This chapter discussed the limitation and recommendation for the future research project.

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