



UNIVERSITI PUTRA MALAYSIA

***PREVALENCE AND FACTORS ASSOCIATED WITH DIZZINESS AND
IMBALANCE AMONG ELDERLY WITH HEALTHY AGEING IN
MALAYSIA***

GROUP 20

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PREVALENCE AND FACTORS ASSOCIATED WITH DIZZINESS AND IMBALANCE AMONG ELDERLY WITH HEALTHY AGEING MALAYSIA

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ABSTRACT

Background: Dizziness is a common complaint during a healthcare visit in the emergency department as well as outpatient clinics. It is defined as various sensations of body orientation and position that are frequently difficult to be described by patients, whereas imbalance can be described as the feeling of instability while being seated, standing, or walking without a specific directional preference. Dizziness can be further classified into vertigo, presyncope, disequilibrium and lightheadedness. It has been a burden for some people as it may affect their daily life and often leads to fall, especially in elderly above 60 years old. It also increases the risk of fracture, restricts mobility, depression, anxiety and even death in elderly. Based on previous studies, the prevalence of dizziness and imbalance in elderly is high in people aged more than 60 years old, in women, Chinese as well as those with low education levels. In addition, comorbidity factors such as diabetes, stroke and hypertension are seen to be more prominent to get dizziness and imbalance.

Significance of study: Previous cross-sectional studies have been carried out to measure the prevalence of dizziness and imbalance among the elderly which found that the prevalence has the tendency to increase with age. Thus, setting forth into this study in order to determine the factors associated with dizziness and imbalance amongst the healthy-ageing elderly population.

Methodology: This is a cross- sectional study where online questionnaires will be distributed to the members of University of Third Age (U3A), Malaysia. We included all elderlies above 60 years old that have the ability to use smartphones or email, and are able to understand English language or Bahasa Melayu. AMER Dizziness Diagnostic Scale (ADDS) and Activities- specific Balance Confidence (ABC) Scale are used in our study where it helps with the differential diagnosis and assessing the confidence level in elderly respectively. These questionnaires are converted into Google Form and will be distributed to our targeted population via online platforms. The statistical software, Statistical Package for Social Sciences (SPSS) version 25.0 (SPSS Inc.,Chicago, IL, USA) will be used to analyze all the data collected and extracted in this study. Data will be expressed as mean $\pm$ standard deviation. Mann-Whitney-U and Kruskal-Wallis are used as a test to perform comparison between independent variables (age, gender, and race) and dependent variable (prevalence of dizziness and imbalance in healthy ageing elderly and level of functioning of elderly).

Results: Out of 200 respondents, the prevalence of dizziness and imbalance among elderly was 63.5%. There is a significant association between hypertension and neurological problem with the ADDS Questionnaire while ABC Scale is also significantly associated with sociodemographic factor 'race'. We also found that dizziness and imbalance have an impact on level of functioning among elderly ($p < 0.05$).

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CHAPTER 1

INTRODUCTION

1.1 Background

1.1.1 Dizziness and Imbalance

Dizziness and imbalance is a very common complaint received by the clinicians regardless of their age and it has been a burden for some people as it may affect their daily life and often leads to fall. This can be very dangerous as it increases risk of fractures, functional disability, stroke and even death, especially in elderly. The word dizziness can be defined as various sensations of body orientation and position that are frequently difficult to be described by patients (Sloane et. al., 2001). Whereas imbalance can be described as the feeling of instability while being seated, standing, or walking without a specific directional preference. In 1989, dizziness was one of the most common symptoms that accounted for over 5.6 million clinic visits in the United States of America (Hoffman et. al., 1999). Based on a survey that has been done, there are 15% to 30.78% of patients who experience dizziness that is severe enough to seek medical attention, and most of them are often women as well as elderly.

In addition, dizziness can be generally categorised either by symptoms or its aetiologies. Drachman and Hart proposed a “complaint-oriented” approach, where they classified dizziness as vertigo, presyncope, disequilibrium and lightheadedness. Furthermore, the aetiologies of dizziness are complex and multifactorial, which can be caused by disorders in various systems. For example, vestibular disorders account for 4% to 64% of cases, 0% to 70% of cases were identified due to cerebrovascular causes and psychiatric causes contributed for 0% to 40% of the cases. Therefore it is important for clinicians to understand, evaluate and carefully diagnose dizziness according to history and physical examinations.

1.1.2 Definition of Elderly

Ageing is a process of becoming older with a decline in biological functions and loss of adaptation to metabolic stress. It is a lifelong process of cellular, organ and whole body level growing older throughout the lifespan (Naja, S. et. al., 2017). According to the World Health Organization (WHO), the age of 65 years old is defined as 'elderly' in most developed countries. Elderly can be classified into three different groups; young old (65-74 years old), middle old (75-84 years old) and oldest old (more than 85 years old). Whereas in Malaysia, the elderly is defined as those who are 60 years old and above, where the cut-off edge adopted by the United Nations (Noor'ain et.al, 2017). The changes in age structure due to decline in fertility and rise in longevity contribute toward the ageing of the population in Malaysia though the population is still relatively young as compared to those in developed countries. Malaysia's population in 2019 is estimated at 32.6 million where 6.7% are constituted by elderly at 65 years and older (Mohd Uzir Mahidin, 2019).

It is everyone's dream to have a longer life expectancy with great health and to be fit to have a productive life in their old age. With recent advances in medical and health sciences, the average lifespan has increased rapidly. 'Healthy ageing' has become a major concern in given current and prospective demographic changes. According to the World Health Organization (WHO), healthy ageing is defined as a process of developing and maintaining functional ability which allows wellbeing in older age. WHO further adds that functional ability is having the ability to meet their basic needs, to learn, to make and maintain relationships and able to give contributions towards society. In addition, functional ability comprises intrinsic capacity (mentally and physically healthy) as well as environmental factors that include home, community and broader society. Living in an environment that is able to sustain and maintain intrinsic capacity and functional ability is said to be the key to 12 healthy ageing. Another

definition of healthy ageing is a lifelong process of optimising the opportunities to improve and preserve health and physical, social and mental wellness, independence, quality of life and enhancing successful life-course transitions (Nancye, Helen and Roderick, 2004).

1.2 Problem Statement

In the older population, dizziness and imbalance is an extremely common problem. In comparison with younger persons, dizziness in older people is not only more frequent but it is also more persistent, has various possible causes, is unlikely due to a psychological reason and is more disabling (Davis. L, 1994).

Previous cross-sectional studies have been carried out to measure the prevalence of dizziness and imbalance among the elderly which found that the prevalence has the tendency to increase with age. For example, in the United Kingdom, 30% of people older than 65 years of age were reported to have dizziness (Colledge et. al., 1994). While in another study done in Sweden, the number of adults with dizziness climbed to nearly 50% in people past 85 years of age (Jonsson et. al., 2004).

According to the World Health Organisation (WHO), the elderly population has reached about 600 million and the rate is expected to double by 2025 and by 2050, it may reach 2 billion. This problem is a growing public health concern due to the fact that elderly people suffering from dizziness are at substantially higher risk of unexpected falls and consequent injuries.

In a previous study, it was reported that falling incidents occur in nearly 28-35% of people aged 65 years and above each year (Herman et. al., 2011). Other than falls and other fall-related injuries such as hip fractures, dizziness is also often associated with a sedentary disease lifestyle

due to limited mobility and reduced emotional and physical quality of life in elderly (Moraes et. al., 2011).

Though there have been multiple research studies conducted in analysing vertigo and dizziness patients within the clinical settings, there has not been a lot of studies conducted on the prevalence of dizziness and imbalance in healthy-aging adults, especially in Malaysia.

1.3 Significance of study

Thus, setting forth into this study in order to determine the factors associated with dizziness and imbalance amongst the healthy-ageing elderly population. Getting this comprehensive and reliable data would enhance understanding and potential management of dizziness issues among health professionals and even among community members. This study will also help to highlight the key elements that can help to develop interventions and programmes to improve the quality of life among elderly in Malaysia. It would be beneficial not only to the respondents, but also to the community and also to the country.

1.4 Research Questions

1. Do sociodemographic characteristics (age, gender, and race) among healthy ageing elderly have any association with the development of dizziness and imbalance?
2. Does the comorbidity of underlying causes (diabetic, hypertension, and neurological disorder) have any association with the development of dizziness and imbalance?

3. Does dizziness and imbalance affect the daily activities of the healthy ageing elderly based on the ABC Scale?

1.5 Research Objective

1.5.1 General Objective

To determine the prevalence of dizziness and imbalance and its associated factors in healthy ageing elderly.

1.5.2 Specific Objective

1. To study the sociodemographic characteristics (age, race, and gender) among healthy ageing elderly.
2. To study the prevalence of dizziness and imbalance among healthy ageing elderly.
3. To study the association between the sociodemographic characteristics (age, gender, and race) with the prevalence of dizziness and imbalance among healthy ageing elderly.
4. To study the association between comorbidity (diabetes, hypertension, and neurological disorder) with the prevalence of dizziness and imbalance among healthy ageing elderly.
5. To study the impacts of dizziness and imbalance on daily physical functional activity level.

1.6 Research Hypothesis

1.6.1 Null hypothesis:

There is no significant association between sociodemographic characteristics (age, gender, and race) and comorbidity of underlying causes (diabetes, hypertension and neurological disorder) with the prevalence of dizziness and imbalance among healthy ageing elderly.

1.6.2 Alternative hypothesis:

There is a significant association between sociodemographic characteristics (age, gender, and race) and comorbidity of underlying causes (diabetes, hypertension and neurological disorder) with the prevalence of dizziness and imbalance among healthy ageing elderly.

CHAPTER 2

LITERATURE REVIEW

2.1 Definition of dizziness and Imbalance

Dizziness is a common symptom that is experienced by patients in all ranges of age, be it teenagers, young adults and elderlies. The term dizziness is described as a non-specific complaint of unsteadiness and imbalance which may have originated from disorders of various systems including peripheral vestibular system, central nervous system, cardiovascular system as well as drugs (Philip and Prepageran, 2009). Patients may refer to the sensation as giddiness (rotational sensation), light-headedness, loss of balance and feelings of fainting. Another definition of dizziness, which is defined as sensation of disturbed or impaired spatial orientation without a false or distorted sense of motion (Newman- Toker and Edlow, 2015).

On the other hand, imbalance can be described as the feeling of instability while being seated, standing, or walking without a specific directional preference. This is also known as disequilibrium. In the United States, dizziness is the third most common complaint among outpatients, and 80% of these cases require medical intervention due to its severity.

Dizziness is more to a symptom rather than a disease and it is one of the most challenging symptoms in medicine. It is difficult to define and it is a challenge to precisely diagnose it as it can be caused by wide range. Therefore, it is very crucial to know the type of sensation the patient is feeling in history taking. Philip, Remy, Rainer and John (2001) in their articles “Dizziness: State of Science” states that dizziness can be subdivided into four categories (vertigo, disequilibrium, presyncope and light- headedness) and this may assist in the differential diagnosis.

2.1.1 Vertigo

Vertigo is a false sensation of motion where patients may feel that their body is moving. This is called a hallucination of movement, where most of the time it is typically rotary movement. Samuels and Harris (2013) suggests that this type of dizziness occurs due to abnormalities or disruption in the vestibular system that is responsible to keep the central nervous system informed of the head's position in space, its relation to the gravitational forces and its accelerations in various planes.

2.1.2 Disequilibrium

Disequilibrium is defined as a sense of imbalance (postural instability) that is primarily felt in lower extremities without a sensation in the head (Phillip, Remy, Ralner and John, 2001). The authors further add that it is most prominent when standing or walking and relieved when sitting or lying down. Elderly patients usually experience this as the ageing process causes multiple sensory deficits that impair the balance system. Other causes of disequilibrium may include peripheral neuropathy, musculoskeletal disorder, gait disorder and Parkinson disease. In addition, poor vision may also accompany the feeling of imbalance. The risk of ataxia increases with the usage of benzodiazepines and tricyclic antidepressants in elderly (Robert and Lori, 2010).

2.1.3 Presyncope

Presyncope is often described as a sensation of impending faintness and loss of consciousness. James, Nissa, Hajira and Shama (2020) states that causes of presyncope can include cardiac and non-cardiac aetiologies. Most adults usually experience this after rapidly standing from lying or sitting position. The authors further add that cardiac causes can be due many diseases such as myocardial infarction, cardiac arrhythmias and carotid sinus syndrome whereas most common non-cardiac causes are like orthostatic hypotension and medication induced. Robert and Lori (2010) suggests that a variety of cardiovascular medications increase the risk of orthostatic hypotension in older persons, including reserpine (at doses greater than 0.25 mg), doxazosin (Cardura), and clonidine (Catapres).

2.1.4 Light-headedness

Non-specific lightheadedness involved vague symptoms like giddiness and a feeling of disconnectedness to the environment. This form of dizziness is the most common within patients. Lightheadedness often is caused by a momentary drop in blood pressure and blood flow to the head, or it can also occur due to hypoglycemia, allergies, anxiety, dehydration as well as alcohol and tobacco consumption. Another crucial factor that can lead to light-headedness is hyperventilation. Although this condition can be associated with anxiety disorders, hyperventilation can also be experienced by many patients without anxiety. Hyperventilation is defined as breathing in excess of metabolic requirements which causes respiratory alkalosis and lightheadedness (Robert and Lori, 2010).

2.2 Causes of Dizziness and Imbalance in the Elderly

2.2.1 Central and Peripheral Causes of Dizziness and Imbalance

Dizziness and vertigo can be said as the most common complaints to be told by the patients who present with different types of diseases and mostly patients who are 60 years and older which are the elderly category, experience these symptoms and are quite severe until it affects their daily activities. Kanashiro *et al* in 2014 conducted a study in 515 adults concluded that the most common syndromes associated with these symptoms are benign paroxysmal positional vertigo, phobic postural vertigo, phobic postural vertigo, central vertigo, Meniere disease and migraine.

Kroenke *et al* in 1992 likewise distributed the outcomes that dizziness was ascribed to a peripheral vestibulopathy in 44%, a focal vestibulopathy in 11%, mental causes in 16%, different conditions in 26%, and obscure causes in 13% of the patients in their appointments. This indicates that approximately 25% of the dizziness experienced due to central causes such as certain central vestibular disorders, migraine and phobic.

According to Troost *et al* (1980) proposed that the central causes of dizziness and imbalance may be due to the dysfunction of the vestibular nuclei within the brainstem and their central connections and also vestibular portion of the eighth nerve, which explains why most people get dizzy or imbalance during walking or sitting. He also added that cerebellopontine angle tumours can be said as the least common causes of dizziness and vertigo as it doesn't present with episodic symptoms of vertigo. Schwannoma is the most common tumor in this location resulting from a proliferation of the Schwann cells. Other types of tumours that can be found here are meningiomas, epidermoids, and metastases. Approximately 25% cases of dizziness are due to the central abnormalities. The most common central causes of dizziness include vestibular migraine and vertebrobasilar ischemia. The most common cause of episodic vertigo

in children is the vestibular migraine. Women are three times more likely to get this disease and this is also accountable to people between 20 and 50 years of age. Abnormalities in the peripheral vestibular system are the causes of peripheral dizziness in adults. Some of the common peripheral causes of dizziness are benign paroxysmal positional vertigo (BPPV), Meniere disease and vestibular neuritis. BPPV occurs due to the dislodge of loose otoconia, which then enters the semicircular canals, usually the posterior semicircular canal. This condition is very common between the people of ages 50-70 years, particularly the elderly.

The second most common cause of vertigo which is due to viral origin, vestibular neuritis. It most commonly affects persons of age 30 to 50 years of age. Meniere disease is due to the inner ear dysfunction because of excess endolymphatic pressure, but the exact cause is still being investigated and researched on. This disease causes unilateral hearing loss and vertigo and also develops at any age, while it is more common between 20 and 60 years. Loss of balance, vomiting and nausea are the symptoms of vertigo associated with this disease (Herbet.M, 2017).

2.2.2 Vestibular and Non-Vestibular Causes of Dizziness and Imbalance

Vestibular causes of dizziness are associated with our vestibular system, which is responsible for relaying messages to our brain about motion, head position and spatial orientation. Vestibular causes can be most likely associated with peripheral causes of dizziness and vertigo. Otological causes, such as BPPV, bilateral vestibular loss, Meniere's disease and vestibular neuritis, which account to most cases of dizziness and imbalance, especially among the elderly. Around 50% of cases with BPPV are associated with dizziness at the age of 80. Patients also complain of brief episodes of vertigo due to changing the head orientation to gravity. BPPV also is caused by the presence of otoconial debris. Vestibular neuritis, the second most

common cause of vertigo, is thought to be of viral origin. It most commonly affects persons 30 to 50 years of age. Men and women are affected equally. It's a single-phase self-limited condition in which nausea, vomiting, vertigo and nystagmus are the common symptoms. Non-vestibular causes can be a wide range of possibilities, which is due to medical, psychogenic, un-localized and even proprioceptive causes. Proprioceptive causes are mostly due to underlying causes such as diabetes, B12 deficiency, or peripheral neuropathy, or sensory loss in the feet, may cause imbalance among elderly adults. Psychogenic dizziness is actually a common type of dizziness as it involves panic attacks, anxiety, any type of phobias, like agoraphobia and stress. Un-localized dizziness often will be misdiagnosed, as one-third of patients can be gone unrecognized. These patients need to be monitored closely as it can be mostly misdiagnosed.

There are various types of drugs that can cause dizziness. These types of drugs are very commonly administered as it is more common in many diseases such as cardiovascular type of dizziness, anaemia, hypotension and so on. Anti-anxiety drugs are mostly common drugs to be prescribed. Benzodiazepines are reportedly to have adverse effects like dizziness, fainting and falls. Such drugs are diazepam, lorazepam and chlordiazepoxide. Imipramine and amitriptyline are tricyclic antidepressants which are known to cause orthostatic hypotension. The side effects of using these drugs are dizziness and vertigo, especially in standing position. Antihypertensive drugs are drugs that are introduced to treat hypertension. Such examples of drugs are calcium antagonist, beta blockers and alpha blockers. Prazosin and terazosin which are hydrochlorothiazide which is noted to cause dizziness and imbalance when administered. Calcium blockers such as verapamil, has also been noted to have the same adverse effects, especially when administered together with other drugs. Anti-tuberculous drugs and aminoglycosides such as streptomycin are also known to cause dizziness and imbalance among patients which is due to the disruption of the vestibular system (Herbet. M, 2017).

Uneri et. al. (2008) stated that the most prominent factors behind dizziness in elderly are usually due to their imbalance as their age. The elderly finds it difficult with their sensory function, central nervous system interrelation, and neuromuscular and skeletal function.

2.3 Dizziness and Imbalance in Elderly

Dizziness and impaired balance are very common in elderlies which creates public health concerns as it usually becomes the risk factor for fall and fractures. Lara, Hayo and Paul (2015) states that falls are the leading cause of accidental death in elderlies at the age of more than 65 years, whereas dizziness is one of the common factors to disability burden. In addition, Timothy (2019) as cited in Jonsson et al (2004) found that the overall prevalence of impaired balance in elderlies among 70 years olds was 36% in women and 29% in men.

The underlying aetiology of dizziness is complex and multifactorial. Shinichi and Tatsuya (2015) states that integration of somatosensory, visual and vestibular inputs to the central nervous system followed by outputs to musculoskeletal systems are all the components that maintain postural stability. Sensory input from vision, proprioception and vestibular system are processed by the brainstem which then feedback messages are sent to the eyes to maintain steady vision and to the muscles for posture and balance. Therefore, dizziness and imbalance can be caused by changes in any one of these components.

2.3.1 Ageing of Vestibular Structures

The function of all three components relevant for vestibular function will be deteriorated with age as hair cells and neurons in the vestibular system do not regenerate specifically in mammals. Jahn (2019) states that about 6% of sensory vestibular hair cells will be decreased every decade from birth to old age. In his research, he found that hair cells in semi-circular canal degenerates earlier and more as compared to hair cells in the macula of otolith organs, while age-related deficits are less affected in the utricle. He further adds that there is 40% reduction in hair cells in cristae, 24% in the saccule and 21% in the utricle seen in elderlies among 70 years old.

Besides decrease in sensory vestibular hair cells, reduction in the neurons in vestibular nuclei for about 3% per decade is also demonstrated among elderlies from 40 to 90 years old. Shinichi and Tatsuya (2015) reports that based on several studies that are conducted to animals, cumulative effects of oxidative stress could impair macromolecules such as mitochondrial DNA. The accumulation of mitochondrial DNA as well as decline in mitochondrial function play an important role in inducing apoptosis of cochlear cells. In addition, excessive reactive oxygen species is also generated in the cochlea due to exposure to a very loud noise. All these lead to vestibular structure age-related changes.

2.3.2 Ageing of Vestibular Function

Vestibulo-ocular reflex (VOR) has been used to measure age-related deterioration of peripheral vestibular function by using rotational test and/or caloric test, which both will reflect the function of lateral semi-circular canals. VOR is a reflex that stabilizes images on the retina during movement of the head by producing compensatory eye movements. Shinichi and

Tatsuya (2015) in their articles “Dizziness and Imbalance in Elderly: Age-related Decline in the Vestibular System” a reduction in VOR gain and shorter VOR time constant is documented among normal adults over 75 years old upon high velocity stimulation as compared to young subjects seen in sinusoidal rotational tests. Eric et.al (2016) states that VOR gain is the amount of eye rotation relative to the amount of head rotation, which ideally should be 1.0. Blurred vision occurs if the VOR gain is not 1.0 in response to image motion on retina upon head movement.

Anson and Jeka (2016) states that reduction in capacity for detecting rotational head movements results from fewer sensory cells in the semi-circular canal. The reduction in VOR time constant indicates the neural integrator as a potential site of age- related degeneration. The authors also add that dependence of VOR on age appears to be variable, as they found that not all experiments show age-related decline in the VOR gain. Furthermore, based on vestibular-evoked myogenic potential (VEMP), VOR function measured by head impulse testing seems to be more impaired than otolith function for subjects over 70 years.

2.4 Prevalence of Dizziness and Imbalance in Elderly

The number of dizziness and vertigo cases recorded by hospitals shows some significant increase in number. According to the population studies done at the Neurological Clinic of University Kebangsaan Malaysia Medical Centre (UKMMC) from early November 2010 to the end of January 2011 with a total of 1283 medical records of patients with ages of 6 to 92 years old, with prevalence of vestibular problem to be 7.4% (Samsudin, N. 2011).

The prevalence of dizziness in the United States has been reported to be 24% with a population-based study done and the people with dizziness are mostly of age 72 and above, with risk of falling due to imbalance and injuring themselves (Iwasaki.S, 2015).

The prevalence of dizziness was calculated by sending postal questionnaires to 1000 subjects , with subjects aged 65 years. The results showed that 30% reported having dizziness, 27% having symptoms of imbalance and dizziness once per month and 37% had symptoms lasting longer than 1 minute (Nicola *et al*, 1994).

2.5 Sociodemographic Factor Associated with Dizziness and Imbalance in Elderly

2.5.1 Age

According to Rosa *et al* (2016) , adults of age 71-80 years old are more prone to getting dizzy and more imbalanced than the other age groups, where 42% of elderly are tested and among them, 24% are number of elderly subjects with dizziness, compared to elderly of age 60-70 years old where 25% are tested and among them, 9% and for elders age more than 81 years old (31% tested), 31% respectively are number of subjects with dizziness.

According to Mueller (2013), vertigo and dizziness are to be known as the biggest contributor to the burden of disability among both men and women ages between 65 and 79 years, where the prevalence of 10.5% (6.6 to 15.1) in men and in women around 90% (5.7 to 13.0) and it is decreased with ages of women.

Subjects who are significantly older (>61 years) have to be said to experience daily dizziness which is 61 years compared with 49 years (Kroenke, 1992).

2.5.2 Gender

According to Kao (2001), in a study where females aged more than 60 years old are more likely to get dizziness and imbalance when they age, where 78% of them complain of getting daily dizziness from a total of 260 subjects.

According to Kroenke (1992), the percentage of dizziness in females is shown to be higher than male and it is significantly higher, which is around 60%. This shows that females are more prone to get dizziness due to multiple factors such as any dizziness, any clinical condition, any medications, pregnancy and so on.

According to Rosa (2016), out of 32% male presented in the study, 14% of them have daily dizziness, whereas out of 66% female presented, 34% of them have been found to have daily dizziness. This shows that females have to be found with higher prevalence of getting daily dizziness.

2.5.3 Race

Corrales et al (2016) stated that among the respondents who participated in his study the race distribution of those who are suffering from dizziness is mostly the whites (81.3%), African American (11.8%) and other races (6.9%) in the United States.

According to Samsudin, N. (2011), the prevalence of dizziness among those with vestibular problems are more prominent in the Chinese race (45.6%), followed by the Malay race (45.4%), and then the Indians (6.6%) and finally other ethics (2.4%). There is no prominent explanation on why these results are achieved.

2.6 Comorbidity

According to Henn et. al. (2008), patients with organic vertigo syndromes have been reported to experience a high degree of psychiatric problems and have a connection with their vestibular dysfunction. Hence, a more structured psychological and psychometric testing have been proceeded in dealing with complex and prolonged vertigo courses and should be approached in a more detailed manner.

According to Wu (1999), postural hypotension may also cause dizziness in elderly, especially when the blood pressure declines to 20mm/Hg or more in systolic blood pressure, as it is considered dangerous and needs immediate healthcare.

According to Walley (2014), risk of having dizziness is more prominent in people who are having diabetes, especially those who have peripheral neuropathy, as they have demonstrated many symptoms such as body sway compared to unaffected peers. Agarwal *et al* in her studies showed that in a study population of more than 21,000 individuals, the reported rate of prevalence for vestibular dysfunction is 35.4%, the odds increased with age and were 70% higher among individuals with diabetes.

According to Wiltink (2009), the symptoms of dizziness were reported among people who are experiencing generalized anxiety, social phobia or panic and more somatic problems such as hypertension, migraine, diabetes have been associated with the people who are experiencing dizziness and imbalance.

According to Esparza et al. (2007), systemic arterial hypertension (SAH) is to be said the cause of the most prominent dizziness cases in elderly as SAH is one of the most circulatory problems that causes peripheral or central involvement of the vestibular system. SAH also causes many secondary injuries that lead to artery muscular hypertrophy with a gradual reduction of the

oxygenation and also increase in vasospasm, ischemia, oedema and microaneurysm. The main symptoms which are reported by people with SAH were tinnitus, rotatory dizziness and also headache and migraine.

According to Kerber et. al. (2006), most of the patients who are having symptoms like extreme dizziness, headache and vertigo are mostly diagnosed with potentially life -threatening strokes. The cerebellar or brain stem infarction is a leading problem to doctors as hydrocephalus or recurrent stroke will follow suite. Many case reports have shown that the leading causes of stroke.

2.7 Impacts of Dizziness and Imbalance in the Elderly

The prevalence of dizziness as a complaint is frequently met among the elderly and it is often due to an underlying vestibular disorder. Over the years, many researchers have begun to pay more attention to the prejudices brought by dizziness in the quality of life (QoL) of the elderly. QoL according to the World Health Organization (WHO) (1980) is defined as an “individual’s perception of his position in life, in cultural context and value system in which he is inserted regarding his goals, expectation, standards, and concerns”. Dizziness and other manifestations of vestibular symptoms such as imbalance, neuro-vegetative signs may interfere with patients’ quality of life as it disrupts locomotion and social autonomy of daily living (Santos et. al., 2010).

Study shows in adults aged 65 years or older, falls is one of the primary leading causes of injury and even accidental death (Kannus et. al., 1999). The presence of dizziness in the elderly has become a predisposing factor for falls due to the fact it restricts movement and also causes instability (Agrawal et. al., 2009). Also, the risk of severe injuries such as hip and wrist

fractures increase including other falls-related trauma which may cause loss of independence and limited mobility in the elderly. Moreover, there is also evidence of fear of recurrences in predicting subsequent falls. This is a reason why many elderly patients with chronic dizziness suffer from anxiety and depression (Maniu et. al., 2016).

In short, dizziness impacts negatively on the lives of the elderly. Therefore, early investigation of vestibular diseases and intervention of such conditions in the elderly population is important in efforts to prevent them from getting worse or untreated which may render their activity in the end, leave them inactive.

2.8 Questionnaires used for dizziness and imbalance

To quantify a vestibular system disease associated with dizziness and imbalance within a patient still remains as a subject for debate. Although various questionnaires have been developed over the years, the performance in a single test barely demonstrates the effects of the underlying illness on the daily life of a patient whichever the approach. Nevertheless, they are still used to provide guidance on further assessments and examinations for clinicians who deal with patients with complaints of dizziness and imbalance in order to avoid unnecessary procedures for clinical diagnosis. These dizziness-specific questionnaires can be classified into the following: quality of life (or handicap), symptoms, and mixed (assessment of both handicaps and symptoms) (Duracinsky et. al., 2007).

Despite the multiple questionnaires available in portraying the emotional, functional, and physical consequences of dizziness and imbalance, there is still lack of a good tool to quickly distinguish the causes of vertigo (Roland et. al., 2015). Hence, the newly developed Amer

Dizziness Diagnostic Scale (ADDS) which is a screening tool for vestibular problems will also be discussed.

2.8.1 Quality of life

2.8.1.1 Dizziness Handicap Inventory (DHI)

The Dizziness Handicap Inventory (DHI) was developed in 1990 by Jacobson and Newman and has become a common tool used to evaluate self-perceived handicapping effects that are imposed by dizziness and imbalance. It has 25 items that measure dizziness in individuals based on 3 aspects which are functional, emotional, and physical (Jacobson & Newman, 1990). Each item is instructed to be responded with either 'No' (0 points), 'Sometimes' (2 points), or 'Yes' (4 points) (Jacobson & Newman, 1990). The items score is subdivided into physical (28 points), functional (36 points), and emotional (36 points) sub-scores where it is summed up and has a maximum score of 100 and a minimum score of 0. The higher the score, the greater the perceived handicap due to dizziness (Vereeck et. al., 2007). Whilst the constant correlation of the results of DHI test results with the physiological measures of vestibular functionality is not certified, the test was shown to have an association with clinical history such as dizziness frequency, events of spontaneous nystagmus and the total of reported falls (Jacobson & Newman, 1990). The DHI was also shown to have reliability and validity for patients with conditions such as peripheral and central vestibular pathology, multiple sclerosis, post traumatic brain injury, whiplash-associated disorders, and benign paroxysmal positional vertigo (Yorke et. al., 2013). The responsiveness of this test was tested in comparison among four other self-reported measures and proved to have the greatest responsiveness (Frischia et. al., 2014).

2.8.1.2 Activities-specific Balance Confidence (ABC) Scale

The Activities-specific Balance Confidence (ABC) scale is another quality of life focused measure of dizziness and imbalance introduced by Powell and Meyers in 1995 which assesses a person's confidence level in performing daily activities. It is composed of 16 items where each is rated from 0% to 100%, with 0 indicating no confidence and 100% indicating complete confidence (Powell et. al., 1995). The overall score is calculated by adding item scores and then dividing by the total number of items. A study shows a total ABC scale score of ≤ 67 in the original English version indicates an increased risk of fall (Lajoie & Gallagher, 2004). The total ABC score was found to be highly stable over a two-week period with $r=0.92$, ($p<0.001$) and Cronbach's alpha was 0.96, indicating high internal consistency of the ABC scale (Powell et. al., 1995). Moreover, a comparison study between ABC and DHI showed a moderately strong negative association between the two with the results suggesting the ABC scale to be a valid instrument to be used in the assessment of patients with complaints of dizziness (Whitney et. al., 1999). Though it is appropriate for use in intervention research studies, it is recorded to be unsuitable for the study of vertigo and balance disorders due to fact that the questionnaire's content and wording are not specified to vertigo (Duracinsky et. al., 2007).

2.8.2 Symptoms

2.8.2.1 Vertigo Symptom Scale (VSS)

The Vertigo Symptom Scale (VSS) by Yardley et. al. (1992) is a self-report questionnaire designed to measure the frequency and severity of vertigo, dizziness, imbalance, and anxiety symptoms in patients. The original English version of the VSS has both internal consistency and test-retest reliability confirmed (Yardley et. al., 1998). While the earliest version had 36

items with questions which address the dizziness pattern within the past 12 months, the short form that is later created contains 15 items which are divided into 2 sub-scales: the first 8 items assess the vertigo symptoms (VSS-VER) which are associated with vestibular disorders and the other is 7 items relating to the associated symptoms (VSS-AA) which correspond to anxiety expressions. The responsiveness data of the VSS is limited but it is the only questionnaire that has reports of predictive validity (Duracinsky et. al., 2007). In 2012, a study was carried out to assess the validity and reliability of the Japanese version of the VSS-short form (Kondo et. al., 2012). Also in 2012, another study was done to investigate the reliability, internal and external validity of the German version of the VSS (VSS-G) and was also found to show satisfactory results (Gloor-Juzi et. al, 2012). Other versions of the VSS that have been developed and used for research over the years are such as Spanish (Yardley et. al., 1999), Norwegian (Wilhemsen et. al, 2008), Turkish (Yanik et. al, 2008), and Afrikaans (Rogers et. al, 2011). In short, it's a reliable tool to be used in assessing the severity of vertigo and related symptoms.

2.8.2.2 European Evaluation of Vertigo (EEV) Scale

The European Evaluation of Vertigo (EEV) scale is a physician-administered questionnaire that only assesses symptoms of the vestibular syndrome (Mègnigbêto et. al., 2001). This scale only assesses the vertigo and associated vestibular symptoms without considering the frequency of vertigo and the handicap effects. It consists of five items: "Illusion of Movement", "Duration of the Illusion", "Motion Intolerance", "Neurovegetative Signs", and "Instability" where each of these items is scored from 0 to 4 on a categorical five-point scale. A clinical validation study of the EEV was carried out in 2001 by ENT specialists among vertigo patients which proves the scale's excellent reliability and responsiveness (Mègnigbêto et. al., 2001). It was also observed that the strongest correlation between the number of attacks and four of the

five EEV items where neurovegetative signs are excluded. Though it's important to take note that no strong correlation exists between the five items (Duracinsky et. al., 2007). Briefly, the content validity of this instrument is guaranteed yet it is important to assess the level of agreement between patients' and clinician's assessments.

2.8.3 Mixed

2.8.3.1 Vertigo, Dizziness and Imbalance (VDI) Questionnaire

The Vertigo, Dizziness, Imbalance (VDI) questionnaire which was introduced in 1999 contains 36 items which measures the feelings of dizziness and unsteadiness symptoms in patients and their psychosocial consequences on people's quality of life (Prieto et. al, 1999). It consists of 14 items in the symptoms scale and 22 items in the Health-Related Quality of Life (HRQoL) scale. Each of these item scores are coded, summed and converted into a scale ranging from 0-100. 0 represents 'absence of symptoms' and 'worst QoL' while 100 represents 'maximum presence of symptoms' and 'best QoL' for symptoms scale and HRQoL scale respectively (Prieto et. al, 1999). Study shows that the VDI questionnaire scores exhibit strong correlation with a patient's condition whether it is deterioration in those with worsening conditions or improvement in patients who are recovering (Prieto et. al, 1999). The reliability, validity and responsiveness of the VDI questionnaire is certified due to its promising data presentation. Another study was carried out in 2007 to evaluate the impact of different questionnaires on a patient's quality of life and the VDI questionnaire was reported to have the best validation score but its responsiveness seems to be weak (Duracinsky et. al., 2007). In short, it is an effective instrument to be applied in the clinical evaluation of patients with dizziness complaints at both group and individual level.

2.8.4 Amer Dizziness Diagnostic Scale (ADDS)

The Amer Dizziness Diagnostic Scale (ADDS) is a newly developed questionnaire that is beneficial as a first-line evaluation tool and reference guide for differential diagnosis, examination and treatment of dizziness (Al Saif and Alsenany, 2015). The ADDS is developed with the intention to help clinicians to be able to come up with differential diagnosis based on the exact pathology so that the patient can properly be diagnosed and given the correct treatment. The questionnaire is composed of 17 questions which are arranged into five categories. The initial seven items question the patient's general information such as gender, age, and etc. The following three questions are specific regarding Unilateral Vestibular Hypofunction (UVH) with the two subsequent questions focused on evaluating Benign Paroxysmal Positional Vertigo (BPPV). The fourth set of questions contains four questions associated with the Central Mediated Problem (CM). The final question is regarding dizziness episodes. No scores are given for the first set of questions while the second, third and fourth sets are given scores '1', '5', and '20' based on each 'Yes' respectively. The final question's score is given based on the length of dizziness episode where the longer the episode, the higher the score. The ADDS total score can be interpreted as the following: '0', the diagnosis is likely Cervicogenic Dizziness problem (CGD). Total score in between 1 and 4 can be diagnosed as Unilateral Vestibular Hypofunction (UVH). Dizziness may be regarded as Benign Paroxysmal Positional Vertigo (BPPV) if the scores are from 5 to 19. For scores 20 or higher, a Centrally Mediated problem is a plausible interpretation. A study was carried out among the Saudi population in 2015 to analyse the validity of the ADDS with results of 96% sensitivity and specificity with guaranteed capability of the scale providing an adequate possible diagnosis (Al Saif and Alsenany, 2015). Another study was carried out in 2018 where the AADS was used to determine the prevalence of dizziness among the elderly population in Saudi Arabia. It shows

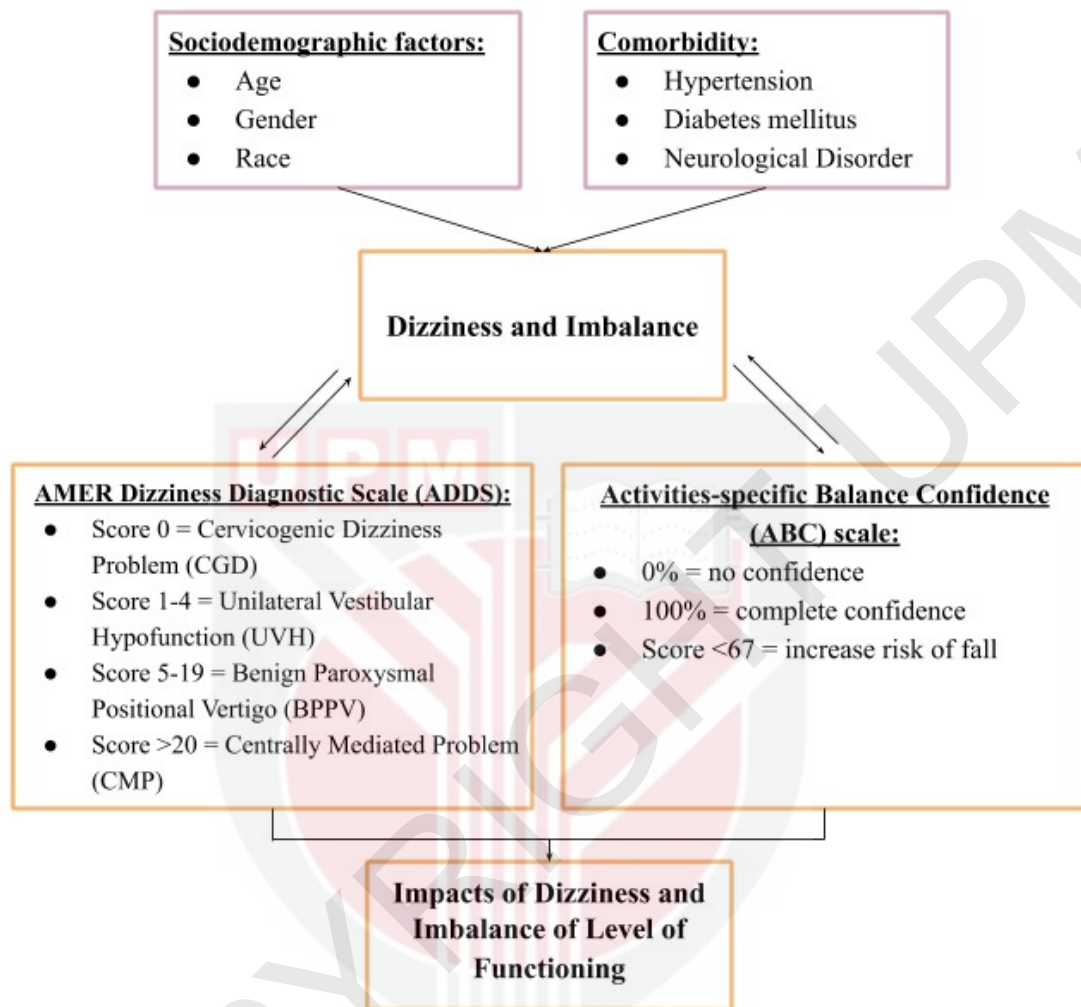
the ADDS strong correlation with the ‘true-positive’ and ‘true-negative’ results making it a reliable predictor for the results (Al Saif and Alsenany, 2018).

2.8.5 The ID Migraine™

The ID Migraine™ is a valid and reliable brief self-administered migraine screener for migraine headaches that can be used in outpatient primary care settings (Lipton et. al., 2003). It contains three items with questions regarding disability, nausea and photophobia. A study was carried out in 2003 to test the reliability of the ID Migraine by using the screener to identify patients with migraine among those with complaints of headache. Patients were required to do the screening test followed by an evaluation by a specialist for a verified diagnosis based on the International Headache Society (IHS) criteria. The migraine screener was reported to have an excellent performance with a sensitivity of 0.81(95% CI, 0.77 to 0.85) and a specificity of 0.75 (95% CI, 0.64 to 0.84) (Lipton et. al., 2003). In 2007, another study was executed to evaluate the validity of the ID Migraine™ in neurology outpatient clinics (NOCs) and it was found that the test was reliable with a sensitivity of 91.8% and a specificity of 63.4% however, the results may confuse migraine with other types of headaches (Karli et. al., 2007). The ID Migraine™ currently has a few validated versions in Italian, Turkish and Portuguese (Mattos et. al., 2017). Briefly, the ID Migraine™ is proven to be a beneficial tool in improving migraine diagnosis in the primary care setting.

This research will be conducted using the questionnaires Amer Dizziness Diagnostic Scale (ADDS) and Activities-specific Balance Confidence (ABC) Scale.

2.9 Conceptual Framework



Legend:

1. = Independent variable
2. = Dependent variable
3. = Associated with study

CHAPTER 3

METHODOLOGY

3.1 Study Location

This survey was conducted through an online platform, targeting the elderly especially from members of the University of Third Age, Malaysia.

3.2 Study Design

The study design that was used is a cross sectional study. The data was collected by distributing an online questionnaire in Google Form through various media such as social media platforms (Whatsapp and Facebook) as well as email.

3.3 Study Duration

This study was conducted from 1st June 2020 until 9th October 2020, where it consists of proposal writing, proposal presentation, submission of documents to JKEUPM, data analysis, final report preparation, submission and presentation. Whereas data collection was done from 17th August 2020 until 24th August 2020.

3.4 Sampling

3.4.1 Study Population

The study population for our study was mainly from the members of an organisation called “University of the Third Age” (U3A), Malaysia as well as the visitors to U3A Facebook page. There are two branches of University of Third Age Malaysia — Kuala Lumpur and Selangor branch as well as Bandar Utama branch. This organisation, which is under University Putra Malaysia (UPM), offers plenty of activities and courses to the elderly adults who are under this course to learn new skills and to develop themselves in terms of ways to lead a healthy lifestyle, such as adult development and ageing, healthy lifestyles, exercise, languages (English, Arabic, Mandarin), arts and craft, gardening, cooking, computing, photography, music, dance and singing. In 2007, Prof. Dr. Tengku Aizan Hamid, the director of Institute of Gerontology in Universiti Putra Malaysia (UPM) has started this program under the “Lifelong Learning for Older Malaysians” project and it was supported by the Government of Malaysia and the United Nations Population Fund (UNFPA) [Country Programme Cycle 2008 – 2012].

In addition, the members of University of Third Age Malaysia were considered as healthy ageing elderly because they met all the criteria mentioned in the definition of healthy ageing by the World Health Organization (WHO). WHO defined healthy ageing as a process of developing and maintaining functional ability which allows wellbeing in elderly. Functional ability is the ability to be or to do anything that makes them feel valuable such as being able to meet their basic needs, being able to learn, to build and maintain bonds with other persons, as well as being able to give contributions towards society. Other than that, most of the members of the University of Third Age Malaysia were retired or semi-retired people over 50 years old. Therefore, they are considered as healthy ageing elderlies.

3.4.2 Sampling Population

3.4.2.1 Inclusion Criteria

- The members of University of Third Age, Malaysia and visitors to U3A Facebook page
- An elderly who is 60 years old and above
- Respondents must be Malaysian
- Have the ability to use smartphone or email
- Able to understand English language or Bahasa Melayu

3.4.2.2 Exclusion Criteria

- Those who is not consented for the study

3.4.3 Sampling Frame

All healthy ageing elderly in Malaysia especially the members of University of Third Age (U3A), Malaysia and visitors to U3A Facebook page.

3.4.4 Sampling Unit

A healthy ageing elderly of both genders aged 60 years and above in Malaysia especially the members of University of Third Age (U3A) Malaysia and visitors to U3A Facebook page that meets all the inclusion criteria.

3.4.5 Sampling Size

This sample size was calculated based on our specific objective - to study the prevalence of dizziness and imbalance among healthy ageing elderly. Based on previous study, the prevalence of dizziness among 50 people aged between 60 and 88 years old is 74% (Lidiane, Karyna, Andre and Kenio, 2014). The sample size for this study was calculated by using sample size calculation to estimate a proportion formula) as shown below:

$$n = \frac{z_{1-\alpha/2}^2}{d^2} P (1 - P)$$

Where:

n = sample size

z = level of confidence interval according to the standard normal distribution (for a level of confidence of 95%, z = 1.96)

p = 0.74 (estimated proportion of the population that presents based on previous studies)

d = tolerated margin error = 5% = 0.05

Calculation:

$$n = [(1.96)^2 (0.74) (1-0.74)] / (0.05)^2$$

$$= 296 \text{ samples}$$

Taking into account adjustment for non-response rate of 10%, the final sample size was calculated using formula as shown below:

$$n_{\text{final}} = \frac{n_{\text{calculated}}}{1 - \text{non response rate}}$$

Calculation:

$$\text{Final sample size, } n = 296 / (1 - 0.1)$$

$$= 329 \text{ samples}$$

Based on our research, there were a total number of 747 members in University of Third Age Malaysia from both branches — Kuala Lumpur & Selangor and Bandar Utama. From 747 members, we aimed for 329 participation from the members as calculated in the sample size.

3.4.6 Sampling Method

Non- probability sampling specifically convenience sampling was used in this study. In this sampling method, samples were taken from a group of people that is easy to contact or to reach. Based on our research, the members of University of Third Age (U3A), Malaysia from both branches were approached to be in our study. For the U3A branch in Kuala Lumpur and Selangor, there were a total of 587 registered members, where 407 of them are lifetime members and another 180 are either ordinary members or associated members (age between 50 to 55 years old). Whereas for the U3A branch in Bandar Utama, there were a total of 160 registered members. Two sets of questionnaires were sent to all members in both branches by distributing an online questionnaire in Google Form through various media such as social media platforms (Whatsapp), Facebook and email. For this, we also contacted a representative from both branches in helping us to distribute the link to the Google Form within their group chats. The target population for this study were elderly who are 60 years and above and they are able to use social media platforms. The participants were recruited by social media platforms using U3A Whatsapp group blasted by the representative to their members. Our participants also consisted of visitors who answered the questionnaire posted in the U3A official Facebook page. However, the participation from 747 members was voluntary-based and we only aimed for 329 respondents from the organization. The respondents that were selected are the ones that meet all the requirements for this study. Those who did not meet the requirements were excluded from this study.

3.5 Data Collection

3.5.1 Materials

- Social demographic details
- Amer Dizziness Diagnostic Scale (ADDS) questionnaire with Malay Language translation
- Activities-specific Balance Confidence (ABC) Scale questionnaire with Malay Language translation

3.5.2 Study Instruments

In this study, our research team had prepared two versions of two different sets of questionnaires.

3.5.2.1 Amer Dizziness Diagnostic Scale (ADDS) questionnaire

The first survey introduced was the self-administered AMER Dizziness Diagnostic Scale (ADDS) questionnaire. It consisted of 17 questions divided into five different sections with varying range of scores (Al Saif and Alsenany, 2015). Questions 1 to 16 are in 'Yes or No' format while only question 17 is designed specifically for dizziness episodes. 'No' always gives a score 0. The first section consisted of seven questions focusing on general information of the patient with no scoring involved. The first two question the regarding the patient's gender and age followed by five 'Yes' or 'No' questions. For Question 5, we modified the original question where it only focused on imbalance problems to be more specific on both dizziness

and imbalance problems. The next section consisted of only three questions which were specific to Unilateral Vestibular Hypofunction (UVH) where 1 point was given to every 'Yes' answer. The third section was composed of two questions precisely for the evaluation of which scores 5 points for every 'Yes' answer. These questions asked patients whether they had experienced any dizziness involved while moving their head and other body movements. The following section were four questions specific to Central Mediated Problem (CM) and a score of 20 points was given for every 'Yes' answer. The final section was regarding the dizziness episodes where patients were given options regarding how long the episodes usually last. 'No' was given 0 point, 'Seconds' was given 1 point, 'Minutes' was given 5 points and lastly, 'Hours' was given 20 points. All the points were summed up at the end and the results were within the 0 to 113 range. The results interpretation was as follows: total score of 0 is either normal or Cervicogenic Dizziness problem (CGD), total scores between 1 to 4 are diagnosed as Unilateral Vestibular Hypofunction (UVH), total scores from 5 to 19 is probably Benign Paroxysmal Positional Vertigo (BPPV) and for scores 20 or higher, the likely diagnosis is Centrally Mediated problem (Al Saif and Alsenany, 2015). This questionnaire was given alongside the translation in Malay Language.

3.5.2.2 Activities-specific Balance Confidence (ABC) Scale questionnaire

The second survey was the Activities-specific Balance Confidence (ABC) Scale questionnaire which consists of 16 self-report questions to evaluate the confidence of a patient in maintaining balance in daily life (Powell et. al., 1995). Elderly respondents were asked to rate their confidence that they will lose their balance or become unsteady in the course of daily activities. It provided information regarding the balance of confidence in doing 16 different daily activities such as walking around the house, walking up the stairs, sweeping the floor, walking

on a slippery floor and walking in a crowd. Each item was scored from 0% (no confidence) to 100% (complete confidence). The total score was determined by summing up all the item scores (possible range = 0 to 1600) and dividing it by the total number of items which is 16. Scores below 50 was an indication for low level of functioning, below 80 was interpreted as medium level of functioning and over 80 was considered as high level of functioning (Powell et. al., 1995). For this study the English version had been translated into the Malay language given alongside one another.

3.5.3 Research Technique

The questionnaires with their Malay language translation were converted into Google Form. Initially, the first questionnaire was the Amer Dizziness Diagnostic Scale (ADDS) and the following questionnaire was the Activities-specific Balance Confidence (ABC) Scale alongside its translated version. The Google Form link was then distributed to the members of University of Third Age Malaysia. After the respondents completed the questionnaire, the data was automatically recorded within the Google Form. Prior to the initiation of the study, a pilot study was done first in order to ensure that the instruments used are appropriate and understandable by most of the respondents. Respondents were randomly chosen during the early stage of the data collection period. Feedbacks and opinions from the respondents were recorded and necessary changes regarding the questionnaire have been made.

3.5.4 Validity and Reliability

The instruments was assessed by the supervisors to ensure that the content of the tests met its purposes and would give almost if not accurate results. The Amer Dizziness Diagnostic Scale (ADDS) with a sensitivity of 96% and a specificity of 96% also was studied to have an acceptable coefficient (r) range of validity at 0.766. The content validity had also been verified by a panel of experts for it to be simple and clear. The Activities-specific Balance Confidence (ABC) Scale was reported to have an excellent test-retest reliability with a stable total score assessed in two-week intervals ($r = 0.92$, $p < .001$) alongside a good internal consistency (Cronbach's $\alpha = 0.96$). Content validity of the ABC scale has also been reviewed by clinicians and it has been reported to have adequate to excellent correlation with vestibular disorders. For this research, a simple translation of the questionnaires into Malay language that had been reviewed and validated by a medical professional is also included. In conclusion, both of the questionnaires Amer Dizziness Diagnostic Scale (ADDS) and Activities-specific Balance Confidence (ABC) Scale had been validated and found to be a reliable tool in measuring dizziness.

3.6 Data Analysis

The statistical software, Statistical Package for Social Sciences (SPSS) version 25.0 (SPSS Inc., Chicago, IL, USA) was used to analyze all the data collected and extracted in this study. Data was expressed as mean $\pm$ standard deviation.

Activities-specific Balance Confidence (ABC) scale showed a very good test-retest ability with strong internal consistency, however its internal consistency may be exceedingly high, as the Cronbach's α was 0.96. To explain more about the sociodemographic data which will be

used to determine the prevalence of dizziness and imbalance among healthy aging elderly, a descriptive study design analysis was used using the Amer Dizziness Diagnostic Scale (ADDS) questionnaire which includes age, gender and race. These sociodemographic factors were the independent variables while the prevalence of the dizziness and imbalance serve as the dependent variable. Chi-Square and Kruskal-Wallis were used as a test to perform comparison between these variables. As we used the non-parametric tests which were stated above, because the ABC Scale and ADDS scores were not normally distributed and there was significant association if the result is less than 0.05. If the null hypothesis was rejected, it means that there is significant association between the sociodemographic factors and the prevalence of dizziness and imbalance.

3.7 Ethical consideration

1. A written ethical approval has been obtained from the Ethics Committee for Research Involving Human Subject of Universiti Putra Malaysia (JKEUPM) for evaluation and approval.
2. Informed written consents have been obtained from the respondents. The respondents were assured that the information obtained through the questionnaire was kept confidential.

3.8 Operational definition

3.8.1 Dependant Variable

- **Prevalence of dizziness and imbalance in healthy aging elderly**

The prevalence of dizziness and imbalance was calculated using the formula given and the dizziness and imbalance faced was based on the score obtained from the questionnaires given to the participants such as the Amer Dizziness Diagnostic Scale (ADDS). Based on the results, score of 0 is either normal or Cervicogenic Dizziness problem (CGD), total scores between 1 to 4 are diagnosed as Unilateral Vestibular Hypofunction (UVH), total scores from 5 to 19 is probably Benign Paroxysmal Positional Vertigo (BPPV) and for scores 20 or higher, the likely diagnosis is Centrally Mediated problem (CMP).

- **Impacts of dizziness and imbalance on level of Functioning of elderly**

The impacts of dizziness and imbalance on level of functioning of elderly was measured using the average scores obtained from Activities-specific Balance Confidence (ABC) Scale. The score interpretations were as follow: scores below 50 was an indication for low level of functioning, below 80 was interpreted as medium level of functioning and over 80 was considered as high level of functioning.

3.8.2 Independent Variable

- **Age**

The age of participants from 60 years and above was chosen.

- **Race**

The race of the locals was divided into Malay, Chinese, India, and Others (Orang asli, Bajau, Kadazan etc.)

- **Gender**

The gender was divided into male and female.

- **Comorbidity**

Comorbidity referred to the presence of more than one disorder in the same person which actually triggers the same symptoms. In this case, we were looking for common diseases such as diabetes, neurological problems and hypertension which have higher potential in affecting the vestibular system, hence causing dizziness and imbalance among elderly.

3.9 Expected Outcomes

The aim of this study was to determine the factors associated with the prevalence of dizziness and imbalance in elderly in the University of Third Age (U3A) Malaysia. Hence, we could determine the association between sociodemographic factors (gender, age and race) with the prevalence of dizziness and imbalance in elderly in the University of Third Age (U3A) Malaysia. Besides, we aimed to identify the association between comorbidity (diabetes, hypertension, neurological disorder) with the prevalence of dizziness and imbalance among elderly as well as determine the impacts of dizziness and imbalance in the physical function of an elderly in the University of Third Age (U3A) Malaysi

CHAPTER 4

RESULTS

Introduction

The results of this study were presented in this chapter. Firstly, the descriptive analysis of the respondents' sociodemographic variables was discussed. The frequencies regarding Amer Dizziness Diagnostic Scale (ADDS) questionnaire and Activities- specific Balance Confidence (ABC) Scale were shown respectively. This was followed by the association study regarding the association of sociodemographic variables (age, gender and race) including comorbidity (hypertension and diabetes) with the ADDS questionnaire and ABC Scale results respectively. All results were presented systematically corresponding to the specific objectives of the research.

4.1 Response Rate

The calculated sample size for this research was 329 samples. Despite 30 days of ongoing data collection and approaching the members of University of Third Age, Malaysia (U3A) through online platforms such as WhatsApp and Facebook, only a total of 200 subjects had responded to the questionnaires.

Calculation:

$$\text{Response rate} = (200 / 329) \times 100$$

$$= 60.8\%$$

Hence, the response rate for the study was 60.8%.

4.2 Normality Assessment

Normality assessment of continuous variable which is age was determined statistically using Kolmogorov-Smirnov and Shapiro-Wilk test and graphically using histogram. Variables are normally distributed if the p-value of Shapiro-Wilk is more than 0.05 ($p > 0.05$). The Shapiro-Wilk test was used to analyse the data as it was more sensitive. Table 4.1 showed the p-value for age which was less than 0.05 ($p < 0.05$). Figure 4.1 demonstrated the histogram for the age at which it showed that the data is negatively skewed. Hence, the result showed that the data was not normally distributed.

Table 4.1: Shapiro-Wilk test

Variable	Shapiro-Wilk	
	Statistic	p-value
Age	0.844	<0.001

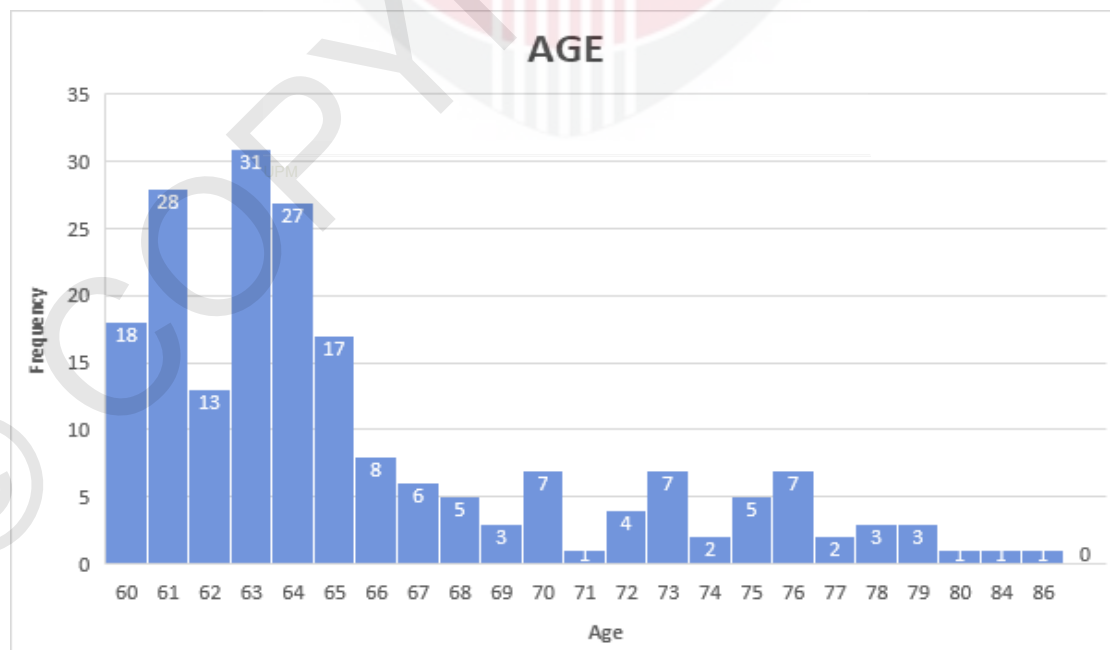


Figure 4.1: Distribution of Age

4.3 Sociodemographic Data

The sociodemographic variables of respondents were shown in Table 4.2. The sociodemographic aspect of the respondents consisted of the following: majority of respondents were female (121, 60.5%), the median $\pm$ interquartile range (IQR) for age was 64.00 ± 6 , Malay (114, 57.0%). This includes respondents who had comorbidity such as hypertension (83, 41.5%), diabetes (51, 25.5%) and neurological disorder (14, 7.0%).

Table 4.2: Sociodemographic Variables of Respondents

Variables	n(%)	Median (IQR)
Gender (n=200)		
Male	79 (39.5)	
Female	121 (60.5)	
Age (n= 200)		64.00 (6)
Race (n=200)		
Malay	114 (57.0)	
Chinese	53 (26.5)	
Indian	25 (12.5)	
Others	8 (4.0)	
Comorbidity		
Hypertension (n=200)	83 (41.5)	
Diabetes (n=200)	51 (25.5)	
Neurological disorder (n=200)	14 (7.0)	

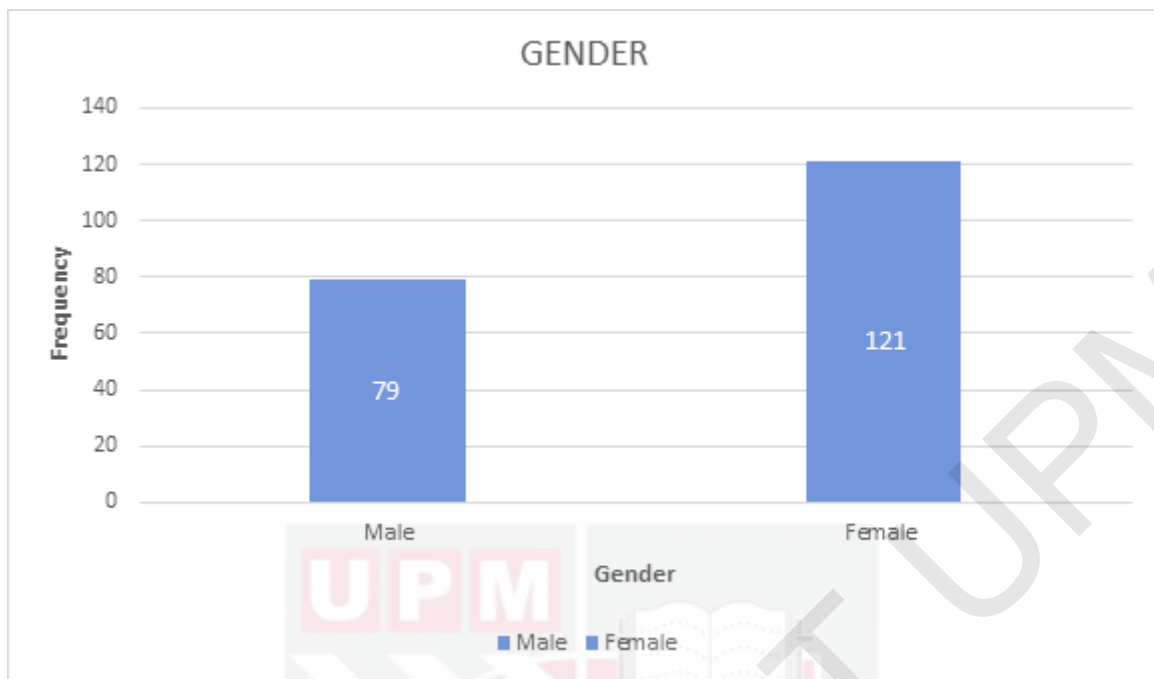


Figure 4.2 : Frequency vs. Gender

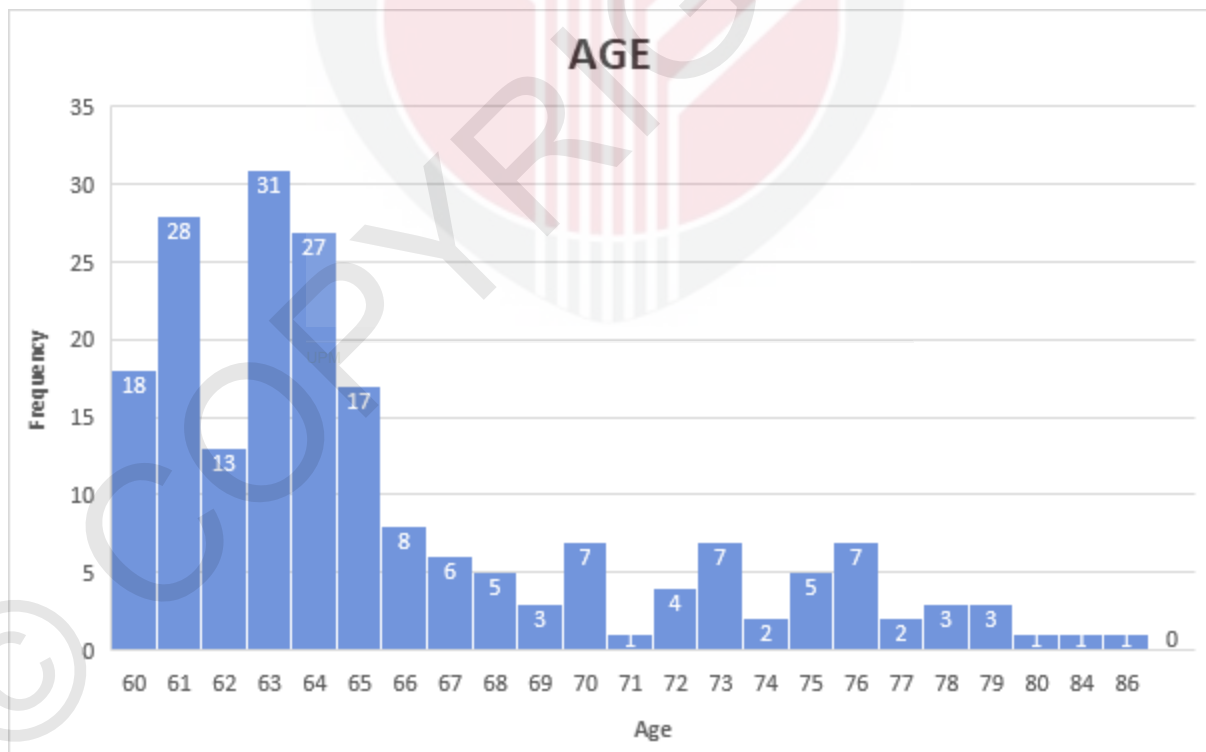


Figure 4.3 : Frequency vs. Age

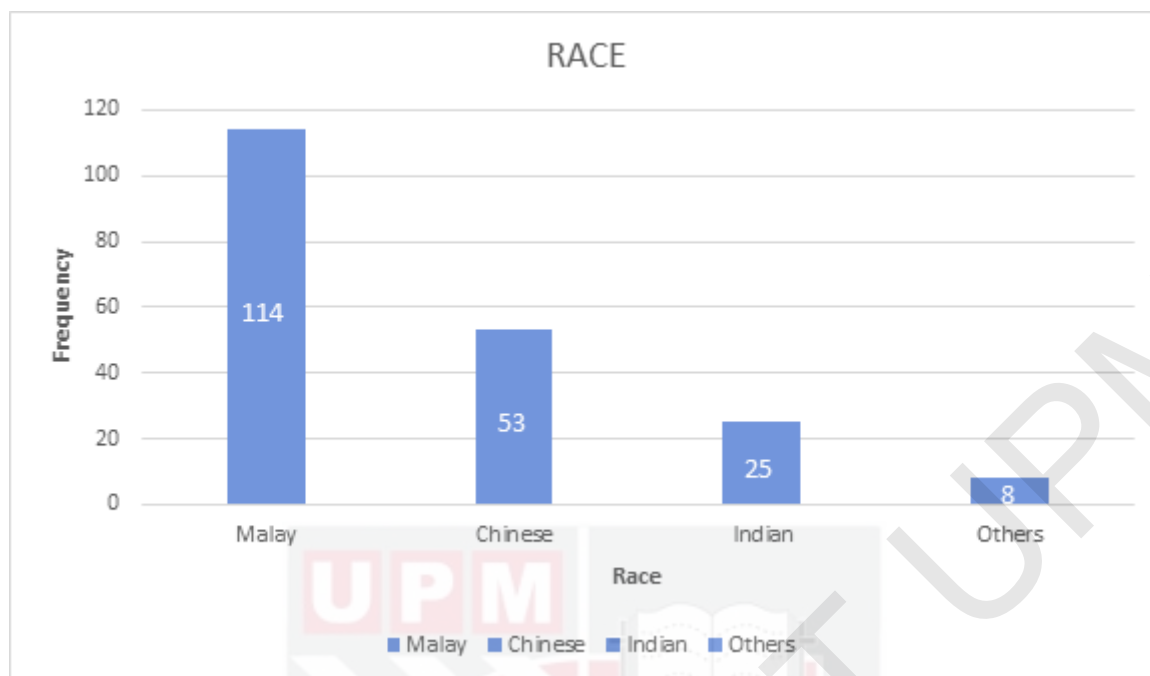


Figure 4.4 : Frequency vs. Race

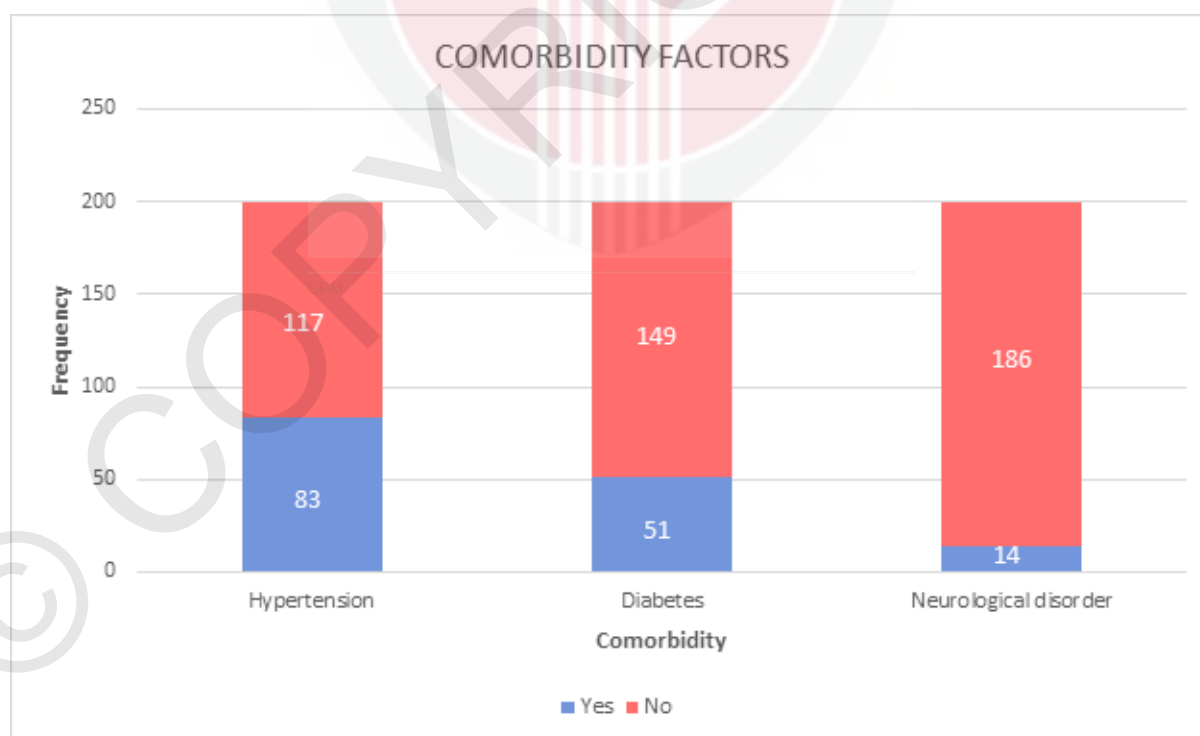


Figure 4.5 : Frequency vs Comorbidity (hypertension, diabetes, neurological disorder)

4.4 Prevalence Study

4.4.1 Amer Dizziness Diagnostic Scale (ADDS) Questionnaire

The total score of the questionnaire is the results of ADDS Questionnaire where score 0 indicated either normal or Cervicogenic Dizziness Problem (CGD), total score of 1 - 4 Unilateral Vestibular Hypofunction (UVH), scores 5 - 19 Benign Paroxysmal Positional Vertigo (BPPV), and scores above 20 indicated Centrally Mediated Problem (CMP). The frequency of each result was statistically recorded in Table 4.3 and graphically in Figure 4.7.

Table 4.3: Frequencies of ADDS Results

ADDS	Frequency (n)	Percent (%)
Normal	73	36.5
CGD	6	3.0
UVH	25	12.5
BPPV	35	17.5
CMP	61	30.5
TOTAL	200	100.0

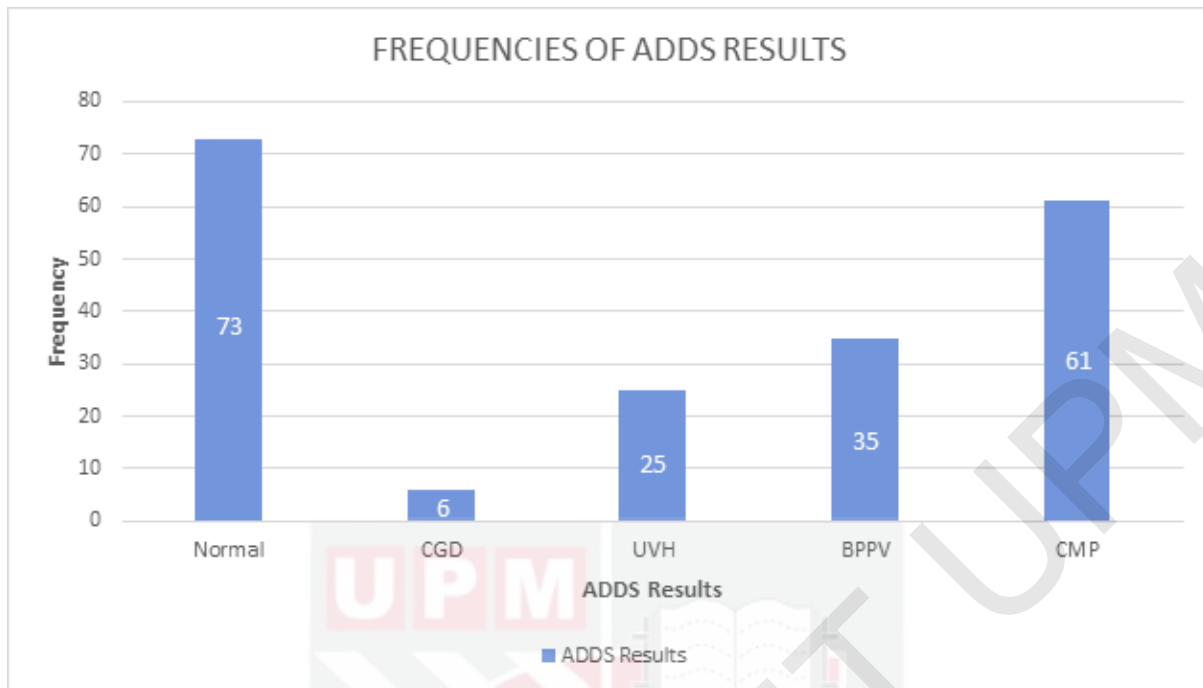


Figure 4.6 : Frequencies of ADDS Results

Frequency of respondents who have dizziness and imbalance vs do not have dizziness and imbalance:

From the Amer Dizziness Diagnostic Scale (ADDS) questionnaire, those who scored 0 can be either normal or had cervicogenic dizziness problems (CGD). Therefore, in order to identify the number of people who had and had not dizziness and imbalance problems, we used ADDS Question 5 to get the frequency. Those who answered ‘Yes’ in Question 5 were considered to have dizziness and imbalance problems, whereas those who answered ‘No’ in Question 5 were considered as normal. Table 4.4 showed the number of respondents who answered ‘Yes’ and ‘No’ in Question 5.

Table 4.4 : Frequency of respondents who answered ‘Yes’ and ‘No’ in ADDS Question 5

ADDS 5	Frequency (n)
Yes	6
No	73

Based on table 4.4, it showed that the frequency of respondents who answered ‘Yes’ and ‘No’ in Question 5 are 6 and 73 respondents respectively. Out of 200 respondents, the frequency of respondents with dizziness and imbalance problems was 127. Hence, the percentage of respondents who had dizziness and imbalance problems was 63.5%.

Those who had either CGD, UVH, BPPV or CMP were grouped together under ‘Yes’ to differentiate them from normal respondents which demonstrated no problems with dizziness and imbalance. This way, we were able to calculate the prevalence of dizziness and imbalance among 200 of our respondents.

Next, the prevalence of dizziness based on the ADDS questionnaire results was shown based on the sociodemographic variables: age (Table 4.6), gender (Table 4.7), race (Table 4.8) and comorbidity which are diabetes (Table 4.9), hypertension (Table 4.10) as well as neurological disorder (Table 4.11). Table 4.5 showed the overall prevalence of dizziness and imbalance among variables. .

Table 4.5 : Prevalence of Dizziness and Imbalance among Sociodemographic Variables and Comorbidity Factors

	Yes n(%)	Normal n(%)
N=200	63.5	36.5
Gender		
Male	60.8	39.2
Female	65.3	34.7
Race		
Malay	64.9	35.1
Chinese	60.4	39.6
Indian	56.0	44.0
Others	87.5	12.5
Comorbidity		
Hypertension	72.3	27.7
Diabetes	64.7	35.3
Neurological disorder	85.7	14.3

Table 4.6 shows the prevalence of age in the total score of the ADDS questionnaire, where the lowest and highest age who answered the questionnaires was 60 and 86 respectively. Based on the table, respondents with the age 63 were recorded as the highest frequency which was 31, whereas the lowest frequency was recorded among respondents with the age of 71, 80, 84 and 86, where each had only one respondent.

Table 4.6 : Prevalence of age in the total score of ADDS questionnaire

Age	Frequency (n)	Mean Rank
60	18	105.06
61	28	92.86
62	13	92.27
63	31	111.81
64	27	101.41
65	17	108.65
66	8	77.13
67	6	117.67
68	5	133.80
69	3	37.00
70	7	89.14
71	1	92.00
72	4	105.25
73	7	76.00
74	2	170.00
75	5	88.50
76	7	75.00
77	2	122.00
78	3	65.33
79	3	125.67
80	1	170.00
84	1	122.00
86	1	170.00
Total	200	

	ADDS Results
Kruskal-Wallis H	22.376
df	22
Asymp. Sig.	0.438

Table 4.7 shows the prevalence of dizziness and imbalance in terms of gender. Based on the table, 39.2% of male and 34.7% of female were recorded to be normal. However, among those who have dizziness and imbalance problems, the prevalence of dizziness and imbalance in male and female respondents were 60.8% and 65.3%, respectively, and the majority of them were diagnosed with centrally mediated problems (CMP).

Table 4.7: Prevalence of dizziness and imbalance based on gender (Total scores of ADDS vs Gender)

ADDS	Male, n (%) (N=79)	Female, n (%) (N= 121)
Normal	39.2	34.7
Yes	60.8	65.3
CGD	2.5	3.3
UVH	8.9	14.9
BPPV	16.5	18.2
CMP	32.9	28.9
Total	100.0	100.0

Table 4.8 showed the prevalence of dizziness and imbalance in terms of race. Based on the table, more than half of the normal respondents were Malay respondents. The pattern is similar for all Malay, Chinese, Indian and other races respondents where more than half of each race has dizziness and imbalance problems and the majority is recorded to be categorised under centrally mediated problems (CMP).

Table 4.8 : Prevalence of dizziness and imbalance based on race (Total scores of ADDS vs Race)

ADDS	Malay, n(%) N=114	Chinese, n(%) N=53	Indian, n(%) N=25	Others, n(%) N= 8
Normal	35.1	39.6	44.0	12.5
Yes	64.9	60.4	56.0	87.5
CGD	5.3	0.0	0.0	0.0
UVH	13.2	9.4	8.0	37.5
BPPV	19.3	18.9	4.0	25.0
CMP	27.2	32.1	44.0	25.0
Total	100.0	100.0	100.0	100.0

Table 4.9 showed the overall prevalence of dizziness and imbalance among comorbidity factors (hypertension, diabetes and neurological disorder). For hypertension, the prevalence of dizziness and imbalance among hypertensive respondents were 72.2%, whereas for diabetes, out of 51 diabetic respondents, 64.7% had dizziness and imbalance problems. The majority of hypertensive and diabetic respondents were categorised under centrally mediated problems (CMP).

Lastly, for respondents with neurological problems, only a mere 14.3% from the total of 200 respondents have neurological problems and among them 85.7% have dizziness and imbalance problems. None of them had cervicogenic dizziness problems (CGD) or unilateral vestibular hypofunction (UVH), however, the majority were categorised under CMP.

Table 4.9 : Prevalence of dizziness and imbalance based on comorbidity (hypertension, diabetes and neurological disorder) (Total score of ADDS questionnaire vs comorbidity)

ADDS	Hypertension, n(%) N = 83	Diabetes, n(%) N= 51	Neurological Disorder, n(%) N= 14
Normal	27.7	35.3	14.3
Yes	72.2	64.7	85.7
CGD	7.2	5.9	0.0
UVH	9.6	5.9	0.0
BPPV	25.3	19.6	7.1
CMP	30.1	33.3	78.6
Total	100.0	100.0	100.0

4.4.2 Activities-specific Balance Confidence (ABC) Scale Questionnaire

The total score of the ABC Scale questionnaire was the results of ABC Scale which was categorised into three different levels of confidence: low (scores below 50), medium (scores below 80), high (scores over 80). The frequency of each result was statistically recorded in Table 4.10 and graphically in Figure 4.8.

Table 4.10: Frequencies of ABC Scale Results

ABC SCALE	Frequency (n)	Percentage (%)
Low level	13	6.5
Medium level	54	27.0
High level	133	66.5
TOTAL	200	100.0

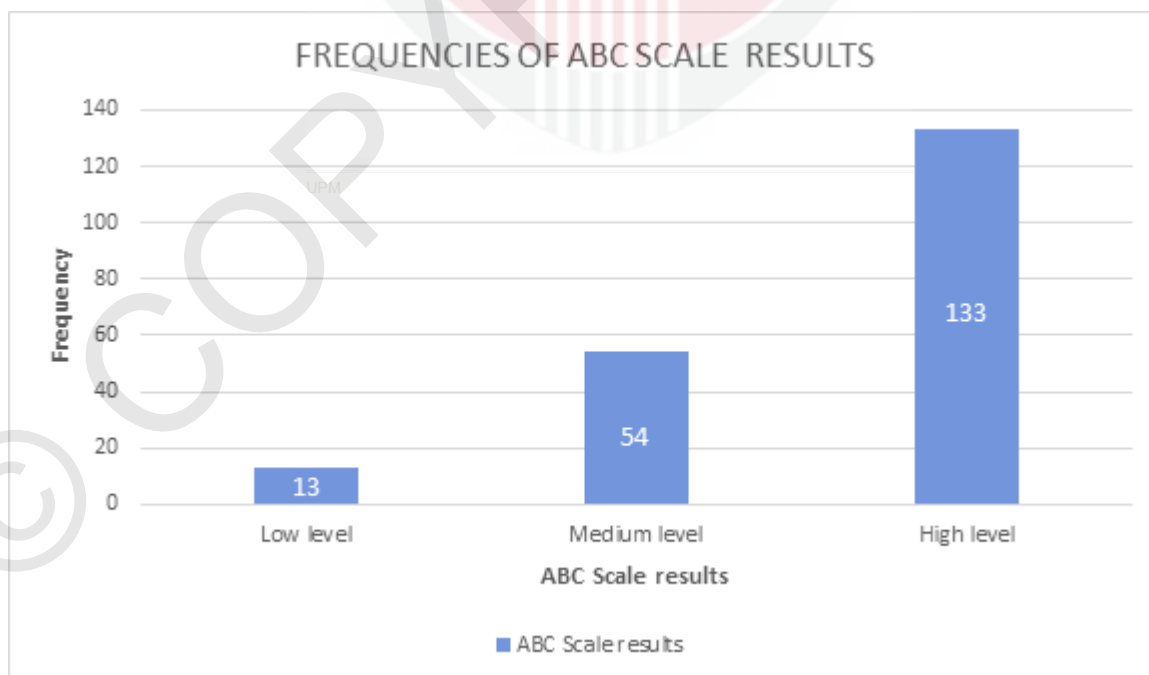


Figure 4.7: Frequencies of ABC Scale Results

Table 4.11 showed the prevalence of age in the total score of ABC scale, where age 63 had the highest frequency with 31 respondents, whereas the lowest frequency was recorded among respondents with the age of 71, 80, 84 and 86, which each had only one respondent. This is also shown graphically with Figure 4.8.

Table 4.11 : Prevalence of age in the total score of ABC Scale

Age	Frequency (n)	Mean Rank
60	18	92.06
61	28	106.09
62	13	119.62
63	31	111.81
64	27	103.81
65	17	80.56
66	8	98.94
67	6	102.83
68	5	89.90
69	3	71.67
70	7	120.64
71	1	134.00
72	4	87.25
73	7	89.14
74	2	87.25
75	5	108.60
76	7	120.64
77	2	40.50
78	3	102.83
79	3	71.67

80	1	40.50
84	1	40.50
86	1	7.00
Total	200	

	ABC Results
Kruskal-Wallis H	24.271
df	22
Asymp. Sig.	0.333

Table 4.12 showed the overall prevalence of each level of confidence based on the sociodemographic variables (gender and race) and comorbidity (hypertension, diabetes and neurological disorder).

Table 4.12 : Level of Functioning in sociodemographic factors (gender and race) and comorbidity (hypertension, diabetes and neurological disorder)

Confidence level	Low, n(%)	Medium, n(%)	High, n(%)
N= 200	6.5	27.0	66.5
Gender			
Male	7.6	21.5	70.9
Female	5.8	30.6	63.6

Race			
Malay	4.4	28.1	67.5
Chinese	5.7	17.0	77.4
Indian	8.0	40.0	52.0
Others	37.5	37.5	25.0
Comorbidity			
Hypertension (n=200)	8.4	26.5	65.1
Diabetes (n=200)	11.8	29.4	58.8
Neurological Disorder (n=200)	7.1	28.6	64.3

Overall, 66.5% of respondents recorded a high level of confidence, 27.0% were medium level confidence and 6.5% had low level of confidence based on the ABC Scale.

Based on gender, out of 79 male respondents, 70.9% had high levels of confidence, 21.5% had medium levels of confidence and 7.6% had low levels of confidence. For females, in the total of 121 female respondents, 63.6% had high levels of confidence, 30.6% recorded medium level confidence and 5.8% had low levels of confidence.

In terms of race, for Malay respondents, 67.5% had high level, 28.1% had medium level and 4.4% had low level of confidence. For Chinese respondents, 77.4% had high level, 17.0% had medium level and 5.7% had low level of confidence. For Indian respondents, 52.0% had high

level, 40.0% had medium level and 8.0% had low level of confidence. Lastly for other races, 25.0% had high level, 37.5% had medium level and 37.5% had low level of confidence.

For comorbidity, among hypertensive patients, 65.1% had high levels, 26.5% had medium levels and 8.4% had low levels of confidence. Next, among diabetic patients, 58.8% had high levels, 29.4% had medium levels and 11.8% had low levels of confidence. Lastly, for respondents who had neurological problems, 64.3% had high levels of confidence, 28.6% had medium levels and 7.1% had low levels of confidence.

4.5 Association Study

Table 4.13 showed the association between sociodemographic variables which were age, gender, race including comorbidity which were diabetes, hypertension and neurological disorder with the results of the ADDS questionnaire and ABC Scale respectively. Kruskal-Wallis test, Chi-square test and Fisher Exact test were used. For ADDS, the results shows that neurological factors ($x^2 = 16.697$, $P = 0.002$) and hypertension ($x^2 = 17.331$, $P = 0.002$) were statistically significant while age ($x^2 = 22.644$, $P = 0.422$), gender ($x^2 = 2.078$, $P = 0.721$), race ($x^2 = 16.374$, $P = 0.175$), and diabetes ($x^2 = 4.675$, $P = 0.322$) did not have any statistically significant association with the score of ADDS. For ABC Scale, the results showed that only race ($x^2 = 20.468$, $P = 0.004$) was significantly associated, while age ($x^2 = 27.629$, $P = 0.188$), gender ($x^2 = 2.071$, $P = 0.355$), diabetes ($x^2 = 3.673$, $P = 0.159$), hypertension ($x^2 = 0.873$, $P = 0.646$) and neurological factors ($x^2 = 0.034$, $P = 0.983$) did not have any statistically significant association with the score of ABC Scale.

Table 4.13 : Association between age, gender, race and comorbidity with ADDS and ABC Scale

		X² (df)	p-value
ADDS	Age	22.644	0.422
	Gender	2.078	0.721
	Race	16.374	0.175
	Hypertension	17.331	0.002
	Diabetes	4.675	0.322
	Neurological disorder	16.697	0.002
ABC Scale	Age	27.629	0.188
	Gender	2.071	0.355
	Race	20.468	0.004
	Hypertension	0.873	0.646
	Diabetes	3.673	0.159
	Neurological disorder	0.034	0.983

Based on Table 4.13, race was significantly associated in which from 200 respondents with the majority being Malay respondents, 77.4% of Chinese respondents recorded a high level of confidence, while 40% of Indian respondents scored medium level for ABC Scale and 37.5% of other races had low level of confidence. In conclusion, other races had a higher tendency of developing a low level of confidence than Malay, Chinese or Indian.

4.6 Impacts of Dizziness and Imbalance on Level of Confidence

Table 4.14 and Figure 4.8 shows the impacts of dizziness and imbalance in elderly that were assessed using two sets of questionnaires - Amer Dizziness Diagnostic Scale (ADDS) questionnaire and Activities- specific Balance Confidence (ABC) scale.

Based on table 4.14, among normal respondents, 84.9% had high levels, 11.0% had medium levels and 4.1% had low levels of confidence. While for patients who had dizziness and imbalance, 55.9% had high levels, 36.2% had medium levels and 7.9% recorded a low level of confidence. This table is also shown graphically in Figure 4.8 where it is seen the number of people who recorded high levels of confidence is higher in normal respondents.

Table 4.14 : ADDS vs ABC scale

ADDS	ABC Scale			Total
	Low Level	Medium Level	High Level	
	(%)	(%)	(%)	
Normal (n = 73)	4.1	11.0	84.9	100.0
Yes (n = 127)	7.9	36.3	55.9	100.0
CGD (n = 6)	0.0	16.7	83.8	100.0
UVH (n = 25)	0.0	32.0	68.0	100.0
BPPV (n = 35)	14.3	28.6	57.1	100.0
CMP (n = 61)	8.2	44.3	47.5	100.0

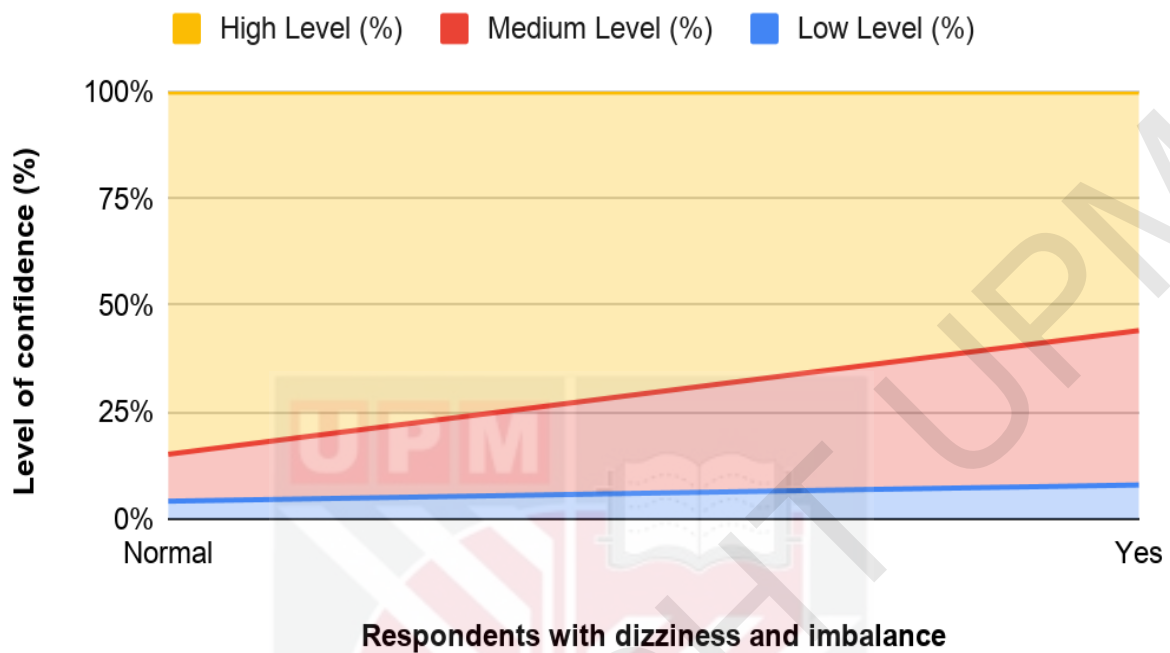


Figure 4.8 : ADDS results vs ABC scale (Impact of dizziness and imbalance on the level of confidence)

Based on table 4.15, the Fisher's Exact Test was statistically significant ($p < 0.05$) suggesting that there was an association between ADDS and ABC Scale.

Table 4.15: Association between ADDS and ABC Scale (impact of dizziness and imbalance on level of functioning)

	X ² (df)	P-value
Fisher's exact test	28.132 (8)	<0.001

We also decided to investigate deeper into the relationship between impacts of dizziness and imbalance on the respondents' level of functioning by looking specifically at the association of the ABC Scale with Question 9 until Question 17 of the ADDS Questionnaire. Table 4.16 showed the overall relationship between impacts of dizziness and imbalance on the level of confidence.

Table 4.16: ADDS (Question 9 until Question 16) vs ABC Scale (impacts of dizziness and imbalance on level of confidence)

		ABC Scale			
ADDS results		Low Level (%)	Medium Level (%)	High Level (%)	Total (%)
N =200					
ADDS9	No (n =168)	5.4	23.2	71.4	100.0
	Yes (n = 32)	12.5	46.9	40.6	100.0
ADDS10	No (n = 178)	6.2	23.6	70.2	100.0
	Yes (n = 22)	9.1	54.5	36.4	100.0
ADDS11	No (n = 169)	4.7	23.1	72.2	100.0
	Yes (n = 31)	16.1	48.4	35.5	100.0
ADDS12	No (n = 143)	2.8	19.6	77.6	100.0
	Yes (n = 57)	15.8	45.6	38.6	100.0
ADDS14	No (n = 193)	6.7	26.4	66.8	100.0
	Yes (n = 7)	0.0	42.9	57.1	100.0

ADDS15	No (n =158)	4.4	22.2	73.4	100.0
	Yes (n = 42)	14.3	45.2	40.5	100.0
ADDS16	No (n = 180)	6.7	24.2	68.9	100.0
	Yes (n =20)	5.0	50.0	45.0	100.0

ADDS Question 9 was about vision problems (double or blurred vision) and we found that out of 32 respondents who answered 'Yes', the majority of them had medium level of confidence (46.9%), whereas 40.6% and 12.5% had high and low levels of confidence respectively.

Based on ADDS Question 10 which was about swaying problems, we found that among 22 respondents who responded 'Yes', 36.4% had high levels of confidence, more than half (54.5%) recorded a medium level of confidence and only 9.1% had a low level of confidence. This can be seen in Table 4.16.

Next, ADDS Question 11 asked about dizziness upon movement of head. From 31 respondents who answered 'Yes', the highest percentage was also recorded as medium level of confidence (48.4%).

Whereas for ADDS Question 12 which was about dizziness upon body movements, it was recorded that 38.6% had a high level of confidence, 45.6% had a medium level of confidence and 15.8% had a low level of confidence.

In addition, for ADDS Question 14, among seven respondents who had concussion before experiencing dizziness, the majority of them recorded a high level of confidence (57.1%) and none had a low level of confidence.

In ADDS Question 15, out of 42 respondents who experience postural hypotension, most of them had a medium level of confidence (45.2%) and 40.5% showed to have a high level of confidence and only 14.3% had a low level of confidence.

Furthermore, based on ADDS Question 16 about vestibular problem (tinnitus), among 20 respondents who had vestibular problems, exactly half of them (50%) had medium level of confidence and only 5% had a low level of confidence.

Next, Question 17 was “How long does your dizziness last?” where respondents answered either ‘None’, ‘Seconds’, ‘Minutes’, or ‘Hours’. For high levels of confidence, 63.9% of them were normal, 26.3% answered ‘Seconds’, 6.0% answered ‘Minutes’, and 3.8% answered ‘Hours’. For medium level of confidence, 31.5% were normal, 38.9% were those who answered ‘Seconds’, 27.8% responded ‘Minutes’, and only 1.9% answered ‘Hours’. Lastly, for low a level of confidence, 30.8% were normal respondents, 23.1% answered ‘Seconds’, 30.8% responded ‘Minutes’ and 6.5% answered ‘Hours’. This is shown in Table 4.17.

Table 4.17 : ADDS 17 vs ABC Scale (impacts of duration of dizziness on level of confidence)

Duration of dizziness (ADDS17)	ABC Scale			Total (%)
	Low (%)	Medium (%)	High (%)	
N = 200				
None (n = 106)	3.8	16.0	80.2	100.0
Seconds (n = 59)	5.1	35.6	59.3	100.0
Minutes (n = 27)	14.8	55.6	29.6	100.0
Hours (n = 8)	25.0	12.5	62.5	100.0

Table 4.18 showed the association between ADDS results (Question 9 until Question 17) with the ABC scale. Based on table 4.18, the Fisher's Exact Test showed that it was statistically significant ($p < 0.05$) in all ADDS questions, except for ADDS Question 14 on head concussion ($X^2 = 1.243$, $P = 0.537$). This suggested that there was no association between ADDS Question 14 (head concussion) and ABC Scale. However, a strong association can be seen between other ADDS questions with the level of confidence.

Table 4.18 : Association between ADDS results (Question 9 until Question 17) and ABC Scale

ADDS results	Fisher's exact test	
	X^2 (df)	P-value
Vision problems (ADDS9)	11.519 (2)	0.003
Swaying problem (ADDS10)	10.578 (2)	0.005
Dizziness upon head movement (ADDS11)	16.755 (2)	<0.001
Dizziness upon body movements (ADDS12)	30.148 (2)	<0.001
Head concussion (ADDS14)	1.243 (2)	0.537
Postural Hypotension (ADDS15)	16.922 (2)	<0.001
Vestibular problem (ADDS16)	5.976 (2)	0.050
Duration of dizziness (ADDS17)	32.569 (6)	<0.001

CHAPTER 5

DISCUSSION

5.1 Introduction

Dizziness and imbalance are one of the common complaints received by clinicians regardless of their age. However, it is more commonly seen in elderly patients and this can be very dangerous as it leads to fall, fracture and even death. The cause of dizziness and imbalance are multifactorial; hence it can be very difficult to be defined and to precisely diagnose it.

Amer Dizziness Diagnostic Scale (ADDS) Questionnaire was used in our study to guide with the diagnosis where it can be categorized into four diagnosis: Cervicogenic Dizziness problem (CGD), Unilateral Vestibular Hypofunction (UVH), Benign Paroxysmal Positional Vertigo (BPPV) and Centrally Mediated Problem (CMP). Besides, Activities-Specific Balance Confidence (ABC) Scale was also used in our study to measure the confidence of elderly in performing daily activities.

Therefore, this study was conducted to determine the prevalence and factors associated with dizziness and imbalance among healthy ageing elderly.

5.2 Sociodemographic Data

This study involved a total of 200 respondents mainly from the University of Third Age (U3A) Malaysia. The majority of respondents were female (60.5%) and Malay (57.0%). The highest frequency for age recorded was age of 63 (n=31). Most of the respondents were also among non-diabetic (74.5%), non-hypertensive (58.5%) and those who did not have neurological disorder (93.0%).

5.3 Prevalence Study in Amer Dizziness Diagnostic Scale (ADDS) Questionnaire

In this study, among 200 respondents who answered Amer Dizziness Diagnostic Scale (ADDS) Questionnaire, we found out that only 36.5% of them were normal. Whereas among 63.5% of respondents who had dizziness and imbalance, the majority of them were recorded to have centrally mediated problems (CMP) with the percentage of 30.5%. The lowest and the highest age who answered this questionnaire was 60 and 86 respectively, where the highest frequency was recorded within participants with the age of 63 with the mean rank of 111.81. In a previous study, among 50 participants between the age of 60-88, 74% of them were found to have dizziness (Ferreira et. al, 2014).

It was observed that the majority of sociodemographic factors (gender and race) and comorbidity factors (hypertension, diabetes and neurological disorders) were recorded to have dizziness and imbalance problems. Among gender, females were observed to have a higher percentage of having dizziness and imbalance problems as compared to male, which was 65.3%. Out of 32% male presented in the previous study, 14% of them had daily dizziness, whereas out of 66% female presented, 34% of them found to have daily dizziness. This showed that females have to be found with higher prevalence of getting daily dizziness (Rosa, 2016). It was also discussed that it may be associated to the fact that fluctuations in women's hormonal cycles that may affect the vestibular system.

Based on our study, in terms of race, Malay was recorded with the highest prevalence of dizziness and imbalance (65%) as compared to Chinese, Indian and other races. A previous study mentioned the prevalence of dizziness among those with vestibular problems are more prominent in the Chinese race (45.6%) as compared to other races, but there is no prominent explanation on why these results were achieved (Samsudin, N, 2011).

Next, in the prevalence of comorbidity factors with the total score of the ADDS questionnaire, the frequency of respondents with no hypertension, diabetic and neurological disorder was higher than those who had the disease, where the records were 117, 149 and 186 respectively out of 200 respondents. However, the percentage of dizziness and imbalance was recorded higher among those who actually had hypertension, diabetes and neurological disorder, with the percentage of 72.2%, 64.7% and 85.7% respectively.

Previous study showed there was a significant association between hypertension and dizziness ($p=0.01$) (Lopes *et.al*, 2013). It was stated that this is because headache, dizziness and tinnitus are manifestations of hypertension due to the sudden increase of blood pressure that affects vestibular system. For diabetes, a high percentage of diabetic patients had vestibular deficiency (Walley *et.al*, 2014). Another study has mentioned that deficiency in the brainstem ocular motor integrator have been associated with diabetic patients that can cause imbalance in posture (Nicholson *et. al.*, 2002).

In addition, the symptoms of dizziness were reported among people who are experiencing generalized anxiety, social phobia or panic and more somatic problems such as hypertension, migraine, diabetes have been associated with the people who are experiencing dizziness and imbalance (Wiltink, 2009). Furthermore, within neurology outpatient referrals, 25% had complaints of dizziness while only 13% within emergency department (ED) neurology consultations (Beh, 2017). He also stated that this is due to fact dizziness is a symptom of many neurodegenerative disorders.

5.4 Prevalence Study in Activities-specific Balance Confidence (ABC) scale

Our study showed that among 200 respondents who answered ABC scale, the majority of them showed high levels of confidence with the percentage of 66.5% and only 6.5% of them had low levels of confidence. The lowest and the highest age who answered this questionnaire was 60 and 86 respectively, where the highest frequency was recorded within participants with the age of 63. A previous study showed the relationship between ABC Scale with age and falls in elderly where it concluded that a lower ABC Scale is significantly associated with falls in elderly ($p = 0.01$) (Harkitasari, 2018).

Overall, it was observed that all sociodemographic factors (gender and race) and comorbidity factors (hypertension, diabetes and neurological disorders) have the same pattern, where all of them showed high levels of confidence. Among genders, male respondents were recorded with a higher percentage of having high levels of confidence as compared to female respondents, where it was portrayed in 70.9% male respondents. In a study where females aged more than 60 years old are more likely to get dizziness and imbalance when they age, where 78% of them complain of getting daily dizziness from a total of 260 subjects (Kao, 2001). Hence, we can say that male have higher levels of confidence, since the percentage of getting daily dizziness is low. The average total score of ABC Scale to be significantly lower in females than male (Harkitasari, 2018).

As for race, the highest percentage was recorded in Chinese, where 77.4% of them had high levels of confidence. The prevalence of dizziness among those with vestibular problems are more prominent in the Chinese race (45.6%), followed by the Malay race (45.4%), and then the Indians (6.6%) and finally other ethics (2.4%) (Samsudin, N, 2011). The author further added that there is no prominent explanation on why these results are achieved. Regarding

functional performance however, a study noted that Indians had highest prevalence of self-reported disability in physical functioning followed by Malays and Chinese (Hairi et. al. 2010).

In addition, for level of functioning among elderly in terms of comorbidity, our study showed that those who had no hypertension, diabetes and neurological disorder had highest levels of confidence as compared to those who had the diseases, where the records were 67.5%, 77.4% and 66.7% respondents respectively. We did not find any significant associations between level of functioning of elderly with any of the three comorbidities. However, it should be noted that a previous study mentioned that elderly with hypertension have higher probability of needing extra support in doing daily activities due to restricted mobility (Lopes et. al. 2013).

Other than that, the risk of having dizziness is more prominent in people who are having diabetes, especially those who have peripheral neuropathy, as they have demonstrated many symptoms such as body sway compared to unaffected peers (Walley, 2014). As mentioned earlier, the prevalence of having dizziness problems was high among those who had hypertension, diabetes and neurological disorder. Therefore, this is why a high level of confidence was shown higher among them who had no disease. For the comorbidity diabetes and its association with level of functioning, Silva (2016) noted that diabetic elderly has significantly decreased physical function. This is because this chronic condition is associated with many microvascular and macrovascular complications that may affect gait and balance. Regarding neurological problems, Maria (2019) found that conditions such as anxiety and depression which is associated with lower functional levels among elderly were higher among them with Functional Neurological Disorder (FND). In our findings, we did discover among respondents who had neurological problems they had lower ABC Scale scores.

5.5 Association Study

Based on our study, our association study was conducted between the variables and Amer Dizziness Diagnostic Scale (ADDS) Questionnaire and Activities-specific Balance Confidence (ABC) Scale. In the association between the variables with ADDS Questionnaire, it showed that only neurological factors ($\chi^2 = 16.697$, $P = 0.002$) and hypertension ($\chi^2 = 17.331$, $P = 0.002$) are statistically significant. This means that there is a strong association between neurological factors and hypertension with the dizziness and imbalance. Dizziness was ascribed to peripheral vestibulopathy in 44%, focal vestibulopathy in 11%, mental causes in 16%, different conditions in 26%, and obscure causes in 13% of the patients in their appointments. This indicates that approximately 25% of the dizziness experienced due to central causes such as certain central vestibular disorders, migraine and phobic (Kroenke *et al*, 2016). This can be the reason why respondents with neurological disorder are more prominent to get dizziness and imbalance problems. As for hypertension, systemic arterial hypertension (SAH) is to be said the cause of the most prominent dizziness cases in elderly as SAH is one of the most circulatory problems that causes peripheral or central involvement of the vestibular system (Esparza *et al.*, 2007). Hence, strong association can be seen between hypertension and dizziness and imbalance.

Whereas in the association between the variables and ABC Scale, only race ($\chi^2 = 20.468$, $P = 0.004$) was recorded as statistically significant. Race is a strong predictor of the likelihood of falls at baseline and over follow-up, with older African Americans having lower prevalence and frequency of falls than their older non-Hispanic white counterparts (Emily J.N and Robert J.T, 2014). In Malaysia on the other hand, there was not much research that we found regarding the correlation between race and risk of fall. The prevalence of dizziness among those with vestibular problems are more prominent in the Chinese race (45.6%) as compared to other races

(Samsudin.N, 2011). However, there was no prominent explanation on why these results are achieved.

5.6 Impacts of Dizziness and Imbalance on Level of Confidence

The impact of dizziness and imbalance on the levels of confidence were assessed from ADDS questionnaire and ABC scale. Based on the Fisher's Exact Test that was done in our study, a strong association was shown between dizziness and imbalance with the levels of confidence ($\chi^2 = 28.132$, $P = <0.001$). Similarly, in a previous study by Marchetti et. al. (2011) whom reported that balance confidence of elderly is reduced among those with dizziness and imbalance problems.

Next, a further study was done to find the relationship between impacts of dizziness and imbalance on the respondents' level of functioning by looking specifically at the association of the ABC Scale with ADDS Question 9 until ADDS Question 17. The majority of the ADDS results showed a higher percentage in having medium level of confidence, except for ADDS14 (head concussion) which more than half had a high level of confidence (57.1%). Based on the Fisher's Exact Test, almost all of the ADDS questions showed to be statistically significant, except for ADDS Question 14 which was found to be not statistically significant ($\chi^2 = 1.243$, $P = 0.537$).

However, in a previous study that was done in 2016, it showed that there is an association between concussion with the level of confidence. Performance measures of balance were significantly correlated with cognitive measures, where greater total symptom scores were related to greater impairment in the ABC and DHI ($r = 0.35- 0.39$, $P < 0.008$) (Alsalaheen *et.al.*, 2016).

For ADDS Question 9, the results show significant association with the level of confidence ($X^2= 11.519$, $P= 0.003$) . This is supported with the previous study conducted where visual problems relatively influence the gait and balance of elderly (Helbostad *et.al.*,2009). As for ADDS Question 10 which assessed the swaying problem among elderly, we found that there is a significant association of the swaying problem with the impacts of dizziness ($X^2= 10.578$, $P= 0.005$). In a previous study done in 2004, it showed that the total Berg score which is used to determine the swaying problems and the total ABC score contributed significantly to the prediction of falls with 89% sensitivity and 96% specificity and three variables are significantly associated with the swaying problems. (Lajoie *et.al.*,2004).

Next, for ADDS Question 11 ($X^2= 16.755$, $P= <0.001$) and Question 12 ($X^2= 30.148$, $P= <0.001$), both showed to have association with the level of confidence. In a previous study, it was found that a moderately strong, significant correlation was found between the ABC and the functional performance measures of the Timed Up & Go (TUG) and Dynamic Gait Index (DGI), as well as with the SF-36 (Marchetti, G.F., *et. al.*, 2011). The authors further added that higher levels of balance confidence as measured by the ABC were associated with better TUG scores and DGI scores. We did not find any significant association between head concussion and dizziness with level of confidence. However, in a study by Akin and Murnane (2011) they stated that head injury may results in vertigo, dizziness, and imbalance reduction.

Based on our study, ADDS Question 15 was found to be statistically significant ($X^2= 16.922$, $P= <0.001$). In a previous study that was conducted in 2018, orthostatic hypotension (OH) was found to be associated with increased risk of falls as well as a reduced quality of life (Saedon *et.al.* 2018). Respondents who had postural hypotension recorded low level of confidence in the ABC scale.

In a research conducted in 2017, there was a relationship between the physical quality of life and dizziness among tinnitus patients however no relationship was found between dizziness specifically with patients who have tinnitus (Miura *et. al*, 2017). In our findings, we also found there is an association between people who reported to have vestibular problems in Question 16 of ADDS Questionnaire with levels of confidence ($X^2= 5.976$, $P= 0.050$).

In a study done in 2009, it was found that among participants who recorded dizziness of vestibular origin, they recorded a longer duration of dizziness than participants who did not. And these participants demonstrated a lower physical and functional ability. This is similar to our findings where we found that there is an association between duration of dizziness recorded in Question 17 of the ADDS questionnaire and level of confidence ($X^2= 32.569$, $P= <0.001$) . A longer duration of dizziness can likely cause a person to have a lower confidence level (Tamber *et. al*, 2009).

CHAPTER 6

CONCLUSION

6.1 Conclusion

The response rate that we achieved for our study was 60.8%, where only 200 respondents participated in our study. The majority of our respondents were consisted elderly with the age of 63, female (60.5%), Malay (57.0%), non-hypertensive respondents (58.5%), non- diabetic respondents (74.5%) and respondents with no neurological disorder (93.0%).

Kruskal- Wallis test was used for continuous data which was age. Whereas for race, gender and comorbidity factors (hypertension, diabetes and neurological disorder), Chi-square test was done to determine the prevalence of dizziness and imbalance for ADDS questionnaire and ABC Scale.

To determine the association between all variables with the ADDS questionnaire and ABC scale, the results from the Chi-square test were taken and we found that for ADDS questionnaire, hypertension and neurological disorder were statistically significant. Whereas in ABC Scale, only race was recorded to be statistically significant. Therefore, there was an association between hypertension and neurological disorder with dizziness and imbalance problems. There was also a significant association between race and the level of confidence.

For the impacts of dizziness on level of confidence, we determined the association between different ADDS questions with the ABC scale, which were for the ADDS Questions 9, 10, 11, 12, 13, 14, 15, 16 and 17, where we found there is significant association between all the questions with the level of confidence except for ADDS Question 14 (head concussion).

6.2 Study Limitations

There were a few limitations that we met in our study. As our study design is a cross-sectional study, there are some problems that may arise such as this study does not help to determine the causes and effects of the results obtained. The findings obtained can be flawed or skewed if there is a conflict of interest with the funding sources. Next, non-probability convenience sampling was used in our study for our sampling method. As we are using this method, this may lead to the inability to generalise the results to the elderly population as a whole. This also would lead to under or over representation of the population. Our study was highly vulnerable to selection bias and it has a likelihood of samples being unrepresentative of the population. It also had high levels of sampling error. In addition, we were also unable to get our actual sample size target during the data collection period. We only received 200 out of 329 respondents who answered our questionnaires. Although the total numbers of the members in University of Third Age (U3A) Malaysia was two times larger than our targeted sample size, we were unable to get their contact numbers of each and only depended on their representative. Therefore, we may have missed a large number of respondents as we were unable to reach each and every one of them personally. Besides, as we targeted only elderly who are 60 years and above, not all of them were able to use smartphones, so they were unable to participate in our study.

6.3 Recommendation

In this study, the low response rate affected the generalization of this study as it reduced the statistical power in detecting the prevalence of dizziness and imbalance among healthy ageing elderly. In addition, the implementation of Movement Control Order (MCO) due to COVID-19 pandemic needed us to solely depend on online surveys, which also may have affected our response rate. Future study is suggested to approach more than one organization in Malaysia and use a direct contact survey method to increase the response rate, hence increase the sample size.

Since the results obtained showed that the prevalence of dizziness and imbalance are more common among those who are elderly, female, Malay community and also those who have an underlying diseases (hypertension, diabetes and neurological disorder), future studies are recommended to study deeper on how these factors influences the prevalence of dizziness and imbalance and also it would be easier for researches to find any intervention and medications that involves in decreasing the prevalence of dizziness and imbalance among the elderly population and hence leading them to a more healthier lifestyle and a good quality of life.

This study can be used by future prospective researchers to study more on how sociodemographic factors and comorbidity factors affect the prevalence of dizziness and imbalance as well as the level of confidence, since there is still not much research being done in Malaysia regarding this topic, specifically among elderly. This study will not only help to enhance understanding and potential management of dizziness issues among health professionals or even among community members, but it also may highlight the key elements that can help to develop interventions and programmes to improve the quality of life among elderly in Malaysia. It would be beneficial not only to the respondents, but also to the community as well as to the country.

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APPENDICES

APPENDIX A: WORK PLAN

Gantt Chart

Month/Activity	Apr	May	June	Aug	Sep	Oct
Proposal Preparation						
Submission of proposal						
Proposal presentation						
Preparation of ethical approval to organization						
Data collection and analysis						
Presentation of analysed data						
Report writing						
Poster competition						
Final presentation						
Submission of logbook						

APPENDIX B: SAMPLE SIZE CALCULATION

The sample size for this study which is factors associated with prevalence of dizziness and imbalance in healthy ageing elderly in Malaysia was calculated using sample size calculation for estimating a proportion as shown below:

$$n = \frac{Z_{1-\alpha/2}^2}{d^2} P (1 - P)$$

Specific objectives	formula/ calculation	Estimated sample size
1. To study the socio- demographic characteristics (age, race, gender, educational level) among healthy ageing elderly		No need sample size calculation
2. To study prevalence of dizziness and imbalance among healthy ageing elderly	$Z (1-\alpha/2) = 1.96$ $P = 0.74$ $d = 5\% = 0.05$	296 samples
3. To study association between socio-demographic characteristics (age, race, gender, educational level) with prevalence	a) Age: <u>i) 70 years old:</u> $Z (1-\alpha/2) = 1.96$	i) 354 samples

of dizziness and imbalance among healthy ageing elderly	$P = 0.36$ $d = 5\% = 0.05$ <u>ii) 88-90 years old:</u> $Z (1-\alpha/2) = 1.96$ $P = 0.54$ $d = 5\% = 0.05$	ii) 382 samples
	a) Gender: <u>i) Female:</u> $Z (1-\alpha/2) = 1.96$ $P = 0.36$ $d = 5\% = 0.05$ <u>ii) Men:</u> $Z (1-\alpha/2) = 1.96$ $P = 0.29$ $d = 5\% = 0.05$	i) 354 samples ii) 316 samples
	a) Race:	

	<u>i) Chinese:</u> $Z (1-\alpha/2) = 1.96$ $P = 0.456$ $d = 5\% = 0.05$ <u>ii) Malay:</u> $Z (1-\alpha/2) = 1.96$ $P = 0.454$ $d = 5\% = 0.05$ <u>iii) Indian:</u> $Z (1-\alpha/2) = 1.96$ $P = 0.066$ $d = 5\% = 0.05$	i) 381 samples ii) 381 samples iii) 95 samples
4. 4. To study the association between comorbidity (stroke, diabetes, hypertension) with the prevalence of dizziness and imbalance in healthy ageing elderly	a) Diabetes: $Z (1-\alpha/2) = 1.96$ $P = 0.328$ $d = 5\% = 0.05$	a) 339 samples

	b) hypertension: $Z (1-\alpha/2) = 1.96$ $P = 0.352$ $d = 5\% = 0.05$	351 samples
5. To study the impact of dizziness and imbalance on daily physical functional activity level		No need sample size calculation

APPENDIX C: CONSENT FORM

BORANG PERSETUJUAN/CONSENT FORM

PENERANGAN DAN PERSETUJUAN RESPONDEN

Sila baca maklumat berikut dengan teliti. Sekiranya anda mempunyai sebarang pertanyaan, sila kemukakan kepada penyelidik. / *Please read the following information carefully and do not hesitate to discuss any questions you may have with the researcher.*

1. TAJUK KAJIAN / STUDY TITLE

Kelaziman dan faktor-faktor yang mempengaruhi pening dan ketidakseimbangan dalam kalangan warga emas yang sihat di Malaysia. / *Prevalence and factors associated with dizziness and imbalance among elderly with healthy aging elderly in Malaysia.*

2. PENGENALAN / INTRODUCTION

Kajian ini merupakan sebuah projek yang dijalankan oleh pelajar sarjana muda doktor perubatan dari 27 April 2020 sehingga 9 Ogos 2020. Kajian ini melibatkan 329 responden yang terdiri daripada ahli 'University of Third Age (U3A)', Malaysia. / *This study is conducted by medical degree students from 27th April 2020 until 9th August 2020. This study involves 329 respondents from the members of University of Third Age, Malaysia.*

Kajian ini dijalankan adalah untuk mengenal pasti kelaziman dan faktor-faktor yang mempengaruhi pening dan ketidakseimbangan dalam kalangan warga emas yang sihat di Malaysia. Kajian ini juga menganalisa ciri-ciri sosio-demografi seperti jantina, bangsa, tahap pendidikan dan komorbiditi. Pening dan ketidakseimbangan adalah sangat

lazim dalam kalangan warga emas dan telah menimbulkan kebimbangan kesihatan awam kerana ia menjadi faktor risiko untuk jatuh dan patah tulang. Pening didefinisikan sebagai pelbagai sensasi orientasi badan dan kedudukan yang sering sukar digambarkan oleh pesakit manakala ketidakseimbangan dapat digambarkan sebagai satu perasaan tidak stabil ketika duduk, berdiri, atau berjalan tanpa arah yang spesifik. / *This study is carried out to determine the prevalence and factors associated with dizziness and imbalance among elderly with healthy aging in Malaysia. This study is also carried out to determine characteristics of socio-demographic factors such as gender, ethnicity, race, educational level and comorbidity of the prevalence of dizziness and imbalance in healthy aging elderly. Dizziness and impaired balance are very common in elderlies which creates public health concerns as it usually becomes the risk factor for fall and fractures. The word dizziness can be defined as various sensations of body orientation and position that are frequently difficult to be described by patients, whereas imbalance can be described as the feeling of instability while being seated, standing, or walking without a specific directional preference*

3. APAKAH YANG PERLU ANDA LAKUKAN? / WHAT WILL YOU HAVE TO?

Satu pautan akan diedarkan kepada ahli-ahli University of Third Age Malaysia di mana ianya mengandungi dua set borang soal selidik. Responden perlu mengisi dua borang soal selidik yang diedarkan iaitu ‘Amer Dizziness Diagnostic Scale (ADDS)’ dan ‘Activities-specific Balance Confidence (ABC) Scale’. Soal selidik ini akan dilaksanakan secara atas talian disebabkan oleh Perintah Kawalan Pergerakan. Setiap bahagian perlu diisi dan dijawab oleh responden. Borang persetujuan akan dilampirkan pada halaman pertama di dalam pautan itu. Mereka yang bersetuju untuk mengambil

bahagian dalam kajian ini perlu mengisi borang persetujuan terlebih dahulu, sebelum menjawab soalan-soalan seterusnya. Mereka yang tidak mahu mengambil bahagian akan dikecualikan dari kajian ini. Oleh itu, semua responden tidak perlu untuk menghantar borang kebenaran terlebih dahulu secara berasingan. Harap maklum bahawa penyertaan dalam penyelidikan ini adalah secara sukarela dan para peserta boleh menarik diri pada bila-bila masa tanpa penalti atau kehilangan faedah yang layak diberikan oleh peserta. Tambahan lagi, tiada pampasan yang akan diberikan kepada peserta. / *A google form link will be distributed to the members of University of Third Age Malaysia, where it consists of two questionnaires. Respondents will have to fill up two self-administered questionnaires i.e., (Amer Dizziness Diagnostic Scale (ADDS) and Activities-specific Balance Confidence (ABC) Scale). The questionnaires will be conducted online due to Movement Restriction Order. Every section has to be filled by the respondents. A consent form will be attached on the first page in the google form. Those who agree to participate in this research require to fill up the consent form first, before they will proceed with answering the questions. Those who do not want to participate will be excluded from this research. Therefore, all respondents are not required to send the consent form beforehand separately. Please note that the participation in this research is based on volunteerism basis and the participants may withdraw at any time without penalty or loss of benefit to which the participant is entitled. In addition, there will be no compensation given to participants.*

4. SIAPA YANG TIDAK BOLEH MENYERTAI KAJIAN INI? / WHO SHOULD NOT PARTICIPATE IN THE STUDY?

Peserta yang bukan dari University of Third Age (U3A) dan umurnya kurang dari 60 tahun akan dikecualikan daripada menyertai kajian ini. / *Participants who are not*

from the University of Third Age (U3A) Malaysia organization and individuals who are below 60 years old will be excluded in this research.

5. APAKAH FAEDAH MENYERTAI KAJIAN INI? / WHAT WILL BE THE BENEFITS OF THE STUDY?

a) KEPADA ANDA PESERTA? / TO YOU AS THE SUBJECT?

Penyertaan responden akan membantu pengkaji dalam memperolehi maklumat mengenai faktor yang melibatkan berlakunya pening dan ketidakseimbangan dalam kalangan golongan warga emas yang sihat khususnya di Malaysia. Dengan ini, tindakan susulan boleh diambil seperti kaunseling dan proses perubatan yang bersesuaian sekiranya terdapat responden yang didapati mengalami masalah yang serius. / *Participation of respondents will help the researchers to obtain information regarding the factors associated with prevalence of dizziness and imbalance in healthy aging elderly in Malaysia. Through this, follow up action can be taken such as counselling and appropriate medical interventions if there are respondents who are found to have serious problems.*

b) KEPADA PENYELIDIK? / TO THE INVESTIGATOR?

Keputusan yang diperoleh daripada maklum balas responden akan membantu pengkaji untuk mengkaji ciri-ciri socio-demografi dengan kelaziman berlakunya pening dan ketidakseimbangan dalam kalangan golongan warga emas yang sihat. / *Results obtained from the feedback of respondents will help*

the researchers to investigate socio-demographics characteristics and prevalence of dizziness and imbalance in healthy aging elderly.

6. ADAKAH IA BERISIKO? / WHAT ARE THE POSSIBLE RISK?

Tiada apa-apa risiko terhadap responden yang mengambil bahagian dalam kajian ini. Segala maklumat mengenai identiti responden akan disimpan dan tidak akan didedahkan kepada pihak ketiga. / *There will be no risk towards the respondents who take part in this study. All information regarding the identities of respondents will be kept confidential.*

7. ADAKAH MAKLUMAT DAN IDENTITI SAYA KEKAL RAHSIA? / WILL THE INFORMATION THAT YOU PROVIDE AND YOUR IDENTITY REMAIN CONFIDENTIAL?

Ya, segala maklumat dan identiti responden yang dinyatakan dalam borang soal selidik tidak akan didedahkan kepada mana-mana pihak. / *Yes, all information and identities of the respondents that is stated in the questionnaire will be kept confidential.*

8. SIAPA YANG SAYA PERLU HUBUNGI SEKIRANYA SAYA MEMPUNYAI SOALAN TAMBAHAN SEMASA MENGIKUTI PENYELIDIKAN INI? / WHO SHOULD YOU CONTACT IF YOU HAVE ADDITIONAL QUESTIONS DURING THE COURSE OF RESEARCH?

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Sila tandatangan disini sekiranya anda telah membaca dan memahami kandungan halaman ini

/ Please initial here if you have read and understood the contents of this page_____

9. PERSETUJUAN

Saya..... No Kad Pengenalan.

.....

beralamat.....

.....dengan ini bersetuju untuk mengambil bahagian secara sukarela dalam penyelidikan yang tersebut di atas *(kajian klinikal/percubaan ubat-ubatan/rakaman video/kumpulan sasaran/temuduga/ soal selidik).

Saya telah diberi penjelasan secara menyeluruh mengenai penyelidikan ini dari segi metodologi, risiko dan komplikasi (seperti tertulis pada Helaian Penerangan Responden). Saya memahami bahawa saya berhak menarik diri dari penyelidikan ini pada bila-bila masa tanpa memberi sebarang alasan. Saya juga memahami bahawa sebarang maklumat yang berkaitan identiti saya akan dirahsiakan.

Saya* berminat / tidak berminat untuk mengetahui keputusan kajian yang melibatkan saya.

I setuju/tidak bersetuju untuk imei/gambar/rakaman video/ rakaman suara digunakan dalam apa jua bentuk penerbitan atau pembentangan. (sekiranya berkaitan).

*potong yang tidak berkenaan

Tandatangan

(Responden)

Tandatangan.....

(Saksi)

Tarikh :.....

Nama:.....

No. K/P:

Saya mengesahkan bahawa saya telah menerangkan kepada responden ini sifat dan tujuan penyelidikan yang tersebut di atas.

Tarikh

Tandatangan

(Penyelidik)

10. CONSENT

I Identity Card No.
address.....
.....hereby voluntarily agree to
take part in the research stated above *(clinical /drug trial/video recording/ focus
group/interview-based/ questionnaire-based).

I have been informed about the nature of the research in terms of methodology, possible adverse effects and complications (as written in the Respondent's Information Sheet). I understand that I have the right to withdraw from this research at any time without giving any reason whatsoever. I also understand that this study is confidential and all information provided with regard to my identity will remain private and confidential.

I* wish / do not wish to know the results related to my participation in the research

I agree/do not agree that the images/photos/video recordings/voice recordings related to me be used in any form of publication or presentation (if applicable)

* delete where necessary

Signature

(Respondent)

Signature.....

(Witness)

Date :.....

Name:.....

I/C No. :.....

I confirm that I have explained to the respondent the nature and purpose of the above-mentioned research.

Date

Signature.....

(Researcher)

APPENDIX D: QUESTIONNAIRE

AMER Dizziness Diagnostic Scale (ADDS)

Name: _____

Date: _____

Therapist: _____

Question		YES	NO		
Section 1 (no score)					
1	Gender?	[M]	[F]		
2	Age?	Above 50	Below 50		
3	Are you Hypertensive?				
4	Are you Diabetic?				
5	Do you have a balance problem?				
6	Do you experience double vision or blurred vision that cause vomiting?				
7	Have you experienced partial hearing loss associated with dizziness?				
Section 2 (yes = 1, no = 0)					
8	Have you been diagnosed with a viral or bacterial infection in the last 2 weeks (cold, flu)?				
9	Do you experience double vision or blurred vision?				
10	Do you drift to one side when walking?				
Section 3 (yes = 5, no = 0)					
11	Do you experience dizziness while moving your head?				
12	Do you experience dizziness with different body movements, like bending forward or sleeping on your side?				
Section 4 (yes = 20, no = 0)					
13	Have you been diagnosed with any neurological disorder (Stroke, MS)?				
14	Have you had a head Concussion before experiencing dizziness?				
15	Do you experience lightheadedness or fainting when moving from a sitting to a standing position?				
16	Do you have ear Tinnitus?				
Section 5 (No = 0, S = 1, M = 5 & H = 20)					
17	How long does your dizziness last?	No	S	M	H
Total (max 113) =					

Diagnosis:

☐ CGD

☐ UVH

☐ BPPV

☐ CM

Activities-Specific Balance Confidence (ABC) Scale

Adapted from: Powell LE and Myers AM. The Activities-Specific Balance Confidence (ABC) Scale.

J Gerontol. A. Biol. Sci. Med. Sci. 1995; 50A:M 28-34

	Level of Confidence (0-100%)
1. Walking around the house	_____
2. Walking up and down stairs	_____
3. Picking up slippers/ something from the floor	_____
4. Reaching at your eye level	_____
5. Reaching while on your tiptoes	_____
6. Reaching while standing on a chair	_____
7. Sweeping the floor	_____
8. Walking outside to a nearby car	_____
9. Getting in/out of a car/transport	_____
10. Walking across a parking lot	_____
11. Walking up and down a ramp	_____
12. Walking in a crowded mall	_____
13. Being bumped while walking in a crowd	_____
14. Using an escalator while holding the railing	_____
15. Using an escalator without holding the railing	_____
16. Walking on slippery floors	_____
Total Score:	_____

APPENDIX E: BUDGET PLANNING

No.	Items	Estimated cost
1.	Printing	RM 15.00
2.	Photostating	RM 15.00
3.	Binding	RM 5.00
	Total	RM 35.00