

## Visual Impairment among Adult 50 Years and Above in Malaysia: Findings from National Health and Morbidity Survey (NHMS) 2015

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### Abstract

**Background:** Visual impairment and blindness are common problems in older adult of Malaysian and the number of people affected is likely to increase as the population age increased. Visual impairment can be described as any chronic visual deficit that impairs everyday functioning. This study aims to determine the association of visual impairment with diabetes mellitus among adults in Malaysia.

**Method:** Data was analyzed on adults aged  $\geq 50$  years from the National Health and Morbidity Survey (NHMS) 2015, a cross-sectional, nationwide population-based survey covering information on socio-demographic profile, diabetes mellitus and visual domain from the locally validated Washington Group Short Questionnaire.

**Results:** The overall prevalence of diabetes patients had difficulty in seeing was 26.1% (95% CI: 24.2, 28.0). Elderly Malaysians was noted to have higher proportion of visual impairment 27.8% (95% CI: 25.6-30.1) compared to other age group. From that, we selected the respondents aged 50 and above and the result showed 32.5% (95% CI: 30.76, 34.37) of them having visual impairment. Logistic regression analysis was used to determine factors associated with visual impairment and showed it was significantly associated with diabetes mellitus [aOR=1.8, 95%-CI: 1.7-1.9], more female visually impaired [aOR=1.1, 95%-CI: 1.0- 1.2] and most among elderly [aOR=5.3, 95% CI: 4.4-6.4], other bumiputra [aOR=1.9, 95%-CI: 1.6-2.1], widow/widower/divorcee [aOR=1.4, 95%-CI: 1.1-1.7] and rural [aOR=1.0, 95%-CI: 1.0-1.1].

**Conclusion:** National screening and educational programs were needed to reduce visual impairment and risk of blindness among diabetes patient. The findings may help increase the awareness of visual impairment by general public and policy makers as well.

**Keywords:** Visual impairment; Diabetes mellitus; Visual acuity; Washington Group

### Introduction

Visual function is an important thing in the quality of life especially among elderly due to increased risk of developing chronic diseases which may affect their healthy life style and require physical and health care [1]. Visual impairment (VI) and blindness was a global problem with the important of socio economic factors which have proven effects on the quality of life of individuals and usually imposed great family related and socio economic losses [2]. It remains a major public health problem worldwide. This condition may worsen if they develop visual impairment or blindness. It has been reported that the prevalence of VI in developed countries was significantly lower compared to developing countries [3].

Visual Impairment is one of the major causes of disability in the United States and Taiwan [2,3]. It has been estimated that the prevalence of visual disabilities will markedly increase during the next several decades, with an estimated 70% increase in blindness and low vision by 2020 [4]. People with Diabetes Mellitus (DM) regard Diabetic Retinopathy (DR) and VI are unable to walk around without assistance

and difficult to perform the simple tasks such as reading, bathing, driving and so on. Mobility of a VI or blindness person is important whether in physical, psychological or economic aspects and it also an important tool of the person's independence in their everyday life. In China, World Health Organisation (WHO) estimated the prevalence of blindness among people more than 50 years was 2.3% based on two major population-based study conducted in sub urban area in Beijing [5].

Visual impairment and blindness are common problems in older adult of Malaysian and the number of people affected is likely to increase as the population age increased [6]. Visual impairment can diminish the health and well-being of older people in many ways, for example by affecting their mobility and contributing to their risk of falls and injury. The prevalence of visual impairment around the world are vary greatly and they play an important role in determining the quality of life, life expectancy, expenses and even the risk of accidents [7]. Their ability to perform everyday activities such as reading, walking or watching television can be affected. Thus, preventing and treating visual impairment can increase the prospect of enjoying life as a healthy and productive older person.

Visual impairment can be described as any chronic visual deficit that impairs everyday functioning. It can be range from mild to severe and includes functional and total of blindness. Approximately 90% of visual impaired people live in developing countries [8]. WHO also reported, adult with aged 50 years and above comprises about 20% of the world's population, and from that about 65% of them were visually impaired [8]. With an increasing elderly population in many countries, more people will be at risk of visual impairment due to chronic eye diseases and ageing factors [8].

World Health Organisation defines VI as Presenting Visual Acuity that is worst than 6/12 to better than 6/60 in the better seeing eye [8]. Visual disability was defined as subjects with visual impairment or blindness [8].

## Objective

This study aims to determine the prevalence of visual impairment among adult 50 years and above in Malaysia and the associate factors.

## Methodology

We extracted data from National Health and Morbidity Survey (NHMS) 2015 and covered both urban and rural areas for every state in Malaysia which focus on visual impairment among elderly aged 50 years and above. The sampling frame was done by Department of Statistics, (DOS) Malaysia based on the required sample size of the survey. From that, the geographical areas in Malaysia were divided into Enumeration Blocks (EB) in each state. On average of the survey, there were 80 to 120 Living Quarters (LQ) with population of 500 to 600 peoples in each EB. In each EBs, a total of 12 LQs were randomly selected and all households and individuals within the selected LQs were invited to involve in this survey [9].

In this study, sample size of visual impairment was calculated based on single proportion formula for estimation of prevalence. The sample size required for single strata analysis was based on 10% estimated prevalence with design effect of 2.0 and non-response of 30%, which margin of error was between 0.01 to 0.05 and 95% confidence interval (CI) [10].

For the topic of difficulty in seeing, the Short Washington Group (WG) questionnaire was used other than hearing, walking, remembering, self-care and communicating. The questionnaires were administered in bilingual language which was Bahasa Malaysia and English. The WG questionnaire was translated by two teams in Bahasa Malaysia, which are language and content expert and fluency in English. The Bahasa Malaysia version was then back to back translated to English by two experts in English-speaking with fluency in Bahasa Malaysia. We conducted the pilot study to test The Bahasa Malaysia version which involved 30 individuals from our three major ethnics in Malaysia which was Malay, Chinese and Indians, from low and highly educated individuals. There were no problems found during the pilot study in term of comprehension, content and wording of the questionnaire translated.

The questionnaire was administered as a face to face interview to our respondents by using mobile device. Interviews were conducted for respondents aged 18 years and above but for the purpose of this visual impairment study, we only selected the topic of difficulty in seeing with respondents aged of 50 and above. A total of 7373 respondents were respond to this topic.

## Data Analysis

Data analysis was performed using complex sample in the IBM Statistical Package of Social Sciences (SPSS) for Windows version 22.0. The overall prevalence of difficulties in seeing and its estimated population affected was determined. We applied the bivariate analysis to look for the association between socio-demographic and co morbidities variables with difficulty in seeing. Multivariate Logistic Regression was used to calculate crude odds ratios and adjusted odds ratio, and to determine the factors associated with difficulty in seeing. It will be used to describe the strength of association between dependant and independent variables. The dependent variable was dichotomous, thus a Logistic Regression (LR) model was used to produce crude odds ratio to measure the association. The socio demographic variables such as locality, ethnicity, sex, age group, marital status and household income, with morbidity aspect such as Diabetes Mellitus, Hypertension, Hypercholesterolemia current smoking and current drinker were included as the independent variables. To obtain the significant variables, FORWARD LR variable selection method was done as a final model. We used the Wald chi-square statistic to test the statistical significance of the individual regression coefficient and the adjusted OR with their respective 95% confidence Interval (CI). A p-value with less than 0.05 ( $p < 0.05$ ) was set as statically significant in this study.

## Ethics Approval

This study was a part of NHMS 2015 and it was reviewed and approved by the Medical Research and Ethics Committee Malaysia (NMRR-14-1064-21877). The involved respondents were provided with information sheet and a copy of signed consent form. Respondents who are illiterate, the information sheet and consent form were read to them and thumb print was taken to replace signature.

## Results

Our survey found that the prevalence of having at least "some difficulties" was highest in 'difficulty in seeing' 16.8% (95% CI: 15.87, 17.75) compared to other difficulties. Due to that, we interested to focus difficulties in seeing among elderly and the associate factors. Elderly Malaysians who were aged 50 and above noted to have higher proportion of difficulties in seeing 27.8% (95% CI: 25.6-30.1) compared to other age group. From that, we selected the respondents aged 50 and above and the result showed 32.5% (95% CI: 30.76, 34.37) of them having visual impairment.

Table 1 shows the socio-demographic profile of respondents aged 50 and above in NHMS 2015 who had visual impairment. Rural area had the highest prevalence of visual impairment, 33.7% compared to urban 30.2% and the highest was among female, 32.2%. By age group, aged 70 and above was seen higher prevalence, 46.3% of VI compared to 50-69 years. In term of ethnicity, other Bumiputeras, was the highest, 44.0% among other ethnic groups which range between 29 to 32%. Those retired respondents, 28.0% was the highest group of visual impairment followed by unpaid or home worker 27.4%, self-employed 26.9%, private sector 23.8% and government or semi government 23.6% Respondents who had no formal education were seen to be the highest prevalence of visual impairment 46.8% compared to those who received primary to tertiary education. By marital status, it was noted that widow/ widower/divorcee was higher prevalence, 39.9% compared to others.

Variable	No	Visual Impairment (%)	95% (CI)		p value	
			Lower	Upper		
Locality	Urban	1159	30.2	28.62	33.05	0.001
	Rural	1187	33.7	34.71	40.45	
Agegroup	50-59 years	908	25.4	24.38	28.83	0
	60-69 years	775	32.9	31.83	37.65	
	70 & above	663	46.3	42.09	49.87	
Sex	Male	1080	31.4	28.89	33.45	0
	Female	1266	32.2	31.74	36.27	
Ethnicity	Malay	1465	31.7	31	35.61	0
	Chinese	439	29.2	25.23	31.86	
	Indian	153	29.9	26.79	38.39	
	Other Bumiputera	241	44	38.7	49.6	
	Others	48	27.1	18.33	41.49	
Occupation	Government/semi Government	112	23.6	20.54	31.72	0
	Private	227	23.8	21.8	29.15	
	self-employed	414	26.9	23.35	29.51	
	Unpaid/ homemaker	387	27.4	25.95	32.95	
	Retiree	211	28	22.98	32.09	
Education	No formal education	479	46.8	43.34	52.05	0
	Primary	1069	33.4	32.64	37.53	
	Secondary	650	26.6	24.82	30.09	
	Tertiary	127	20	16.89	25.4	
	Unclassified	17	38.6	20.62	61.46	
Marital Status	Single/Never married	60	25.9	21.59	36.25	0
	Married	1669	29.9	28.46	32.49	
	Widow/ widower	617	39.9	38.41	45.28	
	divorcee					
Household Income	Poorest 20%	647	36.9	35.13	41.72	0
	Poor 20%	516	33.1	31.48	37.96	
	Middle income	440	30.3	27.41	34.45	
	Rich 20%	365	29.8	24.4	31.49	
	Richest 20%	378	27.4	26.81	34.02	
Diabetes Mellitus		905	34.8	33.06	38.4	0
Hypertension		1537	33.7	32.29	36.71	0
Hyper cholesterolemia		1522	31.1	30.69	34.57	

Current Smoker		414	33.6	30.62	37.94	
Current drinker		66	23.5	17.81	30.98	

**Table 1:** Socio-demographic profile of respondent aged 50 and above with Visual Impairment in NHMS 2015 (n=7373).

On the morbidity aspects, our study found that among adults aged 50 and above those who were having Diabetes Mellitus, 34.8% of them had visual impairment compared to hypertension 33.7% and hypercholesterolemia 31.1%.

Table 2 shows the associate factors of visual impairment among respondents aged 50 and above in Malaysia. Overall visual impairment among respondents aged 50 and above was noted as higher in rural area and among females (crude OR=1.2) respectively. By ethnicity, compared to Malays visual impairment was 1.7 times more likely to be found among other Bumiputeras and one time higher among Chinese, Indians and others. Visual impairment also noted 2 times higher among widow/widower (crude OR=1.9) compared to married (crude

OR=1.2) and one time higher among all household income compared to the richest 20% group, and also one time higher among those with secondary education compared to others as well as those who had Diabetes Mellitus and Hypertension (crude OR=1) respectively. In term of occupation, it also noted one time higher among all groups.

Further analysis using logistic regression found that population at risk of having visual impairment in Malaysia significantly among rural dwellers [aOR=1.0, 95%CI: 0.90, 1.10]. In term of age group also noted that older age significantly having at risk of VI compared to 50-59 years old. By ethnicity, we found that other Bumiputeras [aOR=1.8, 95%-CI: 1.49, 2.14] and others [aOR=0.9, 95% CI: 0.67, 1.32] were significantly having risk of VI compared to others.

	Variables	Prevalence (95% CI)	Crude OR (95% CI)	Wald	Adjusted OR (95%CI)	p value
Locality	Urban	30.2 (28.62, 33.05)	R	R		
	Rural	33.7 (34.71, 40.45)	1.18 (1.07,1.30)	10.635	1.00 (0.90, 1.10)	0.001
Age group	50-59 years	25.4 (24.38, 28.83)	R	R		
	60-69 years	32.9 (31.83, 37.65)	0.40 (0.35, 0.45)	103.082	0.40 (0.35, 0.45)	0.000
	70 & above	46.3 (42.09, 49.87)	0.57 (0.50, 0.65)	41.149	0.57 (0.50, 0.65)	0.000
Sex	Male	31.4 (28.89, 33.45)	R	R		
	Female	32.2 (31.74, 36.27)	1.04 (0.94, 1.15)	0.547		
Ethnicity	Malay	31.7 (31.00, 35.61)	R	R		
	Chinese	29.2 (25.23, 31.86)	0.89 (0.78, 1.01)	2.533	0.88(0.77, 1.00)	
	Indian	29.9 (26.79, 38.39)	0.92 (0.75, 1.12)	0.337	0.93(0.76, 1.14)	
	Other Bumiputera	44.0 (38.70, 49.60)	1.70 (1.41, 2.02)	19.988	1.79 (1.49, 2.14)	0.000
	Others	27.1 (18.33, 41.49)	0.80 (0.58, 1.12)	1.916	0.94 (0.67, 1.32)	
Marital Status	Single	25.9 (21.59, 36.25)	R	R		
	Married	29.9 (28.46, 32.49)	1.22(0.91, 1.65)	73.64		
	Widow/Widower	39.9 (38.41, 45.28)	1.90 (1.40, 2.60)	82.48		
Household income	Richest 20%	27.4 (26.81, 34.02)	R	R		
	Rich 20%	29.8 (24.40, 31.49)	1.55 (1.33,1.81)			0.000
	Middle income	30.3 (27.41, 34.45)	1.31 (1.12, 1.54)			0.001
	Poor 20%	33.1 (31.48, 37.96)	1.15 (0.98, 1.36)			
	Poorest 20%	36.9 (35.13, 41.72)	1.12 (0.95, 1.00)			
Education Level	Tertiary Education	20.0 (16.89, 25.40)	R	R		
	Secondary Education	26.6 (24.82, 30.09)	1.40 (0.75,2.60)	0.620	1.23 (0.69, 2.42)	

	Primary Education	33.4 (32.64, 37.53)	0.80 (0.43, 1.47)	0.182	0.88 (0.47, 1.63)	
	No formal education	46.8 (43.34, 52.05)	0.58 (0.31, 1.06)	0.893	0.74 (0.40, 1.39)	
	Unclassified	39.2 (20.62, 61.46)	0.40 (0.21, 0.75)	3.772	0.52 (0.27, 1.01)	
Occupation	Government/semi Government		R			
	Private	23.8 (21.80, 29.15)	1.01 (0.78, 1.31)			
	self-employed	26.9 (23.35, 29.51)	1.19 (0.94, 1.510)			
	Unpaid/homeworker	27.4 (25.95, 32.95)	1.22 (0.96, 1.55)			
	Retiree	28.0 (22.98, 32.09)	1.26 (0.97, 1.64)			
Diabetes Mellitus	Yes	34.8 (33.06, 38.40)	1.27 (1.11, 1.36)	11.019	1.20 (1.09, 1.34)	0.001
	No	65.2 (61.60, 66.94)	R			
Hypertension	Yes	33.7 (32.29, 36.71)	1.23 (1.13, 1.39)	1.410	1.07 (0.96, 1.20)	
	No	66.3 (63.29, 67.71)	R			
Hypercholesterol emia	Yes	31.1 (30.69, 34.57)	0.90 (0.81, 0.10)			
	No	68.9 (65.43, 69.31)	R			
Current Smoker	Yes	33.6 (30.62, 37.94)	1.10 (0.97, 1.25)	6.522	1.20 (1.04, 1.37)	
	No	66.4 (62.06, 69.38)	R			
Current drinker	Yes	23.5 (17.81, 30.98)	0.75 (0.43, 1.33)			
	No	76.5 (69.02, 82.19)	R			

**Table 2:** Associate Factors of Visual Impairment among respondents aged 50 and above in Malaysia.

## Discussion

Visual impairment is one of the common problems in older people and the presence of additional health conditions may affect health and rehabilitation outcomes. Based on the finding of our survey, we found that VI was one of the main problems and significantly affecting the elderly in Malaysia which showed the prevalence of adult aged 50 and above who had visual impairment was 32.5%. From the result, we worried that; the large number of elderly people with VI will increase a huge national health burden for the government and society as well. There was a positive relationship between visual impairment and older age in other studies [11,12]. There was research from India and other parts of the world, revealed that visual impairment increased with the increasing of age and was also estimated that people aged 50 years and above comprised 65% of VI and 82% of blindness [13]. It seems that a reason for the higher prevalence of blindness in this study was the age group. As the age increased, the function of the body will be poorer and people can suffer more and more related eye disease such as cataract, diabetic retinopathy, glaucoma and so on which are also main causes of visual impairment.

According to our study, ageing is the most common independent factor of visual impairment. National Health and Morbidity Survey 2015 reported, the prevalence of difficulty in seeing was increased as the age increased [10]. The prevalence showed that difficulties in seeing increased significantly in the individual aged 50 and above compared

to younger age groups [10]. It was noted that lack of access to ophthalmologic facilities and services among older group was a major reason for almost finding, considering the fact that most diseases occur in the fifth decade of life [14]. Study done in Poland, also stated that visual impairment was found in 27.5% subjects in the worse-seeing eye and showed the increasing age and female gender were independent risk factors [15].

From the result, proportion of diabetic patients who had difficulties in seeing was 35%. Our finding indicated that diabetes patients significantly had relationship with visual impairment which result showed that people with diabetes mellitus 1 times higher risk of developing visual impairment and blindness ( $p < 0.001$ ). Most studies have shown that people with higher level of diabetes are more probably to report visual impairment [16]. Visual impairment and blindness are major public health problems among diabetic patients which were caused by the increase of diabetes cases especially in the developing countries. Globally, the number of adults with Diabetes Mellitus aged 20-79 years old is known to be increase from 366 million (83%) in 2011 to 552 million by 2030 [17]. It is estimated that above 80% of these 552 million people with diabetes will live in developing countries [17].

In many develop countries; Diabetes Mellitus is among the leading causes of visual impairment and blindness [18]. As one of the complication of DM, diabetic retinopathy has been identified as the

leading cause of new cases of VI and blindness among adults aged between 20-79 years in develop countries [19]. There was a study found chronic comorbid conditions and cognitive status also contributed significantly to the prediction of visual impairment among the population [20].

Hypertension also reported as a directly and indirectly linked with broad spectrum of vision-threatening eye disorders such as hypertensive retinopathy, ischemic optic neuropathy, retinal vein occlusion and so on [11]. Our study also found that, those respondents who had hypertension also had chances to get Visual Impairment. Another study found a higher prevalent trend of visual impairment among patients with a longer duration of hypertension or diabetics for more than 10 years, and the patients with diabetic retinopathy had a 3.7 times increased of visual impairment [21].

Other finding from our study showed that female respondents significantly had higher prevalence of visual impairment compared to male and among elderly aged 50 and above, but a higher risk among those respondent with aged 70 and above. These results in general replication of past findings that female with older age had lower levels of vision than male counterparts [22]. It also noted that female were less likely to express a need for sight due to fear of being seen as a burden, and some household heads seem to be more inclined to support surgery for male elderly than female [23].

Another result indicated that socioeconomic status and education level also to be the important predictor of visual impairment among elderly people in Malaysia. Our finding was consistent with some previous studies which found household income and level of education to be a significant impact on visual impairment. Those who were in the lower income group and lower education level significantly to have 1 to 2 times of visual impairment compared to the higher income and higher education group ( $p < 0.001$ ). This confirms the role of education and its interaction with economic status as well [24]. In addition, poor accessibility and affordability of eye care services to this population may be responsible for this result [12].

Further research and assessment of education regarding public awareness of eye care considered necessary to determine the direction of educational programs for the target population especially in the 50 years of age groups. Considering the confirm role of income, education and inequality of economic status in the high prevalence of visual impairment, less assessment to healthcare and their less awareness about eye healthcare for these groups, it will be good to give more emphasis on educational programs and implement screening programs for them in order to decrease the percentage of visual impairment among elderly in Malaysia.

Further information on the status of VI in Malaysia, National Eye Survey II (NES II) was implemented on the fourth quarter of 2014 by using Rapid Assessment of Avoidable Blindness (RAAB) methodology. It was also a population-based survey conducted by the Ophthalmology Service of the Ministry of Health (MOH) in collaboration with the Institute for Public Health (IPH) and Clinical Research Centre (CRC) of the MOH. One of the objective of that survey was to estimate the prevalence of blindness and low vision among Malaysian adults who are 50 years and older in Malaysia.

National Eye Survey (NES) II identified that prevalence of blindness (presenting vision  $< 3/60$  in the better eye) in Malaysia was 1.2%. The adjusted prevalence of severe visual impairment (presenting vision  $< 6/60$ - $3/60$  in the better eye) in Malaysia was 0.9% while for the moderate visual impairment (presenting vision  $< 6/18$ - $6/60$  in better

eye) was 5.5% [25]. This survey has provided baseline indicators for planning and monitoring of eye care services in this country. This is in line with WHO Global Action Plan for the Prevention of Avoidable Blindness and Visual Impairment 2014-2019, where the global target is the reduction in prevalence of avoidable VI by 25% by 2019 from the baseline of 2010. Faced with the result of visual impairment in this survey, more efforts are required to enhance treatment and rehabilitation among people with eye disorders to prevent visual impairment and improve their lives.

## Strengths and Limitations

This current study had strength and limitation. The strength of this study is that it provides a nationally representative large sample and produced a reliable and valid data to estimate the magnitude of disability especially visual impairment among adults in Malaysia. This survey also used an internationally comparable validated tool which can compare internationally. A limitation of this study is the used of self-reported functional limitation only without clinical confirmation of the morbidities.

## Conclusion

This survey provides reliable and internationally comparable data on functional disabilities in Malaysia especially on visual impairment. Our survey noted that female, lower socio-economic status, ethnic minority, and lower education level are significant risk factors for visual impairment among adults aged 50 and above in Malaysia. Other than that, it was also identified that Diabetes Mellitus were the common causes of visual impairment and blindness among adult population.

The risk of getting visual impairment due to diabetes mellitus can be reduced by good control of blood glucose level and eye examination. Nationwide eye and diabetic screening as well as educational programs are needed to reduce the risk of visual impairment and blindness among diabetic patients.

Malaysia, same like many other countries worldwide also experiencing the population ageing phenomenon, owing to declining fertility rates combined with increasing life expectancy over the half of 20<sup>th</sup> century. Together with increasing life expectancy, it is predicted that the number of people with visual impairment and blindness will increase significantly in future. The findings may help increase the awareness of visual impairment by general public and policy makers as well.

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