VISUAL FUNCTIONS STATUS IN GERIATRIC NURSING HOME KUANTAN

MOHD HAFIEZZUDDIN BIN MOHD HASHIM
DEPARTMENT OF OPTOMETRY AND VISUAL SCIENCES, KULLIYAH OF ALLIED HEALTH SCIENCES, INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA, JLN SULTAN AHMAD SHAH BANDAR INDERA MAHKOTA 25200 KUANTAN, PAHANG, MALAYSIA
hafiezhashim95@gmail.com

NORSHAM BINTI AHMAD (CORRESPONDING AUTHOR)
DEPARTMENT OF OPTOMETRY AND VISUAL SCIENCES, KULLIYAH OF ALLIED HEALTH SCIENCES, INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA, JLN SULTAN AHMAD SHAH BANDAR INDERA MAHKOTA 25200 KUANTAN, PAHANG, MALAYSIA
ansham@iium.edu.my

ABSTRACT

Introduction: Age related visual impairment and eye diseases are one of the real worries among the different issues that influence the geriatric population on the grounds that their visual status plays major role in the quality of life. The aim of this study was to investigate the visual function status and eye diseases among the old individuals in a nursing home. **Methods:** A total of 43 elderly (males and females) in range age from 51 to 78 years who stayed at nursing centre were examined in this study. The parameters such as visual acuity, colour vision, stereopsis and any eye disorder were collected. There were no incorporation and prohibition criteria in the study. The tools used to measure them were LogMAR chart (at 3 metres), Farnsworth D-15, TNO booklet, portable slit lamp and direct ophthalmoscopy respectively. **Results:** The outcome demonstrates some of them mostly have cataracts (Nuclear 55.8%; Cortical 4.7%; PSCC 4.7%), pterygium (16.3%), arcus senilis (4.7%) and diabetic retinopathy (2.3%). There is a noteworthy impact of cataract formation on colour vision status, $x^2(9, N = 43) = 3.634$, $p < 0.05$. There is likewise an uncovered that cataract give vital impact to stereopsis value, $x^2(12, N = 42) = 9.837$, $p < 0.05$. Stereopsis indicated more influenced than visual acuity as a result of the pathological and physiological changes during aging process. **Conclusion:** It seems important to realize the importance of optometric administration such as doing the screening effectively and the geriatric ought to be urged to come for formal yearly eye check-up to improvise their quality of life.

KEYWORDS: visual function status, geriatric, nursing home, quality of life

INTRODUCTION

Approximately 2 million of Malaysian population are aged 50 years and above in the year 2017 (Barreintos and Soria, 2018). The population of these ages are comprising about 7 percent of the total Malaysian of 32 million approximately (Malaysia Population, LIVE). Age-related visual impairment and eye diseases are one of the major concerns among the various issues that affect the geriatric population. Normalina et al. (1998) highlighted that blindness and low vision in the elderly in Malaysia show significant problem because their visual status are the major role in the quality of life. They also state that as the age increasing, the prevalence of blindness also increases as well as one third of geriatric population are having some impairment of vision (Normalina et al, 1998).

According to Sainz-Gomez et al. (2010), the number of elderly in the geriatric nursing home increases as the Spain population getting old. Apart from that, the prevalence of blindness conditions such as glaucoma, cataract and macular degeneration is high among the elderly. However, almost all researches have investigated the prevalence of low vision and blindness of non-institutionalized population. Because of that, the study of geriatric, those with difficulty in moving or terribly ill patients are restricted.

Sainz-Gomez et al. tell that the observation of frequency of blindness conditions and low vision are fewer at nursing homes rather than those who do not stay at the nursing home. In addition, Tielsch et al. (1995) pointed out that visual impairment among nursing home residents are highly frequent compared to patients living by their own. In their research in Pamplona (Spain), cataract is the advance factor of blindness followed by opacification of cornea, macular degeneration and glaucoma.

Enhancing visual status in order to give better quality of life is a major target in any eye care delivery system. The purpose of this paper is to investigate the visual function status amongst the elderly people in a nursing home.

MATERIALS AND METHODS

Subjects

A total of 43 elderly (males and females) aged from 51 to 78 years who stayed at Senior Citizens' Center Kuantan, Complex Penyayang Building, Kampung Tiram, Kuantan, Pahang were enrolled in this study because most of them stayed around Kuantan in radius of 10km.

Procedure

Visual acuity (VA) was measured by using logMAR chart with their habitual corrections. The chart was presented at 4m and participants needed to read the letters on the chart, beginning at the top line until the smallest letters that they can read. If participant could read all letters in the best line read, the result were recorded according to the logMAR unit for that particular line. But if they were unable to read all letters on the best line read, VA was calculated as below:

VA= LogMAR value of the best line read + 0.03(number of letters that cannot read)

Colour vision was measured by using Farnsworth D-15. Participants were instructed to wear their habitual near correction. The D-15 box was presented at 40cm and the caps colour was placed in a random order on the lid closer. Participants were instructed to rearrange the caps in order of colour similarity, starting with the reference cap which was glued down on the box. This test was done for only 2 minutes per eye. After participants finished rearranged the caps, the lid was closed and the box will be turn over so that examiner could record the number for the caps and draw the pattern in the recording sheet. Colour vision status was determined by the pattern.

TNO booklet was used to measure depth perception. Participants were instructed to wear his/her habitual near correction and a red-green goggle was placed on top of the correction. The booklet was presented at about 40cm, angled so that it is paralled to the plane of participant's face. Test started by showing plates V to VII to the participant. They were asked to identify and point to the sector of the circles that are missing in each of the plates which measured stereoacuities from 480" to 15". The result of stereoacuities were recorded. However, if participants could not identify the missing sector even the 480" one, the test will be continue with plates I to III which measured gross stereopsis (2000").

Visual impairment was detected by using portable slit lamp and ophthalmoscope where the participant's eye was shined to examine anterior and posterior part of eye respectively. The participant was instructed to look certain directions during the examination.

Statistical Analysis

All data were analysed using Statistical Package for Social Science version 12.0.1 for Windows. Data normality were tested using skewness of histogram. Median and inter-quartile range were used to describe the numerical data as these data were not normally distributed.

RESULTS

A total of 43 elderly participated in this study. The participants consisted of 8 males (18.6%) and 35 females (81.4%). The mean age of the total subjects was 64.3 ± 5.7 years and for men and women mean age was 66.0 ± 4.2 and 64.0 ± 6.0 years respectively.

Visual acuity test using modified LogMAR chart was performed subjectively on all participants. Median and interquartile range for this parameter was calculated and recorded in Table 1. Participants with VA 0.00 – 0.36 LogMAR were classified in group 1 (good vision) while for those with VA worse than 0.36 LogMAR were categorized as visual impairment (group 2). This classification was made based on the International Statistical Classification of Diseases (ICD) codes for blindness and low vision and reflect parameters from the World Health Organization (WHO). There were 40 (93.0%) elderly who had good vision in the right eye and 38 (90.7%) in the left eye. Meanwhile, 3 (7.0%) had visual impairment in the right eye and 5 (9.3%) in the left eye (refer Figure 1).

Table 1 Visual acuity was evaluated according to the statistical method (median ± interquartile range).

Parameter (unit)	Materials	Right eye	Left eye
Visual acuity (LogMAR)	Modified LogMAR chart at 4m	0.03 ± 0.16	0.00 ± 0.13

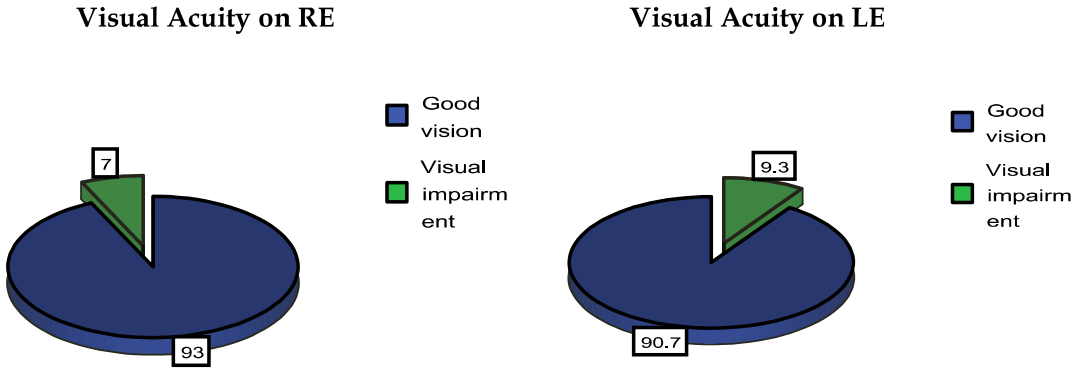


Figure 1 Pie charts showing percentage of good vision (VA better than 0.36 LogMAR) and visual impairment (VA worse than 0.36 logMAR) for both eyes.

Stereopsis and colour vision were examined on 42 out of 43 (97.7%) participants. One participant did not give compliance for both tests thus the results was assumed to be invalid. Figure 2 explain the findings for stereopsis test. For color vision, right eye, 25 out of 43 (58.1%) had normal colour vision; 14 (32.6%) might be tritan; and 3 (7.0%) give ambiguous result. While for the other eye,

28 (65.1%) had normal colour vision; 10 (23.3%) were tritan; and other 4 (9.3%) show unspecified pattern (refer Figure 3).

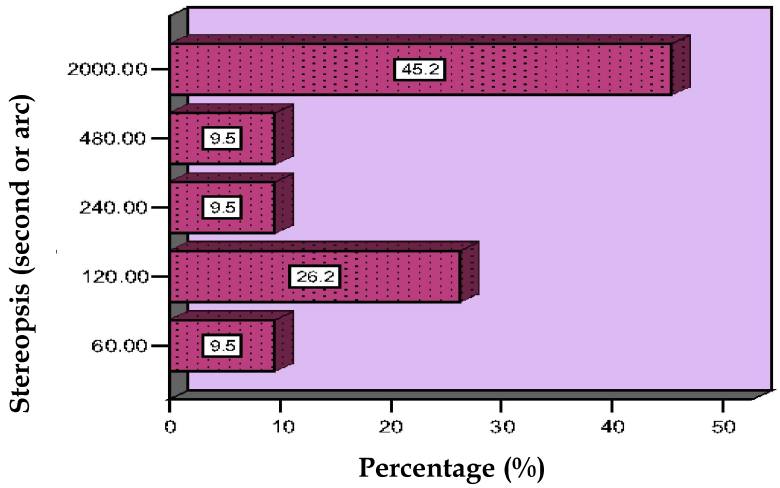


Figure 2 Bar charts showing the percentage of stereopsis achieved by participants. Almost half of the participants (45.2%) had gross stereopsis (2000 seconds of arc) and 26.2% from the participants achieve 120 seconds of arc. 9.5% of participants have stereoacuity of 60, 240 and 480 seconds of arc respectively.

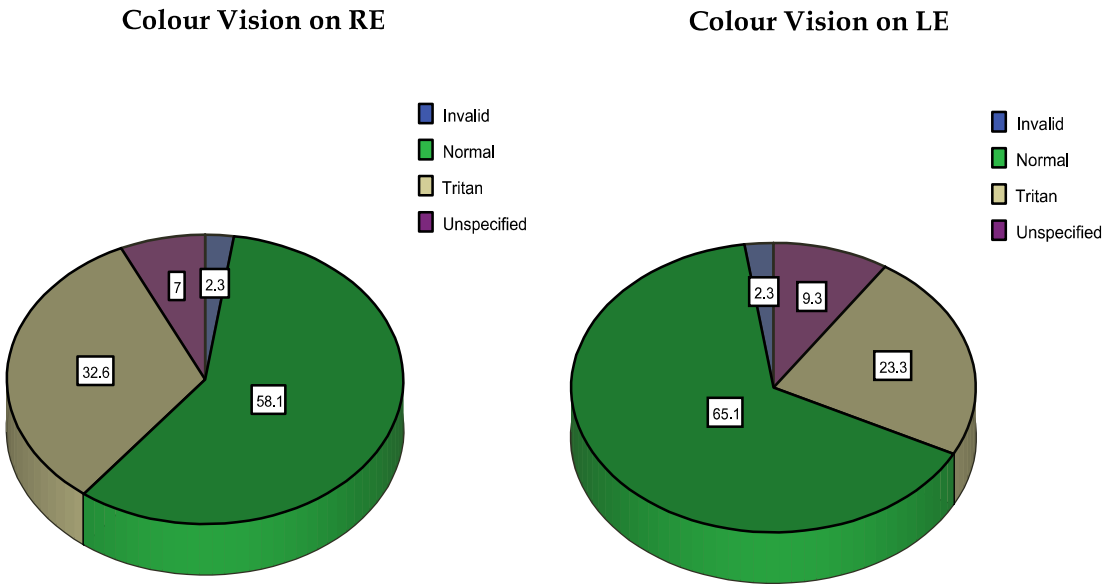


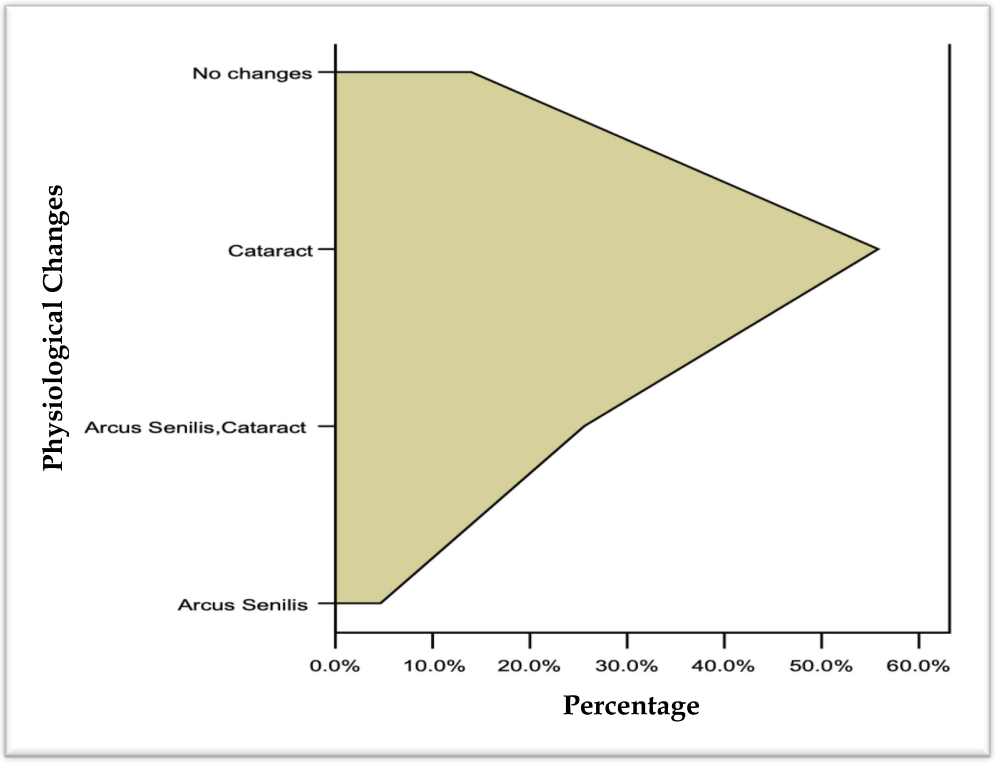
Figure 3 Percentage (%) of colour vision results for both eye

Eye disorder was classified into physiological changes (due to aging process) and pathological changes (due to ocular and systemic diseases). In terms of physiological changes, 24 from 43(55.8%) participants had nuclear cataract while two participants (4.7%) had arcus senilis (refer Figure 4.a). The total participant that had both cataract and arcus senilis was 11 people which is equal to 25.6% (refer Table 2).

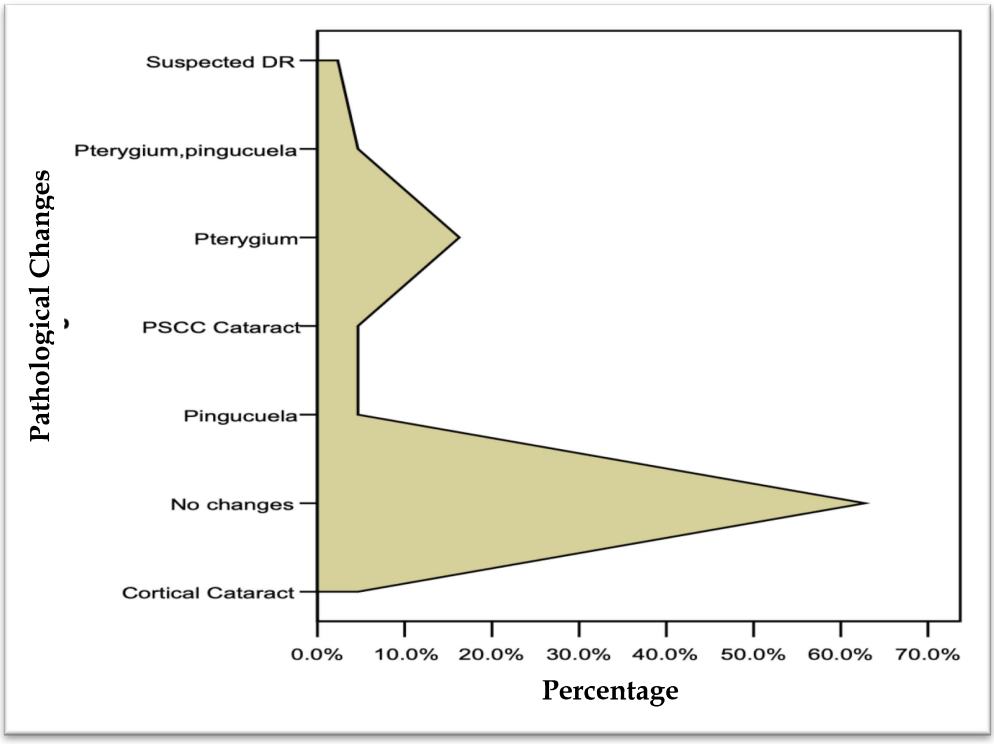
Apart from that, findings on pathological changes given in Table 2 revealed 2 participants (4.7%) had cortical cataract, 2 participants (4.7%) had posterior subcapsular cataract (PSCC), 7 participants (16.3%) had pterygium, 2 participants 4.7% had pingucuela, 1 participant had suspected diabetic retinopathy (DR) and 2 participants (4.6%) had both pterygium and pingucuela (refer Figure 4.b). Regarding the cataract type, 79.1% was nuclear sclerosis while 4.7% were cortical and posterior subcapsular respectively (refer Table 2).

Table 2 Physiological changes were evaluated according to the statistical method (frequency and percentage).

Physiological changes	**Number of cases (n)**	**Percentage (%)**
No physiological changes	6	14.0
Nuclear cataract	24	55.8
Arcus Senilis	2	4.7
Nuclear cataract + Arcus Senilis	11	25.6
Total	**43**	**100.0**
Pathological changes		
No pathological changes	27	62.8
Cortical cataract	2	4.7
PSCC	2	4.7
Pterygium	7	16.3
Pingucuela	2	4.7
Pterygium+ pingucuela	2	4.7
Suspected DR	1	2.3
Total	**43**	**100.0**
Types of Cataract		
No cataract	5	11.6
Nuclear	34	79.1
Cortical	2	4.7
PSCC	2	4.7
Total	**43**	**100.0**



(a)



(b)

Figure 4 (a) Percentage (%) of physiological changes, **(b)** Percentage (%) of pathological changes

There is a significant effect of cataract on colour vision status, x^2 (9, N = 43) = 3.634, $p < 0.05$. Among 34 people that have nuclear sclerosis on right eye, 19(55.9%) have normal colour vision while 12(35.3%) are tritan (Refer Table 3). In the other hand, out of the total 34 that have nuclear sclerosis on the left eye, 21(61.8%) are normal colour vision and 9(26.5%) are tritan (Refer Table 4). There is also revealed that cataract give vital affect to stereopsis value maybe due to poor visual acuity, x^2(12, N = 42) = 9.837, p < 0.05. From the total of 19(45.2%) of those who have reduced stereopsis (2000 sec of arc), 14(42.4) of them have nuclear sclerosis cataract, 4(21%) have other type of cataract and 1(5.3%) has no cataract (Table 5).

Table 3 Chi-Square test of type of cataract vs colour vision status of right eye

Variable	Normal lens (n=5) No.(%)	Nuclear sclerosis (n=34) No. (%)	Cortical cataract (n=2) No. (%)	Posterior subcapsular cataract (n=2) No. (%)	Chi-Square statistic (*df*)	*p*-value
Colour Vision Status (RE)						
Normal	3(60.0)	19(55.9)	2(100.0)	1(50.0)		
Tritan	1(20.0)	12(35.3)	-	1(50.0)	3.634	<0.05
Unspecified	1(20.0)	2(5.9)	-	-	(9)	
Invalid	-	1(2.9)	-	-		

Table 4 Chi-Square test of type of cataract vs colour vision status of left eye

Variable	Normal lens (n=5) No.(%)	Nuclear sclerosis (n=34) No. (%)	Cortical cataract (n=2) No. (%)	Posterior subcapsular cataract (n=2) No. (%)	Chi-Square statistic (*df*)	*p*-value
Colour Vision Status (LE)						
Normal	4(80.0)	21(61.8)	2(100.0)	1(50.0)	4.327	<0.05
Tritan	-	9(26.5)	-	1(50.0)	(9)	
Unspecified	1(20.0)	3(8.8)	-	-		
Invalid	-	1(2.9)	-	-		

Table 5 Chi-Square test of type of cataract vs stereopsis

Variable	Normal lens (n=5) No.(%)	Nuclear sclerosis (n=33) No. (%)	Cortical cataract (n=2) No. (%)	Posterior subcapsular cataract (n=2) No. (%)	Chi-Square statistic (*df*)	*p*-value
Stereopsis (sec of arc)						
60	-	4(12.1)	-	-	9.837	<0.05
120	3(60.0)	8(24.2)	-	-	(12)	
240	1(20.0)	3(9.1)	-	-		
480	-	4(12.1)	-	-		
2000	1(20.0)	14(42.4)	2(100.0)	2(100.0)		

DISCUSSION

Visual functions

The present study aimed to investigate the visual function and common eye impairment among persons aged 50 years and above at geriatric nursing home at Kuantan. The result showed that this overall population had good visual acuity as compared to elderly population in Sydney, Australia. Dagnelie (2013) mentioned that the changes in visual pathway is normal in aging process. However, Owsley thought that the risk of age-related visual impairment depend on differences in genetic, environmental and lifestyle factors in geriatric population (Aging and Vision, 2011).

Stereopsis is the computation of depth based on the binocular disparity between the images of an object in both eyes (Read, 2014). According to Wright and Wormald (1992), the elderly population lack the full ability to use binocular disparity to judge depth probably due to undercorrected myopia (might due to nuclear sclerosis) as well as decreased in cerebral function. This corresponds with the findings where almost half of participants had gross stereopsis value (Refer to Figure 2). In addition, they said older people tend to develop specific pathological changes of visual system that may abolish the retinal disparity (Bohr and Read, 2013).

The results show that there is a significant association between cataract and colour vision status. Helve and Krause (1972) stated that crystalline lens opacity could cause the colour vision defects in elderly. This statement is supported by the other study where it claimed that the disease of visual pathway or discolouration of crystalline lens could affect blue-yellow and red-green colour discrimination (Mashiah, 1978). Kollner's rule (1912) states that the damage from outer retinal disease (ARMD and diabetic retinopathy) and media changes (cataract) causes a blue-yellow defects, while defects secondary to disease of the inner retina, optic nerve, visual pathways or visual cortex will be of a red-green deficiency. These supports the findings in this present study as shown in Figure 3 where one third of the participants had problem with colour discrimination ability while arranging the Farnsworth D-15 caps.

Ocular Disorder

There are many concerns that affect the geriatric, a part from them are common health problems comprising age related visual impairment. Loh and Ogle (2004) stated that demographic researches had consistently depicted that age was the best predictor of blindness and visual impairment. In addition, they stressed that visual impairment that caused by eye disorder or diseases could give huge impact on daily routines because it could disturb the accuracy in visual-motor coordination, reduced contrast sensitivity, decreased stereopsis, unsteady gait and visual field. The physiological changes in eye in this study means that deterioration of function of the eye tissues and increment prevalence of ocular pathology in geriatric were due to the aging process (Dagnelie, 2013). Based on Loh and Ogle (2004), the cataract is the highest incidence in elderly people due to aging process and it is corresponds with the findings where half of participants have nuclear cataract. It is followed by arcus senilis as well as both of nuclear cataract and arcus senilis. Reddy et al. (2015) pointed out that

arcus senilis is deposition of lipid in the peripheral cornea and usually related with normal process of aging (2015). They also claimed that there was no correlation between arcus senilis and cataract appearance.

Pathological changes in eye in this study means abnormal anatomical or physiological conditions and objective or subjective manifestations of disease, not classified as disease or syndrome. The findings (refer Table 2) show pterygium is a major pathological changes followed by pingucuela, cortical and PSCC cataract and suspected diabetic retinopathy. Pterygium is a benign wing shaped fibrovascular conjunctival growth that caused by the exposure of ultraviolet light (UVB) (Isyaku, 2011). Cortical and posterior subcapsular (PSCC) cataracts mostly related with environmental factors such as ultraviolet exposure, diabetes, alcohol and drug usage (Pau, 2005).

Association Between Visual Functions and Ocular Disorder

There result of data collection shows that the aging process effect the visual acuity and stereopsis. The inclining trend in the Figure 5 means that the reduction of visual acuity is related to the pathological and physiological changes during aging process (r^2 of RE= 0.109, $p < 0.05$; r^2 of LE = 0.162, $p < 0.05$). However, stereopsis reduction shows insignificant related to the pathological and physiological changes during aging process ($r^2 = 0.009$, $p > 0.05$).

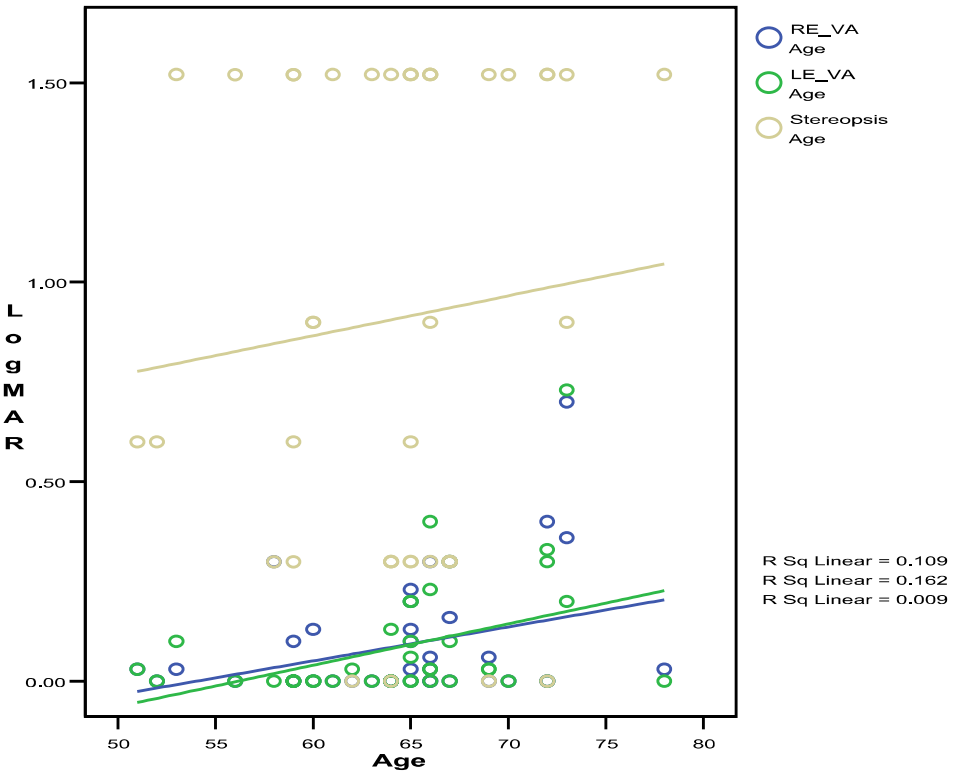


Figure 5 Scatter plot of effect of aging on visual acuity and stereopsis.

CONCLUSION

Visual function defects among the geriatric population remains a major health problem. Active screening for eye health at seniors' activity centre and nursing home should be done as the part of health examination. The elderly should be encouraged to come for formal yearly eye check-up for early detection of visual function defects and ocular impairment as well as to treat all associated problems in order to prevent permanent visual deterioration. Having good vision indirectly minimised both the physical and psychological complications such as falls, social isolation and depression.

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