

## Blindness and low vision in Malaysia

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### ABSTRACT

The data of national eye survey 1996 revealed that the prevalence of blindness and low vision in Malaysia was 0.29% and 2.44% respectively. Cataract, refractive errors and glaucoma are the most common causes of preventable blindness and low vision. In children, retinopathy of prematurity is the leading cause of avoidable blindness. The level of activity and interaction varies among the visually impaired and blind, and they tend to be more depressed than the sighted. A variety of treatment is available ranging from spectacles, contact lenses, low vision aids to surgical treatment

such as corneal transplantation, and osteo-ordonto-keratoprosthesis. Another mode of helping these people is computer based technology such as voice browser which can enable the visually impaired to acquire knowledge faster, and use of a smart phone utilizing braille system keyboard. Educational facilities and rehabilitation services for the blind are provided by Ministry of Education through special schools for blind children. Facilities for vocational training courses, skills training for self/family financial assistance, and assistance to parents of blind children are available in Malaysian Association for the Blind.

**Key words:** Blindness; Low vision; Prevalence; Causes; Treatment; Rehabilitation

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### INTRODUCTION

Blindness can be total or near total vision loss. It may be congenital or acquired and can interfere with activities of daily living. There are a variety of causes that can lead to blindness. The prevalence of blindness and low vision in any country depends on the socioeconomic status, availability of medical and health care facilities and literacy of the population. In the 10<sup>th</sup> revision of the WHO International statistical classification of diseases and health problems, low vision is defined as visual acuity of less than 6/18), but equal to or better than 3/60 in the better eye with best possible correction. Blindness is defined as visual acuity of less than 3/60 (counting fingers at 3 meters) to no light perception (NPL) in the better eye with best possible correction<sup>[1]</sup>.

World Health Organization in 2010 has estimated that there are 39 million blind people, and 246 million with low vision. The principal causes of visual impairment (low vision) are uncorrected refractive errors (43%), cataract(33%), glaucoma 2%, age related macular degeneration, diabetic retinopathy, trachoma, corneal opacities (1% each), and undetermined (18%). The causes of blindness are cataract

51%, glaucoma 8%, childhood blindness and corneal opacities (4% each), uncorrected refractive errors and trachoma (3% each), diabetic retinopathy 1%, and undetermined (21%)<sup>[2]</sup>.

As per the Department of Statistics Malaysia, total population in 2016 is estimated at 31.7 million persons [Bumiputra 68.6%, Chinese (23.4%), Indians (7%) and others (1%)]. The percentage of non-malaysian citizens was 10.3% out of total population<sup>[3]</sup>. In this paper, the prevalence and causes of blindness and low vision in Malaysia are reviewed. The treatment modalities for regaining vision and rehabilitation measures are also briefly mentioned.

## METHODS

We did a Pub Med, Science Direct and Google Scholar search for the papers on the prevalence and causes of blindness and low vision reported from Malaysia for the past two decades (1996 – 2016). The key words used for search were prevalence, blindness, low vision, causes, Malaysia. prevalence, causes, sequelae, treatment and rehabilitation. Twenty nine (29) papers published from Malaysia over a period of two decades are included in this review. We excluded the unpublished or ongoing studies.

## RESULTS

### Prevalence and causes of blindness and low vision

Multiple studies on different types of subjects have shown varying figures for prevalence of blindness and low vision in Malaysia depending on the type of subjects examined. Loh and Ogle have stated various risk factors of common causes (presbyopia, cataracts, age related macular degeneration, primary open angle glaucoma and diabetic retinopathy) of visual impairment in the elderly<sup>[4]</sup>.

**Population based studies:** Among 330 rural Malay population of Kuala Selangor, Zainal *et al*<sup>[5]</sup> have reported visual impairment and blindness to be 0.7% and 5.6% respectively. Age was the most important factor associated with the prevalence; while gender, level of education and level of income were not significantly related to blindness and low vision. Cataract was the most common cause of visual impairment and blindness while diabetic retinopathy was the second most important cause.

In the National Eye survey Malaysia 1996, among 18027 residents examined, Zainal *et al*<sup>[6]</sup> found that the age adjusted prevalence of blindness and low vision was 0.29% and 2.44% respectively. Females had a higher age adjusted prevalence of low vision compared to males. There was no significant difference in the prevalence of bilateral low vision and blindness among the four ethnic groups, and urban and rural residents. Cataract was the leading cause of blindness (39%) followed by retinal diseases (24%). Uncorrected refractive errors (48%) and cataract (36%) were the major causes of low vision. The authors concluded from this survey that blindness and visual impairment rates are comparable with other countries in the South East Asia region. However, there is a need for an evaluation on accessibility and availability of eye care services and barriers to eye care utilization in the country.

In a study of 311 rural population aged 40 years and above in Selangor state whose vision was checked during a door to door survey, the prevalence of impaired vision was 18.9% and blindness 2.9%. However, the detailed eye checkup of 150 residents who turned up for examination revealed that the common causes of visual impairment and blindness were refractive errors, cataract, glaucoma, diabetic retinopathy and age related macular degeneration in the order of their frequency<sup>[7]</sup>.

**Hospital based studies:** In a study of 1169 patients attending the eye clinic of University of Malaya Medical Centre, Reddy *et al*<sup>[8]</sup> reported the prevalence of 9.8% low vision and 0.9% blindness among urban population in Kuala Lumpur. Cataract was found to be responsible for visual loss in 32.93% and refractive errors in 10.77%. The possible explanation for the higher figures may be the better awareness about the eye diseases in urban population for seeking early treatment to improve their vision.

Among 1081 rural population attending the eye clinic in a district hospital in Pahang state, Thevi *et al*<sup>[9]</sup> reported low vision in 9.3% and blindness in 3.2% patients. Cataract was the most common (22.84%) cause of visual loss in their study followed by refractive errors (7.77%).

**Childhood blindness studies:** Reddy and Tan<sup>[10]</sup> in a national study on 6 blind school students aged 7 to 17 years in Malaysia, noted 92.7% (332 out of 358) were blind or severely visually impaired. The lens was the major anatomical site (22.3%) of visual loss followed by retina (20.8%), whole globe (17.2%), cornea (15.1%), optic nerve (8.7%) and uvea (5.1%). Glaucoma was responsible for blindness/severe visual impairment in 7.2% and others in 3.6% of cases. Hereditary diseases were responsible for visual loss in 29.5%, intrauterine factors in 4.5%, perinatal factors in 9% and childhood factors in 7.8% of cases. They suggested that perinatal screening for intrauterine factors and hereditary eye diseases, and appropriate interventional therapy will help in reducing the prevalence of childhood blindness.

Patel *et al*<sup>[11]</sup> examined 469 children from 24 blind schools in different states of Malaysia and found 95.6% had blindness/severe visual impairment. The major causes of visual loss were retinal disorders [33%; mainly retinopathy of prematurity (17.4%)], cataract/pseudophakia/aphakia (17.2%), anomalies affecting the whole globe (21.7%) and perinatal factors (20.5%). Chang *et al*<sup>[12]</sup> analyzed retinopathy of prematurity students of different ages from a previous survey of 24 blind schools in order to evaluate the trend of retinopathy of prematurity in Malaysia from 1992 to 2001. It was found that 17.4% were blind/severely visual impaired due to the disease. There was a significant surge in the number of retinopathy of prematurity students who were born in 1994 when the use of synthetic surfactants was first introduced in Malaysia; the percentage of these cases was increasing. Prevalence of avoidable causes of childhood blindness in Malaysia (cataract and retinopathy of prematurity) was 50.5% of all the cases of childhood blindness, whilst in the poor income countries such as Bangladesh, Ethiopia, Nigeria and Indonesia, the prevalence was in excess of 60%<sup>[13]</sup>.

**Case series studies:** In a retrospective study of 167 perforating injuries of eye in 159 patients over three year period in National University of Malaysia hospital, 107 (64%) eyes had vision of 3/60 or worse at initial assessment. Of these, 55% of eyes were blind at six months follow up<sup>[14]</sup>.

In a retrospective study of 573 patients seen at the Universiti Kebangsaan Malaysia-Malaysian Association for the Blind (UKM-MAB) low vision clinic in Kuala Lumpur, Mohidin and Yosuf<sup>[15]</sup> reported that the main causes of low vision were congenital structural defects including nystagmus among patients in the zero to 29 years age group, retinitis pigmentosa among the 30 to 59 years age group and age related macular degeneration among those over 60 years of age. Three hundred and forty one (59.5%) patients seen at the low vision clinic accepted the use of low vision devices.

Mallika *et al*<sup>[16]</sup> reported vision worse than 6/60 in 7.7% (160 out of 2081) of patients from diabetic eye registry in Sarawak. The retrospective study of 100 patients on angle closure/glaucoma

suspects/glaucoma patients by Liza-Sharmini *et al*<sup>[17]</sup> from Hospital University Sains Malaysia highlighted how lack of public awareness about this disease accounted for the fact that about 30% of the patients under review were found to have advanced glaucoma, while 15% were actually blind from Primary Angle Closure Glaucoma at presentation.

Evelyn-Tai *et al*<sup>[18]</sup> from University Sains Malaysia hospital, reported 63% of blindness (vision less than 3/60 at presentation) in 100 patients of non- glaucomatous optic atrophy. However, at the end of one year follow up, only 33% had vision worse than 3/60. The main aetiology of optic atrophy in these patients was space - occupying intracranial lesions, followed by congenital/hereditary, trauma and vascular problems.

In the secondary analysis on Malaysian cataract registry data, Salowi *et al*<sup>[19]</sup> reported that in patients presenting for cataract surgery the eyes with unaided visual acuity of worse than 3/60 decreased from 62.6% in 2002 to 47.7% in 2011, where as those with 6/18 to 3/60 increased from 35.2% to 48.5% ( $p < 0.001$ ). In rural Sabah, poor vision (58%) was one of the comorbidities in a cross sectional study of participants aged 60 years and above, who had face-to-face interviews using health-related quality of life questionnaires (SF-36)<sup>[20]</sup>.

**Case reports:** A patient with Sturge Weber syndrome had a bigger right eye with purplish marks on the face and was advised eye drops by the Ophthalmologist at 1 month of age. This patient was lost to follow up and at the age of 18 years presented with a blind eye of Hand Movement. This report highlights the importance of awareness of continuous follow-up in Sturge-Weber syndrome patients as this syndrome can lead to blindness due to advance glaucoma<sup>[21]</sup>.

A case of irreversible blindness following intravenous Streptokinase injection given for acute Myocardial infarction was reported by Payman and Subrayan<sup>[22]</sup>, where the patient developed no perception of light, massive vitreous haemorrhage and raised intraocular pressure (56 mmHg). After glaucoma medication, intraocular pressure was controlled but vision did not improve because of optic atrophy.

#### Level of activity in blind people

The general feeling among the public is that there will be difficulty in performing the daily activities in people with low vision and blindness. The following studies show controversial results to this belief. Singh and Singh<sup>[23]</sup> studied the cardiopulmonary capacities of twelve adults (aged between 14 to 44 years) with varying degrees of blindness engaged in regular recreational activities and compared with twelve age-matched normal sighted healthy males (control group) who were also involved in regular recreational activities. No significant differences in VO<sub>2</sub>max, forced vital capacity and leg strength and power were observed between the blind and the control groups. No anthropometric differences were evident between the two groups. The results show therefore that the visually handicapped who are active can have a similar level of physical fitness, lung function and explosive leg strength as those of their active sighted counterparts.

After an interview and observational study of 114 visually impaired adolescents on the actual oral hygiene practices, Azrina *et al*<sup>[24]</sup> reported that low vision participants had to bring the toothbrush close to the eyes to place the toothpaste while blind participants held the head of the toothbrush with the thumb and index finger to place the toothpaste on the bristles. These people encountered some difficulties, especially when putting the toothpaste on the toothbrush and also the way that they brushed their teeth could cause detrimental effect to the oral cavity. Thus, they need to be taught on proper oral hygiene care so that they can practice safe oral hygiene care and

maintain their own oral health.

Mohammed and Omar<sup>[25]</sup> compared the performance between visually impaired print reading, Braille reader, and normally vision children. A statistically significant difference was found in reading rate between the three groups ( $p < 0.0001$ ). The Braille reader had the lowest reading rate compared to other groups. Only a small percentage of the visually impaired children were able to achieve a reading rate within the normal values of normally sighted children. Results of the comprehension test showed no significant difference in the scores of the three groups ( $p = 0.232$ ). The findings of this study suggests that visually impaired students required a longer time to read and understand a text and this has implications on the time given to them, especially during examinations.

#### Sequelae of low vision

Noran *et al*<sup>[26]</sup> evaluated the relationship between severity of visual impairment and depression among Malaysians aged 60 years and above who attended eye clinic of University of Malaya Medical Centre and reported that the odds of developing depression among elderly with low vision were 2 times more than those with normal vision, and elderly who were blind had almost 5 times the odds to be depressed compared with those having normal vision.

People with low vision will experience physical, economic, and psychological changes that diminish their quality of life if neglected. Low vision affects daily routines such as walking, going outside and cooking. It can also affect leisure activities such as reading, sewing, travelling or sports. When a person with low vision is not able to perform job-related functions at the work place, this can lead to a loss of income<sup>[27]</sup>.

## DISCUSSION

#### Treatment of low vision and blindness

The most common cause of low vision is uncorrected refractive error resulting in amblyopia. The effective way of preventing this is routine screening of school children in kindergarten schools under school health programme and prescribing glasses to all children requiring glasses. Eye health education to parents during the meetings of parents and teachers in the schools will help a lot in understanding the eye problems in children, and this will prevent/ lower the occurrence of ocular injuries in children especially during the festive season. In addition to this, congenital cataract and squint will be detected in the screening for eye diseases by the doctors during school health programmes. The referral of such students to the eye specialist in government hospitals for appropriate treatment will also improve the vision of the children, and lower the prevalence of low vision in children. Squint patients require correction of refractive error with spectacles, treatment of amblyopia with occlusion therapy and finally surgical correction for cosmetic purpose and to maintain the improved vision. Squint treatment in early childhood will improve in vision, while in adults will only help cosmetically looking straight eyes.

If vision cannot be improved to the needs of daily life by conventional methods, such as spectacles, contact lenses, medication, or surgery, then low vision rehabilitation should be suggested. Rehabilitation with low vision aids will help these people to learn adaptive techniques and skills so that they can maintain an independent lifestyle and improve their quality of life. This is evident in patients with age related macular degeneration.

The most common cause of preventable blindness is cataract. The facilities for cataract surgery (phacoemulsification/extra capsular cataract extraction) are available in all the government state

hospitals and in some of the district hospitals. They are available in many private hospitals also in all the states in Malaysia.

Open angle glaucoma is another common cause of blindness. This is labelled as silent killer of the eye because the patient may not have any warning symptoms in the early stages until the vision has decreased considerably. The only way to reduce its morbidity is by eye health education through all the available resources so that patients understand about the importance of its treatment to control the intraocular pressure by eye drops. If needed, surgery (trabeculectomy) will be performed in patients with intraocular pressure > 20 mmHg after using maximum number of glaucoma eye drops. Laser/peripheral iridectomy in angle closure glaucoma (acute congestive glaucoma) is done after controlling the intraocular pressure with medical treatment. In some of these patients trabeculectomy may be required if the intraocular pressure is not controlled well in spite of using glaucoma eye drops.

If the low vision or blindness is due to corneal disease (corneal opacity either due to corneal ulcer or lacerated corneal injury, corneal dystrophy, chemical injuries of eye, postoperative endothelial dysfunction following cataract surgery) corneal transplantation (penetrating keratoplasty) will help for the recovery of vision in these patients. If this fails and corneal graft becomes opaque, the same procedure can be performed one or two times more. Finally, Osteo-odonto-keratoprosthesis (OOKP) procedure helps in the end stage of ocular surface disorders and bilateral corneal blindness patients.

OOKP procedure helped two patients in Malaysia. (1) A 54 year-old man who was blind due to chemical injury in the only eye. Penetrating keratoplasty performed in this eye failed, resulting in corneal opacity and patients could only perceive light. Following OOKP, he developed vitreous haemorrhage and pars plana vitrectomy was performed. His final visual acuity in this eye was 6/60. He was able to walk around his house more independently, dress and feed himself. He was also able to read large prints in the books and papers<sup>[28]</sup>. (2) A 35 year-old woman, a known case of Steven Johnson syndrome with bilateral dry eyes and corneal blindness (failed corneal graft with vascularised total corneal opacity in the right eye and non-healing corneal ulcer in the left eye), had vision of hand movement only in both eyes. Following OOKP operation in the right eye, vision improved to 6/6 and patient can do daily activities independently<sup>[29]</sup>.

Early diagnosis and prompt treatment of diseases can prevent permanent loss of vision. Norlaili *et al*<sup>[30]</sup> reported a 25 year-old Army man who presented with 6/60 vision in the left eye due to carotid cavernous fistula, but with surgical intervention (embolization with detachable balloon and later on with detachable coils) he regained 6/6 vision in the affected eye.

Vision rehabilitation services in Malaysia are available in Ministry of Health optometry clinics, special schools under Ministry of Health, National Council for blind<sup>[31]</sup>, Malaysian Association for Blind<sup>[32]</sup> and St Nicholas home, Penang<sup>[33]</sup>. The low vision rehabilitation is still unexplored in the management of ocular injuries and illnesses among industrial workers. Introducing low vision rehabilitation can benefit both workers and employers as it provides care beyond spectacles or contact lens prescriptions. Another mode of helping these people is computer based technology such as voice browser which can enable the visually impaired to acquire knowledge faster as they depend in sound<sup>[34]</sup>. An innovation by Robest enables the blind to use a smartphone utilizing braille system instead of Qwerty keyboard<sup>[35]</sup>.

## CONCLUSION

The most common causes of blindness and low vision are cataract, refractive errors, glaucoma, diabetic retinopathy, and retinopathy

of prematurity. A variety of treatment is available ranging from spectacles, contact lenses and low vision aids to surgical treatment such as corneal transplantation and osteo-odonto-keratoprosthesis. Vocational and navigation rehabilitation will help these people to learn adaptive techniques and skills that let them maintain an independent lifestyle and improve their quality of life.

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