

Kertas Asli/Original Articles

Profile of Functional Amblyopia Cases Seen by Optometrists in the Ministry of Health (MOH) Malaysia Hospitals (Profil Kes Baru Amblyopia Fungsional yang Dilihat oleh Pegawai Optometri di Hospital Kementerian Kesihatan Malaysia (KKM))

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ABSTRACT

Amblyopia is one of the most common causes of visual deficit in children. Presently, in the Ministry of Health Malaysia hospitals, there is no documented data on the characteristic and profile of amblyopia cases. This study was conducted to describe the profile of new amblyopia cases seen by optometrists at the Ministry of Health (MOH) Hospitals. This study was a retrospective and multicenter study including all MOH hospitals with optometry clinics. Clinical record data of amblyopic patients aged 3 to 17 years old who were newly diagnosed between 1st August 2010 to 31st January 2011 and who fulfilled the inclusion criteria were obtained. Data collected included demography, systemic history, ocular history and optometric findings and diagnosis. Thirty eight MOH hospitals participated and a total of 301 patients were diagnosed with functional amblyopia within the study period. Mean age for these amblyopic patients was 7.70 ± 0.16 years old. Boys were the predominant gender (57.1%) and Malay preceded the other races with a 65.4% occurrence. Mild amblyopia was found in 51.5% of the patients, 31.6% were with moderate amblyopia and only 16.9% of patients were severe amblyopia. The underlying amblyogenic causes assessed were ametropia (61.5%), anisometropia (25.2%), strabismus (9.3%) and stimulus deprivation (4.0%). Refractive error was discovered as the most common cause of amblyopia in this study. It is crucial for optometrists to detect this type of visual impairment and undertake an early optometric intervention.

Keywords: Functional amblyopia, Ametropia, Refractive error, Myopia, Early optometric intervention

ABSTRAK

Amblyopia merupakan salah satu penyebab utama gangguan visual di kalangan kanak-kanak. Pada masa ini, data terperinci mengenai ciri-ciri dan profil kes amblyopia masih belum ada direkodkan di hospital Kementerian Kesihatan Malaysia. Kajian ini bertujuan untuk mengenal pasti profil kes baru amblyopia yang dilihat oleh pegawai optometri di hospital-hospital Kementerian Kesihatan Malaysia (KKM). Kajian ini merupakan kajian retrospektif dan melibatkan pelbagai pusat pengumpulan data yang merangkumi kesemua hospital KKM yang mempunyai klinik optometri. Data rekod klinikal pesakit ambliopia berumur 3 hingga 17 tahun yang baru didiagnosis dalam tempoh 1 Ogos 2010 sehingga 31 Januari 2011 dan memenuhi kriteria sahaja yang dikumpulkan. Data yang dikumpul adalah demografi, sejarah sistemik, sejarah okular dan hasil pemeriksaan optometry dan diagnosis. Tiga puluh lapan hospital KKM telah mengambil bahagian dan sebanyak 301 pesakit telah didiagnosis sebagai amblyopia fungsional dalam tempoh kajian. Purata umur bagi pesakit amblyopia ini adalah 7.70 ± 0.16 tahun. Jantina lelaki lebih dominan (57.1%) dan kaum Melayu mendahului kaum-kaum lain sebanyak 65.4%. Amblyopia ringan telah didiagnosis pada 51.5% pesakit, amblyopia sederhana (31.6%) dan ambliopia teruk hanya 16.9% dari keseluruhan pesakit. Punca penyebab amblyopia adalah ametropia (61.5%), anisometropia (25.2%), strabismus (9.3%) dan halangan rangsangan visual (4.0%). Ralat refraksi telah dikenal pasti sebagai punca utama penyebab amblyopia dalam kajian ini. Adalah penting untuk optometris mengesan gangguan visual ini dan memberikan intervensi optometri seawal mungkin.

Kata kunci: Amblyopia, Ametropia, Ralat refraksi, Miopia, Intervensi optometri awal

INTRODUCTION

Amblyopia remains as one of the most frequent causes of visual problems in childhood (Rutstein 2005). It is usually referred as "lazy eye or squint" among the local public; the term amblyopia is defined as a unilateral or

infrequently bilateral condition in which the best corrected visual acuity (BCVA) is poorer than 6/6 in the absence of any obvious structural anomalies or ocular disease (American Optometry Association 1994). It is a significant public health problem in the country which a population based study (RESC) at Gombak District in 2004 estimated a 2% prevalence of amblyopia in Malaysia. The study also

found approximately 10.4% of unexplained poor vision was suspected due to amblyopia (Goh et al. 2005). Amblyopia was also reported at 1.3% among 479 preschool children in Hulu Langat district (Duratul et al. 2009). Similarly, it is a common case seen at Optometry clinics at the Ministry of Health Malaysia (MOH) Hospitals.

Amblyopia starts at an early age, usually resulting from a dysfunction of processing visual information caused by degradation of the retinal image during the sensitive period of visual development. Functional amblyopia is only found in the setting of causative factors such as strabismus, high refractive error (isoametropia), refractive imbalance (anisometropia), asymmetric meridian power (astigmatism), and a form deprivation resulting from congenital cataract, corneal ulcer or ptosis, without any manifest ocular diseases. The vision loss may range from mild amblyopia (6/7.5) to severe amblyopia (legal blindness, 6/60 or worse) (Millodot 2004; Scheiman 2002).

It is widely known that an early detection and treatment are essential, especially during infancy and childhood to prevent a permanent loss of vision. The prognosis for success is generally good, especially if the amblyopia is diagnosed and treated early within the sensitivity period (American Optometry Association 1994). Generally, the deficit of visual acuity is often reversible within the sensitivity period of the first 9 years of life. Thus treatment for amblyopia is commonly done only in children younger than 10 years old (Mintz-Hittner & Fernandez 2000). However recent studies have shown that occlusion therapy can be successful, even when initiated between 9 and 15 years old (Park et al. 2004; Mohan et al. 2004).

The standard of amblyopia therapy over the past four centuries has consisted of penalising the preferred eye (normal eye) with an eye patch or atropine thus forcing the brain to use visual signals from the amblyopic eye (Pediatric Eye Disease Investigator Group 2003). The response to occlusion therapy is related to the type and the depth of amblyopia (Levartovsky et al. 1995; Cobb et al. 2002). The direction of optometrists in managing amblyopia should now embark in a more scientific way which are evidence based clinical trials. As such, there will always be new areas and solutions for each condition of amblyopia (David 2007). Most recent studies attempt to standardise the duration of patching and to maximize the treatment efficacy (Stewart et al. 2004). In most MOH hospitals, optometrists prescribe spectacles if indicated for 4 weeks once diagnosis is made and patching therapy is commenced with near work activities following refractive adaptation; which patching regime is dependent on the type and severity of the amblyopia.

To date, there is no published data on the clinical profile and characteristics of the amblyopia patients seen by optometrists in the MOH Malaysia hospitals. In this study we retrospectively analysed the clinical profiles of amblyopia patients presented for the first time to optometrists at public hospitals. This valuable data will assist us in improving the

quality of amblyopia care management and will support the need to implement an early vision screening program in children.

SUBJECTS AND METHODS

This was a retrospective multicentered descriptive study, evaluating the clinical profiles of functional amblyopia patients in 48 optometry clinics of MOH Malaysia hospitals throughout the country, covering urban and rural areas. A standardized data collection form was distributed to these hospitals together with operational instructions and research protocol. Respective optometrists were required to retrieve and record all data pertaining to the demography, systemic history, ocular history and full optometric examination findings and diagnosis of all the new case patients who were diagnosed with amblyopia within the study period (1st August 2010 to 31st January 2011). The inclusion criteria were Malaysian nationality, normal ocular health and patient's age within 3-17 years old. We adopted the normal value of visual acuity for a particular age-group in determining the cut-off for amblyopia as suggested by Pan et al. (2009). In children aged 5 years and older, amblyopia were diagnosed as BCVA 6/12 or worse while BCVA of 6/15 or worse were applied for children aged 3 to 4 years old. Visual acuity was measured with a Snellen chart or equivalent.

We employed the established definitions of amblyopia classification by Mein J. & Trimble R. (1991) and Von Noorden G.K. (1967) as summarized in the Table 1.

The severity classification of the amblyopia was based on the BCVA level of the patients: Mild amblyopia (6/12-6/18), moderate amblyopia (6/24-6/36) and severe amblyopia (6/60 and worse).

The data also included a thorough case history taking, past ocular and systemic history as reported by patients and or parents or guardians. Slit lamp examination findings conducted by the residence ophthalmologist were also sought to confirm the absence of any organic lesion and normal ocular health.

Data from the optometric examination included assessment of the vision (unaided VA) and the BCVA using a standard Snellen visual acuity chart in literate children or a Teller acuity chart or Cardiff acuity cards in illiterate children. Findings from refraction assessment including cycloplegic refraction and binocular vision assessment (such as cover test, ocular motility and stereopsis) were also recorded. Myopia is defined as spherical equivalent (SE) of $>-0.50D$, hyperopia $>+1.50D$ and astigmatism $>0.75D$ (Peters 1984).

At the end of the study period, optometrists returned the completed forms to the Amblyopia Registry Committee for data analysis. Obtained data was analysed for descriptive and frequencies using the Statistical Package for Social Sciences (SPSS 17.0).

TABLE 1. Amblyopia classification for diagnosis (SE : spherical equivalent)

| Types | Description |
|--------------------------------------|--|
| <i>Strabismic amblyopia</i> | Heterotropia at distance or near fixation in the absence of any anisometropia. Patients with strabismus and refractive errors > 1 D SE in one or both eyes or eyes with regular astigmatism > 1.5 DC in any meridian. |
| <i>Anisometropic amblyopia</i> | Anisometropia that > 1 D SE, or > 1.5 D difference in astigmatism between both the eyes that persisted for at least 4 weeks after spectacle correction, in the absence of any measurable heterotropia at distance or near. |
| <i>Mixed amblyopia</i> | Heterotropia at distance or near and with anisometropia of > 1 D SE or > 1.5 DC difference in astigmatism in any meridian between both the eyes that persisted after at least 4 weeks of spectacle correction. |
| <i>Sensory deprivation amblyopia</i> | Patients with a known documented cause of sensory deprivation with no primary heterotropias or refractive errors that could be causally related to the amblyopia. |
| <i>Ametropic amblyopia</i> | Refractive errors more > 1 D SE in both eyes resulting in subnormal vision in one or both eyes and no associated strabismus or any other ocular pathology. Patients with heterotropias for distance or near with bilateral refractive errors >1 were included under strabismic amblyopia. |
| <i>Meridional amblyopia</i> | Regular astigmatism > 1.5 D of astigmatism in any meridian or those with irregular astigmatism in both eyes, resulting in a decrease in vision in one or both eyes and no associated strabismus. Patients with significant anisometropia (as defined above) along with a difference > 1.5 DC astigmatism between the two eyes were excluded from this category and grouped under the anisometropic amblyopia group. Patients with heterotropias for distance and near with regular astigmatism >1.5 D in any meridian or irregular astigmatism were included under strabismic amblyopia. |

RESULTS

Of the 48 hospitals approached for this study, thirty eight (79.0%) hospitals returned the completed forms. Overall, there were a total number of 301 young patients diagnosed with functional amblyopia by the optometrists during the 6 month period. The mean age for these amblyopic patients was 7.70 ± 0.16 years old. Boys were found as the major predominant gender (57.1%). Malay preceded the other races with 65.4%, while Chinese were comprised of 13.3%, Indian 11% and other races 10.3%. Most of these patients had no experience of wearing glasses before (72.1%).

Most of the amblyopic patients had Down's syndrome as compared to other systemic problems (52.63%). Amblyopia involving both eyes was also found in more than half of the children (64.8%). Almost all (94.4%) of the patients were not suffering from any other ocular comorbidity.

The underlying causes of amblyopia is illustrated in Figure 1. It shows that 86.7 % of them have amblyopia due to refractive error; which consists of ametropia (61.5%) and anisometropia (25.2%), whereas the secondary cause of amblyopia in these patients is mostly due to strabismus (9.3%) and only 4.0% are caused by stimulus deprivation.

Figure 2 shows the Best Corrected Visual Acuity (BCVA) indicating the severity of the amblyopic patient's visual acuity when first presented at the clinic. Half of the children (51.5%) have mild amblyopia with BCVA within 6/12 to 6/18 with optical correction. This is followed with moderate amblyopia (31.6%) with BCVA within 6/24-6/36 and only 16.9% of the patients have severe amblyopia (6/60 and worse).

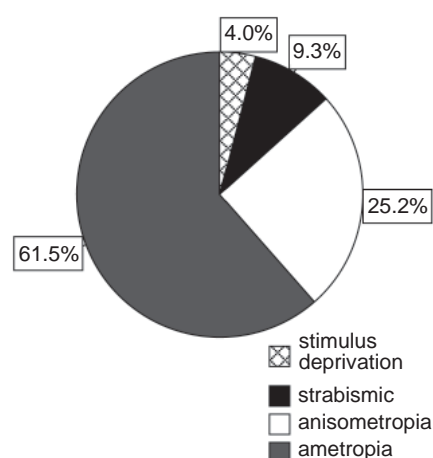


FIGURE 1. Primary causes of functional amblyopia

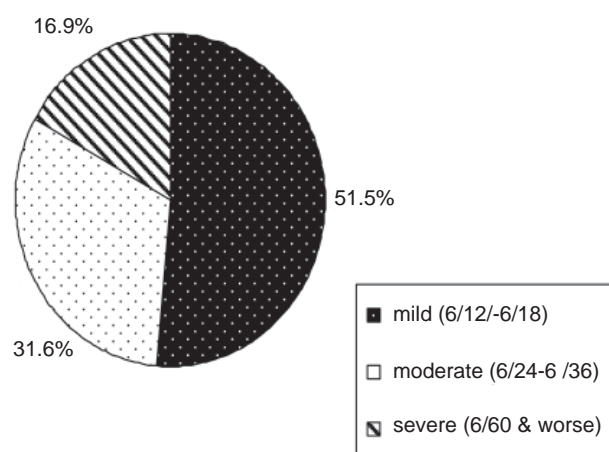


FIGURE 2. Best Corrected Visual Acuity (BCVA) of amblyopic eye

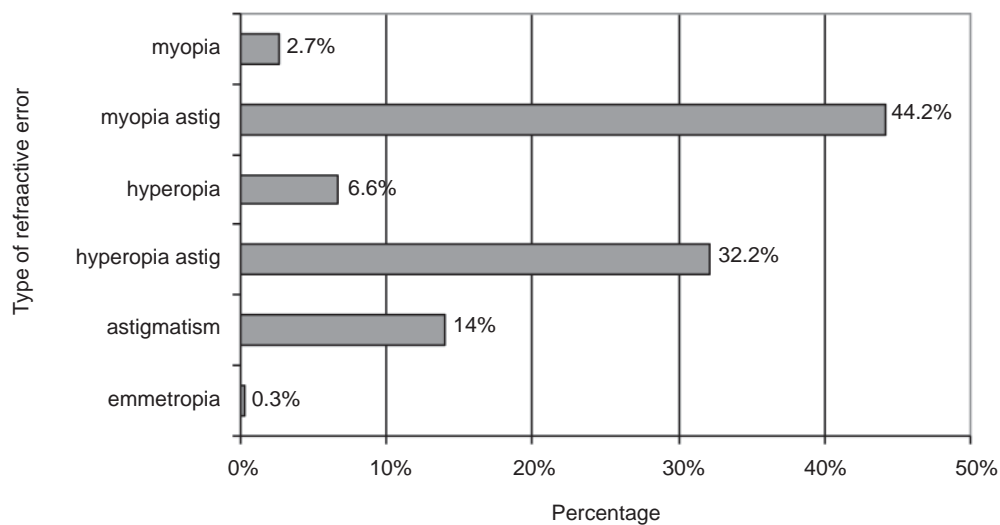


FIGURE 3. Percentage distribution of refractive error among amblyopic patients

Figure 3 portrays the distribution of refractive error among all the amblyopia patients, with myopia astigmatism (44.2%, n = 133) being the most common type of refractive error, followed by hyperopia astigmatism (32.2%, n = 97) and astigmatism (14.0%, n = 42).

Finally, almost three quarter of the patients (63.1%, n = 190) were treated with glasses solely at the first visit, while the other major group (34.6%, n = 104) was also prescribed with patching therapy as an addition management to glasses.

DISCUSSION

The response rate (79.0%) for this study was good for a multicenter study as it solely relies on the commitment given from each of the optometrists to retrieve the clinical records. We are aware that the result might be under-reporting due to the busy optometry clinics, resulting to infeasible data retrieval and incomplete forms. Whilst efforts have been made by attaching the study operational instruction and research protocol to the optometrists, the outcomes of the study needed to be interpreted in the light of a hospital-based study since there might be few cases that may have been misunderstood by the respective optometrist during completion of the form.

The large number (301 patients) of newly diagnosed functional amblyopia during 6 months of the study period was consistent with the findings of amblyopia prevalence as reported by Goh et al. (2005) in Gombak district. We couldn't calculate the prevalence rate of amblyopia in our study as we did not inquire about the number of children seen in a particular month in the study form. However, it is expected that the prevalence in our study would be possibly higher than the other published studies for example the United Kingdom, America and Netherlands, where amblyopia was in the range of 2.0%-4.0% (Holmes

& Clarke 2006). This is because our data was drawn from patients who were referred from school screening or practitioners because of reduced vision. Data from the annual MOH Optometry National Census indicated there was an increased trend in the number of patients who received amblyopia therapy throughout the country from year to year. It started from only 1742 children in 2006 to 1930 children in 2007. The following 3 years had seen the number double to 3859 children in 2010 (Ministry of Health Malaysia 2010). Knowledge about these high prevalence rates of amblyopia among children would encourage the eye care practitioners about the importance of conducting a routine preschool vision screening. An early diagnosis of amblyopia is very essential to enable an early intervention for the patients.

The mean age of 7.70 ± 0.16 years of first presentation to the hospital obtained in this study was comparable with findings from Menon et al. (2005) which was also a hospital-based study. Children normally were first detected having visual deficit when they began their pre-school at around the age of 4 to 6 years or during the school vision screening at 7 years. Teachers would also query the child's vision if they showed difficulty in copying writing from the blackboard and teachers reported this to the parents. For this reason they were presented later at a hospital eye clinic for a thorough examination. Age presentation is an important factor for visual prognosis in amblyopia. The younger the child is treated the better visual prognosis for the child (Rutstein 2005), which proven in our findings. An appropriate timely management for amblyopia therapy was associated with level of visual impairment for the children (Menon et al. 2005).

Our study reveals that majority of the amblyopic children were of mild amblyopia followed with moderate amblyopia and severe amblyopia. This was particularly due to the type of amblyopia being refractive and thus optical correction was prescribed by the optometrist for the patients

on their first visit. Additionally, younger age presentation in our study as discussed plays a factor influencing the severity of the amblyopia.

Ametropia amblyopia and anisometropia amblyopia; both forms refractive amblyopia (86.7%) were found as the most common types of functional amblyopia diagnosed by the optometrists. Our finding on the cause of amblyopia was quite similar with Pediatric Eye Disease Investigator Group (PEDIG) study for its 3-6 year old children, but in contrast to Menon et al. (2005) and by Sethi et al. (2008) which reported strabismic amblyopia was the most common type. Uncorrected refractive error in children was one of the leading causes of visual impairment in Malaysia with prevalence as high as 87.0% (Goh et al. 2005). Myopia astigmatism was the largest form of refractive error found in our study. Goh et al. (2005) also reported that prevalence of myopia had increased from 9.8% in children age 7 years old to 34.4% in 15 years old. Identification of the causes of amblyopia is important in selecting the priority of vision screening tests.

Majority of the optometrists showed their preferences to prescribe glasses solely on the first visit for 4 weeks and only initiated patching therapy on the second visit if the visual acuity had not improved to 6/6 as suggested by PEDIG (2006). PEDIG (2006) concluded that refractive correction alone improves visual acuity in many cases and results in resolution of amblyopia in at least one third of 3 to 7 year old children with untreated anisometropic amblyopia. Further, the authors suggested that while most cases of resolution occur at moderate levels of visual acuity 6/12 to 6/30 amblyopia, the average 3-line improvement in visual acuity resulting from treatment with spectacles may lessen the burden of subsequent amblyopia therapy for those with denser levels of amblyopia. For this reason, the current practice by the optometrists in our study is clinically justified and should be continued per case by case basis.

Although there are ongoing debates on the duration of patching, it remains a recommended option for a persistence moderate amblyopia (PEDIG 2003). The study revealed that in the treatment of moderate amblyopia, a beneficial effect of patching is present throughout the age range of 3 years old to younger than 7 years old and the visual acuity range of 6/12 to 6/30. At 6 months, the amount of improvement appears to be similar when 6 hours of daily patching are initially prescribed versus a greater number of hours. However, when the baseline acuity is 6/24 to 6/30, a greater number of hours of prescribed patching may improve visual acuity at a faster rate. Thus having put into account of their findings, optometrists in our study were found started patching in conjunction with glasses prescription in 34.6% of the amblyopic patients. However we did not investigate the patching regime in detail for its duration and type.

Furthermore, patching with near activities was also prescribed to all patients in this study as suggested by PEDIG (2005). Performing near activities while patching may be beneficial in treating amblyopia especially for

severe myopia. PEDIG (2005) indicated that after 4 weeks of treatment, there was a suggestion of greater improvement in amblyopic eye visual acuity in those assigned to near visual activities (mean 2.6 lines versus 1.6 lines, $P = 0.07$). Therefore, the practice of this approach should be continued among optometrists until proven otherwise.

In summary, although limited sources; the descriptive results obtained from our study should be taken into consideration to implement essential measures to tackle the problems with regards to amblyopia. Firstly there is a need for changes in vision screening at school level. The existing vision screening program for public schools in Malaysia for 6 years old students onwards did contribute to quite a bit towards the prevention of amblyopia. But, in order to start an intervention earlier, vision screening should be mandated during preschool years. Vision screening program for private schools should also be implemented as these children would be left out of the national school health screening. An early detection of amblyopia and appropriate therapy should be initiated as these solutions have immense value towards preventing the prevalence of lifelong visual morbidity. Perhaps the findings in this study could be referred as the evidence to enhance screening efforts in a more organised manner. At the hospital level, an optometrists' major diagnostic task should be to identify the underlying etiology and associated conditions related to amblyopia. Finally, effective measures could be taken to educate other health personnel at every level to detect and refer these amblyopic patients; which should be initiated as soon as possible. Hence it will further ensure the betterment of quality care in amblyopia.

LIMITATION

Although this study has a selection bias because it was hospital based, these findings may form as the basis for future population-based studies. The pitfall that we had faced was tracking the retrospective records of these 301 patients for the thorough eye examination findings and subsequent months of amblyopia therapy follow up. Also it is difficult to sustain follow up visits as patients may default on appointment, due to their family being transferred to other places.

CONCLUSION

This study showed that most of amblyopia cases among school-aged children seen in Ministry of Health Malaysia hospitals were caused by refractive error. Most of amblyopic eyes were categorized as mild which has a good prognosis with treatments. The mean age of the children was 7.70 ± 0.16 years old which emphasises that early vision screening among school children is crucial in detecting amblyopia which is a valuable way to prevent avoidable blindness.

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