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Incidence of Refractive Error and Amblyopia Among Young Adults – A Hospital Based Study

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1. Introduction

Visual impairment remains a major public health problem world wide, with an estimated 161 million people with visual impairment, of whom 37 million are blind.[1] Uncorrected or inadequately corrected refractive errors have been shown to be a major cause of visual impairment in population-based studies[2-6]. While amblyopia is a significant cause of unilateral reduced visual acuity in a population aged 40 years and older.[7]

Genetic factors are thought to play a role in development of refractive errors. It has been established that myopia clusters within families, and familial high myopia (refraction of -6 diopter {D} or less) has been linked to long arm regions on chromosomes 7, 12 and 18[8,9]. Environmental risk factors have also been associated with refractive errors, myopia or hypermetropia. Education[10,11] and near-work[12] are both strongly associated with increasing severity of myopia.

In different parts of Asia such as in India, the Andhra Pradesh Eye Disease Study shows 15.2%[13] prevalence rate of myopia (spherical equivalent {SE} at least -1.0D). While study in a 15,068 Singapore military recruits aged 16 to 25 years, the prevalence rates of myopia (SE at least -0.5 D) were much higher with some racial variation, 82.2% in Chinese, 68.8% in Indians, and 65.0% in Malays[14]. Similar high rates of myopia (SE at least -0.25 D; 84%) were present in 16 to 18 years old Chinese children in Taiwan[15]. In Pakistan the prevalence rates of myopia, hypermetropia, astigmatism (with SE worse than –0.5 D, greater than +0.5D, and greater than 0.75D respectively) was 36.5%, 27.1%, and 37%, respectively in adults aged 30 years or more in the National Blindness and Visual Impairment Survey.[16]

In United states, the Baltimore eye survey[17] and Beaver Dam study[18] showed the prevalence rates of myopia (SE at least -0.5 D) were 28.1% in white adults aged 40 years or more and 26.2% in adults aged 43 to 84 years respectively.

Amblyopia is a frequent cause of unilateral or bilateral blindness. The prevalence of amblyopia ranges from 0.73% to 3.06%[7] in previous studies. However, the epidemiology of amblyopia among this region of Asia is not well described and may be different from other because of difference in distribution of refractive error or strabismus.

AIM: To assess the incidence of refractive error and associated amblyopia among young adult.

2. Methodology

2.1 Subjects

This six months study was conducted from June 2008 to November 2008 at tertiary referral center Liaquat University Eye Hospital, Hyderabad Sindh, Pakistan. Three thousand four hundred fifty two patients were included and examined in out patients department with age ranged from 20-40 years. The proportion of men and women was 1:0.54. Both rural and urban residents were evaluated. After taking written consent all subjects underwent a comprehensive ophthalmic examination, and a standardized form was used to extract the data, including the following variables: demographic information, best corrected visual acuity, types of refractive error including myopia, hypermetropia, astigmatism and amblyopia.

2.2 Methods

Monocular visual acuity was determined with current spectacle prescription if any. Pinhole acuity was assessed in eyes with presenting visual acuity <20/20. Non-cycloplegic auto-refraction followed by subjective refinements was performed in all subjects. The best corrected visual acuity was recorded. Refraction data was based on subjective refraction. Only the right phakic eye of each subject was considered for refractive error evaluation and amblyopia evaluated bilaterally.

Amblyopia was defined as best-corrected visual acuity of 20/40 or worse in the absence of any pathological cause. Hypermetropia was defined as a SE greater than +0.5 diopter sphere (DS)[17-21]. Emetropia was defined as a SE between -0.50 and +0.50 DS[20]. Myopia was defined as a SE worse than -0.50 DS[17–21] and a SE or worse than -5.00 DS[19] was classified as high myopia. Astigmatism correction was prescribed in minus cylinder format, and astigmatism was defined as cylindrical error worse than -0.50 diopter cylinder (DC) in any axis. The axis of any cylinder component was classified as with the rule (WTR) if the minus cylinder axis was within 15^{o} of 180^{o}, against the rule (ATR) for minus cylinder axis within 15^{o} of 90^{o}, or oblique (other than WTR or ATR)[22].

3. Results

Of the 3452 patients, 847 (24.54 %) patients had best corrected visual acuity 20/40 or better and remaining 2605 (75.46%) had less than 20/40 due to different anterior and posterior segment eye pathologies, or amblyopia.

Out of the 847 patients 525 (15.20 %) were phakic in right eye, and remaining 322 (9.32%) were pseudophakic. For refractive error the result was analyzed for only 15.20%

phakic ametropic patients. While for amblyopia all patients who met the criteria were evaluated.

There were 341 (64.95% of phakic ametropic patients) male and 184 (35.05%) were female. The age range from 20 to 40 years **(Table 1),** mean age being 26±3.9 years. The mean age of men and women was 28±3.9 and 24±6.3 years respectively (statistically significant at P<0.001). The mean refractive error was 0.75D.

Hypermetropia was found in 185 (35.24% of phakic ametropic) patients (Table 1). The mean age of hypermetropia was 26.31±4.51 years. Which was not significantly different from that of entire population (P=0.5476). There were 121 men (23.04% of total ametropic) and 64 women (12.19%). Man had significantly higher prevalence of hypermetropia than women (P<0.001).

Three hundred and fifteen (60% of phakic ametropic) patients had myopia (Table 1). The mean age of myopes was 23.69±3.98 years. Which was significantly lower than the entire population (P<0.001). There were 205 (39.05%) men and 110 (20.95%) women. The man had a significantly higher prevalence of myopia than did the women (P<0.001)

Twenty five (4.76%) patients of the study population were high myopes (Table 1). Among which 15 patients were males and 10 were females. The mean age among high myopes was 22. 50±3.25 years. Which was also significantly lower than the entire population (P<0.0002). However there was no significant different between the mean age of myopes and high myopes (P=0.1632).

Two hundred and fifteen (25.38 % of phakic ametropic) patients had astigmatism worse than –0.5 DC. The males were 134 (62.32%) of total astigmatic patients and remaining were females. The man had a significantly higher prevalence of astigmatism than women (P<0.001). One hundred and forty two (66.04%) patients had ATR astigmatism, 52 (24.18%) had WTR astigmatism and 21 (9.76%) had oblique astigmatism. The prevalence of against the rule astigmatism increased significantly with age (P=0.007).

The incidence of associated unilateral amblyopia was in 19 (3.62%) of phakic ametropic patients (Table 2). Ten (52.63%) patients were male and 09 (47.37%) were females. Amblyopia was not found to be significantly different by age (p=0.1312) group and gender (p=0.1211). Anisometropia was more common in amblyopic cases (41.75%) compared to the normal population (5.91%), and 69% of amblyopic eyes had visual acuity worse than 20/60. However, two amblyopic patients had strabismus in addition to anisometropia, but the prime reason of both conditions was anisometropia. While none of the case of bilateral amblyopia were seen in this study.

Age (yrs)	Hypermetropia		Myopia		High myopia		Total (%)
	M	F	M	F	M	F	
21-25	38	21	48	25	7	4	143 (27.23)
26-30	29	17	65	27	5	4	147 (28.00)
31-35	27	10	49	32	0	1	119 (22.68)
36-40	27	16	43	26	3	1	116 (22.09)
Total	121	64	205	110	15	10	525 (100)

Table 1. Age and type of refractive error

Age (yrs)	Frequency of amblyopia		Total (%)
	Male	Female	
21 -25	2	2	4 (21.04)
26 -30	3	2	5 (26.32)
31 -35	2	3	5 (26.32)
36 -40	3	2	5 (26.32)
Total	10	9	19 (100)

Table 2. Demography of amblyopia

4. Discussion

The incidence of hypermetropia in this study was 35.24% of total 525 phakic ametropic patients. In contrast to Andhra Paeye disease study (APEDS)[13], Barbados eye study[20], and several other studies[17,18] hypermetropia decrease with increasing age in our study

The incidence of myopia and high myopia in this study was 60% and 4.76% of the phakic ametropic patients and decreased with age. The Attebok et al[18], Wang et al[11], Katz et al[17] reported a significant trends of decreasing myopia with age. However the Chennai glaucoma study[3], Barbodos[20] study reported increase of myopia with age and also have an association of nuclear sclerosis with myopia. Saw[22], Guggenheim et al[23] and Dan et al[24] reported environmental influence such as near work, night lighting and ultraviolet exposure may be responsible for ageing of the crystalline lens and associated myopia. In contrast to population based studies from Australia[18], Singapore[19], and Indonesia[25], the incidence of myopia was more in males than females in our study.

The incidence of astigmatism in this study was 25.38% and increased significantly with age. The same has been reported from Chenni[3], Australia[18], Singapore[19], and Indonesia[25]. ATR astigmatism in this study was predominant that made the 66.04% of the total ametropic patients. In relation to the Chennai[3] study the incidence of ATR astigmatism significantly increased with age and WTR astigmatism decreased with age in our study. Gudmundsdottir et al[26], Pensyl et al[22] and Goss et al[28] reported same and the reason for this could be increased lid laxity with age causing flattening of vertical corneal meridian thereby decreasing WTR astigmatism and increased ATR astigmatism.

In this study the incidence, of associated amblyopia was 3.62% of phakic ametropic patients, which was less than Goel B.S[29] study in which amblyopia was reported 5.97%. One thing common in both were higher rate of amblyopia in ametropic then general population. In contrast to Karki JKD[30] study amblyopia was not found significantly different by age and gender in this study.

In conclusion, 15.20% of people had refractive error and 3.62% has the amblyopia. The prevalence of myopia was 60% and decreased with age. Hypermetropia was more common among men. The prevalence of astigmatism was 25.38%. It was interesting to note that against the rule astigmatism in contrast to other studies was observed more often (66.04%) in this study. Though the above study represent the regional population of limited age (20-40 years), but the differences in the pattern of refractive error in this study leads us to believe that genetic, racial, environmental and occupational influences may play an important role.

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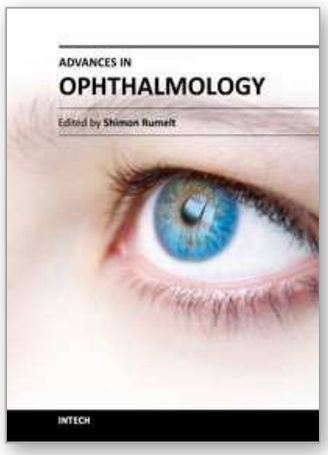
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