

**Research Article**

## **INFLUENCE OF GENDER ON THE PREVALENCE OF MYOPIA IN YOUNG ADULTS**

**\*Sood R.S.<sup>1</sup> and Sood A.<sup>2</sup>**

<sup>1</sup>*Department of Physiology, Padmashree Dr. DY Patil Medical College, Hospital & Research Center, Pimpri, Pune, India*

<sup>2</sup>*Family Physician, Trust Clinic, Pune, India*

*\*Author for Correspondence*

### **ABSTRACT**

‘Nurture’ and ‘nature’ interact to produce myopia. There have been inconsistent reports about the influence of gender on prevalence of myopia. Majority of the studies published point to a higher prevalence in female gender. This study probed the relation of myopia with gender, in young adults in India. One hundred forty eight young adults were tested for myopia and the odds of the sexes being affected were calculated. These were subjected to test of statistical significance. We report a trend, of female gender having a higher prevalence of myopia, though not having attained statistical significance. Various studies published since 1928, when researchers starting looking at the prevalence of myopia, have been tabulated and compared with our findings. Complex nature of the influence of gender has been discussed.

**Key Words:** *Gender, Myopia, Prevalence, Young Adults*

### **INTRDUCTION**

Two theories have been advanced for the development of myopia. The ‘biological theory’ proposes genetic influence whereas the ‘use - abuse theory’ proposes environmental influence. It is generally agreed that both these influences of ‘nature’ and ‘nurture’ have a role to play. This study probed the relation of myopia with gender, in young adults in India.

### **MATERIALS AND METHODS**

#### ***Study Design***

This study was designed as a descriptive cross sectional study. The prevalence of myopia in the male and female participants was calculated separately, as proportion of the participants with myopia.

#### ***Study Population***

The only inclusion criterion was being a first MBBS student. The exclusion criteria included past history of ocular surgery, ocular injury, diabetes mellitus and glaucoma. One hundred and forty eight first MBBS students at a medical college in western Maharashtra volunteered to recruit after institutional ethics committee clearance was duly obtained. The sex distribution of the participants was 59% (88/148) males and 41% (60/148) females. The mean (SD) age was 18.82 (1.34) years, age having been recorded as the number of completed years as on the nearer birthday.

#### ***Diagnosis of Myopia***

A participant was classified as having myopia if the distance visual acuity (DVA) was worse than 6/6 in at least one of the eyes, which could be improved with the optical correction last prescribed (OCLP) or a pinhole instead.

#### ***Data Collection***

After informed consent, the participants were interviewed and their personal particulars and recent medical history were obtained using a questionnaire. Using a Snellen’s test type, DVA was determined without the OCLP, if any. If it was worse than 6/6, the test was repeated with the OCLP or with a pinhole, in case the optical correction was not yet prescribed.

**Research Article**

DVA recorded was collapsed into categorical dichotomous scale, based on the presence or absence of myopia. Any improvement in the DVA with the OCLP (or a pinhole), was recorded directly on a categorical dichotomous scale.

**Statistical Analysis**

The prevalence of myopia was calculated separately for the sexes, as a proportion of the participants detected to have myopia, per hundred participants. The odds of presence of myopia in male and female participants were determined and subjected to test of statistical significance of the difference. Statistical analysis was done using the ‘StatCalc’ function of software Epi Info 2007.

**RESULTS AND DISCUSSION**

The prevalence of myopia in the female participants was higher at 50% as compared to that in the male participants at 42% (Table 1).

**Table 1: Gender difference in the prevalence of myopia**

<b>Gender</b>	<b>Myopia present % (numbers)</b>	<b>Myopia absent % (numbers)</b>	<b>Total no. of participants</b>
Female	50 (30/60)	50 (30/60)	60
Male	42 (37/88)	58 (51/88)	88
All	45 (67/148)	55 (81/148)	148

Statistical analysis revealed that the odds of myopia co-existing in the female participants were 1.38 times as compared to those in the male participants [Odds ratio 1.38 (CI = 0.71-2.67); p = 0.43; X<sup>2</sup> = 0.62]. This trend in the relationship did not reach the level of statistical significance.

**Table 2: Studies reporting a higher prevalence of myopia in females**

<b>Author</b>	<b>Location</b>	<b>Sample Size</b>	<b>Age group (Years)</b>	<b>Statistical significance</b>
Hirsch, (1952)	California	10,000	5-14	Not available
Goldschmidt (1968)	Denmark	-	13 – 14	Not available
Woodruff and Samek (1977)	Ontario	-	Adolescence	Not available
Alsbirk (1979)	Denmark	-	15-39	Not significant
Angle and Wissmann (1980)	USA	-	12-17	Not available
Krause <i>et al.</i> , (1982)	Northern Finland	12,000	0-15	Not available
Sperduto <i>et al.</i> , (1983)	USA	-	12-54	Not available
Xu <i>et al.</i> , (2005)	Northern China	4,439	40-90	Significant
Bar <i>et al.</i> , (2005)	Israel	9,19,229	16-22	Significant. Female gender an independent risk factor.
Fotouhi <i>et al.</i> , (2007)	Southwest Iran	5721	14-18	Not available
Deng <i>et al.</i> , (2010)	New England	147	6-18	Not significant

**Research Article**

The ‘biological theory’ of development of myopia indicates it to be an un-modifiable, genetic condition, in contrast to the advocacy of modifiable environmental factors under the ‘the use – abuse theory’ (Angle and Wissmann, 1980). That both these influences of ‘nature’ and ‘nurture’ play a role is generally agreed. More recently emphasis has shifted in favour of the environmental factors, particularly in view of the massive increases in the prevalence of myopia that have taken place in East Asia.

Any gender influence is generally viewed to be of a genetic nature. However, it is pertinent to note that, at least in some parts of the world, a particular gender may indulge certain lifestyles that are risk factors of myopia. To name a few, these lifestyles include, among others, less outdoor activity and excessive near work.

We attempted to probe the relation of myopia with gender among young adults in India. We report a statistically insignificant trend of female gender being more prone to myopia in our study population. Though the influence of gender on prevalence of myopia has been reported often, since long, the reports have been inconsistent.

Female participants having higher prevalence of myopia have been reported more often than otherwise (Table 2). Like in our study, statistically non-significantly higher prevalence has been reported in female participants by researchers listed in this table. Most remarkable is the study in close to a million young adult participants from Israel that reported the female gender as having been an independent risk factor for myopia, thus proving the case statistically by virtue of its sheer size (Bar *et al.*, 2005).

Myopia was found associated significantly with female gender in a study in northern China (Xu *et al.*, 2005). Higher prevalence found in 13-14 years old girls is attributable to maturational differences between boys and girls at that age (Goldschmidt, 1968).

Very few studies have reported gender neutral myopia prevalence (Table 3). Our findings contrast those of the study in a comparable age group (Rezvan *et al.*, 2012).

**Table 3: Studies reporting gender neutral myopia prevalence**

Author	Location	Sample Size	Age group (Years)
Peckham <i>et al.</i> , (1977)	UK	11179	11
Peet <i>et al.</i> , (2007)	Pennsylvania	969	50 and above
Rezvan <i>et al.</i> , (2012)	Iran	2020	6-17

Few studies have reported higher prevalence of myopia in male gender (Table 4). Two of the studies reporting statistically significant results relate to ages 39 and above and cannot be compared with our much younger participants (Alsbirk, 1979, Prema *et al.*, 2008).

**Table 4: Studies reporting a higher prevalence of myopia in males**

Author	Location	Sample Size	Age group (Years)	Statistical significance
Kempf <i>et al.</i> , (1928)	Washington DC	1810	School children	Not available
Hyams <i>et al.</i> , (1977)	Israel	4051	40 and above	Not available
Alsbirk (1979)	Denmark	Not available	40 and above	Significant
Bourne <i>et al.</i> , (2004)	Bangladesh	12782	30 and above	Not available
Prema <i>et al.</i> , (2008)	India	4800	39 and above	Significant

The relationship of myopia with gender seems to be a complex one as appears from the inconsistent findings of various studies since Kempf investigated the issue for the first time in 1928 (Kempf *et al.*, 1928). Part of the reason for this probably lies in the fact that, in addition to exerting genetic influence,

### **Research Article**

gender might influence presence of lifestyle issues, at least in some parts of the world-that might affect the prevalence. It may, thus, be misleading unless the findings of any study looking at the issue are interpreted in the light of regional social norms, customs and habits. Most reports do point towards a higher prevalence in the female gender. Huge sample size does help in clinching the issue.

### **REFERENCES**

- Alsbirk PH (1979).** Refraction in adult West Greenland Eskimos. A population study of spherical refractive errors, including oculometric and familial correlations, *Acta Ophthalmologica* **57**(1) 84-95.
- Angle J and Wissmann DA (1980).** The epidemiology of myopia. *American Journal of Epidemiology* **111**(2) 220-228.
- Bar Dayan Y, Levin A, Morad Y, Grotto I, Ben-David R, Goldberg A, Onn E, Avni I, Levi Y and Benyamini OG (2005).** The changing prevalence of myopia in young adults: a 13-year series of population-based prevalence surveys. *Investigative Ophthalmology & Visual Science* **46**(8) 2760-2765.
- Bourne RR, Dineen BP, Ali SM, Noorul Huq DM and Johnson GJ (2004).** Prevalence of refractive error in Bangladeshi adults: results of the National Blindness and Low Vision Survey of Bangladesh. *Ophthalmology* **111**(6) 1150-1160.
- Deng L, Gwiazda J and Thorn F (2010).** Children's refractions and visual activities in the school year and summer. *Optometry and Vision Science* **87**(6) 406-413.
- Fotouhi A, Hashemi H, Khabazkhoob M and Mohammad K (2007).** The prevalence of refractive errors among schoolchildren in Dezfoul, Iran. *The British Journal of Ophthalmology* **91**(3) 287-292.
- Goldschmidt E (1968).** On the etiology of myopia: an epidemiological study. *Acta Ophthalmologica* **98**(supplement) 1-172.
- Hirsch MJ (1952).** The changes in refraction between the ages of 5 and 14; theoretical and practical considerations. *American Journal of Optometry and Archives of American Academy of Optometry* **29**(9) 445-459.
- Hyams SW, Pokotilo E and Shkurko G (1977).** Prevalence of refractive errors in adults over 40: a survey of 8102 eyes. *The British Journal of Ophthalmology* **61**(6) 428-432
- Kempf GA, Collins SD and Jarman BL (1928).** Refractive errors in the eyes of children as determined by retinoscopic examination with a cycloplegic. *Public Health Bulletin No. 182*. Washington, DC: U. S. Government Printing Office.
- Krause U, Krause K and Rantakallio P (1982).** Sex differences in refraction errors up to the age of 15. *Acta Ophthalmologica* **60**(6) 917-926.
- Peckham CS, Gardiner PA and Goldstein H (1977).** Acquired myopia in 11-year-old children. *British Medical Journal* **1**(6060) 542-545.
- Peet JA, Cotch MF, Wojciechowski R, Bailey-Wilson JE and Stambolian D (2007).** Heritability and familial aggregation of refractive error in the Old Order Amish. *Investigative Ophthalmology & Visual Science* **48**(9) 4002-4006.
- Prema R, George R, Sathyamangalam Ve R, Hemamalini A, Baskaran M, Kumaramanickavel G Catherine M and Vijaya L (2008).** Comparison of refractive errors and factors associated with spectacle use in a rural and urban South Indian population. *Indian Journal of Ophthalmology* **56**(2) 139-144.
- Rezvan F, Khabazkhoob M, Fotouhi A, Hashemi H, Ostadimoghaddam H, Heravian J, Azizi E, Khorasani AA and Yekta AA (2012).** Prevalence of refractive errors among school children in Northeastern Iran. *Ophthalmic & Physiological Optics* **32**(1) 25-30.
- Sperduto RD, Seigel D, Roberts J and Rowland M (1983).** Prevalence of myopia in the United States. *Archives of Ophthalmology* **101**(3) 405-407.
- Woodruff ME and Samek MJ (1977).** A study of the prevalence of spherical equivalent refractive states and anisometropia in Amerind populations in Ontario. *Canadian Journal of Public Health* **68**(5) 414-424.
- Xu L, Li J, Cui T, Hu A, Fan G, Zhang R, Yang H, Sun B and Jonas JB (2005).** Refractive error in urban and rural adult Chinese in Beijing. *Ophthalmology* **112**(10) 1676-1683.