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INFLUENCE OF GENDER ON THE PREVALENCE OF MYOPIA IN YOUNG ADULTS

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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.

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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

| Gender | Myopia present % (numbers) | Myopia absent % (numbers) | Total no. of participants |
|--------|-------------------------------|------------------------------|------------------------------|
| 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); $p = 0.43$; $X^2 = 0.62$]. This trend in the relationship did not reach the level of statistical significance.

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

| Author | Location | Sample Size | Age group (Years) | Statistical significance |
|---------------------------------|------------------|-------------|-------------------|--|
| 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 |

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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,

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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.

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