

Myopia and level of education

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PURPOSE. *To find out whether the development of myopia is related to the level of education.*
MATERIALS AND METHODS. *From two big ophthalmic outpatient clinics in Jordan, 968 subjects (between the age of 24 and 45 years) were included in this study. A subject was considered myopic if at least one eye had a spherical equivalent refractive error of at least -0.75 diopter. The subjects were divided into two groups: the educated group was those who had finished at least 12 years of education and the non-educated which included those with maximum of six years of education. There were 468 men and 500 women.*

RESULTS. *The frequency of myopia was higher in the educated group in both men and women. A significant relationship was found between the level of education and myopia in the whole study group ($p < 0.0001$).*

CONCLUSIONS. *This study had too few subjects to draw general conclusions, but within the study group there was a significant relationship between the level of education and the development of myopia. (Eur J Ophthalmol 2001; 11: 1-5)*

KEY WORDS. *Education, Myopia, Reading*

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INTRODUCTION

Myopia is that form of refractive error where parallel rays of light come to a focus in front of the sensitive layer of the retina when the eye is at rest. Kepler provided the first satisfactory definition of the condition in 1611, and Plempius first examined the myopic eye anatomically and attributed the condition to a lengthening of its posterior part. Donders established its pathological basis, and detailed its clinical manifestations (1). From birth to adulthood, the human eye increases in diameter by 40% and its volume by 300% on average (2). However, as we all are aware, some eyes grow far longer (and some far shorter) than others. Why this happens is far from clear. There has been extensive discussion whether myopia is related to environmental (3-6) or hereditary factors (7-11).

This study was conducted in two medical centers in Jordan; King Hussein Medical Center in Amman and Jordan University of Science and Technology in Irbid, to find out whether the development of myopia is related to the level of education in this Middle Eastern country.

MATERIALS AND METHODS

This study was conducted in the ophthalmology outpatient clinics of two medical centers in Jordan: Jordan University of Science and Technology in Irbid and King Hussein Medical Center in Amman. Between January and August 1999, 968 subjects (468 males and 500 females) who attended the general ophthalmic clinics and were examined by the authors were in-

TABLE I - NUMBERS AND PERCENTAGES OF EDUCATED AND NON-EDUCATED PERSONS IN THE STUDY GROUPS

Sex	Educated		Non-educated	
	Number	(%)	Number	(%)
Male	298	(31)	170	(17)
Female	348	(36)	152	(16)
Total	646	(67)	322	(33)

TABLE II - THE RELATION BETWEEN MYOPIA AND EDUCATION IN THE WHOLE STUDY GROUP

Level of education	Number of myopes	Number of non-myopes
Educated	246	400
Non-educated	53	269

p<0.0001

TABLE III - THE RELATION BETWEEN MYOPIA AND EDUCATION AMONG FEMALES

Level of education	Number of myopes	Number of non-myopes
Educated	150	198
Non-educated	39	113

p<0.001

TABLE IV - THE RELATION BETWEEN MYOPIA AND EDUCATION AMONG MALES

Level of education	Number of myopes	Number of non-myopes
Educated	96	202
Non-educated	14	156

p<0.0001

cluded in the study. These patients either attended the clinics on their own or were referred from different provinces of Jordan for ocular problems. Subjects who had a history of ocular surgery, those below the age of 24 years and those above 45 years were excluded.

Data obtained included sex, level of education, occupation and refractive status. Subjects were evaluated with standard optometric methods using the retinoscope. A spherical equivalent refractive error was calculated for each eye. A person was considered to be myopic if at least one eye had a spherical equivalent refractive error of at least -0.75 diopter. All the myopic eyes were refracted and the best corrected visual acuity was 20/40 or better.

The subjects were divided into two groups: an “educated” group included all those who had finished at least secondary school (12 years of education), and a “non-educated” group included subjects who were illiterate or who had only finished elementary school (six years of education). In the non-educated group, all subjects with a near-work occupation were excluded from the study. The relation between the level of education and myopia in the study population was calculated using the chi-square test.

RESULTS

The numbers and percentages of educated and non-educated subjects in the study groups are shown in Table I. About two thirds of the participants were educated. Table II shows the relation between education and myopia in the whole study group. The frequency of myopia was 38% in the educated group and 16% in the non-educated group and there was a significant relationship between the level of education and myopia (p<0.0001). Similarly, in women alone the relation between education and myopia was significant (p<0.001), as shown in Table III, with nearly 43% of the educated females being myopes, against only 26% of the non-educated females. Table IV presents the frequency of myopia in educated and non-educated males. The frequency of myopia was higher among educated than non-educated men (32% and 8%) and a consistent significant relationship was again revealed between the level of education and myopia (p<0.0001).

DISCUSSION

There is good evidence that hereditary and environmental factors play a role in the development of myopia. It is difficult to assess the importance of each factor and the possible interplay between them, largely because family members share a common genetic background and are often exposed to similar environmental factors early in life when emmetropization occurs.

Genetics undoubtedly plays a substantial role in the development of refractive error: the refractive error is more similar among monozygotic than dizygotic twins (10, 11). Zadnik et al (7) reported that even before the development of myopia, children with two myopic parents had longer eyes and less hyperopic refractive errors than children with one or no myopic parents. Widely varying modes of myopia inheritance have been proposed in support of the genetic hypothesis (12-15).

Evidence of environmental factors in the development of myopia comes from animal experiments (16, 17) and various cross-sectional studies in different parts of the world (18-20). A Jordanian student spends an average of five hours per day at school or university and dedicates 2-3 hours per day to reading at home. Our data showed an association between myopia and educational level. The frequency of myopia was 38% among the educated group with long years of schooling and prolonged hours dedicated to reading, but only 16% among the non-educated group with relatively shorter years of schooling.

This finding is in agreement with numerous earlier reports of a positive association between myopia and educational status or near-work habits (4, 5, 21). An analysis of the Health Interview Survey showed that individuals who read for long periods are more likely to have myopia (22). A large-scale study of US patients showed that the incidence of myopia increased with education. Among subjects aged 18-24 years with less than five years of schooling, only 3.1% had myopia. In comparison, 30% of subjects in the same age group with more than 12 years of education had myopia (23). Of the adult population which did not attend college or military academies, 10% developed myopia, whereas 20 to 40% of those who had higher education developed nearsightedness (24).

A study of Eskimo volunteers from Barrow, Alaska showed that the prevalence of myopia was 8.4% among

parents and 58% among children. This study also showed that no Eskimos over the age of 51 were myopic. Researchers observed that until 1947, this community only offered the first six grades of education.

After 1947, children were required to attend the eighth and ninth grades. Myopia in the group without compulsory education was 1.5%. Of those with compulsory education, 40.3% had myopia (25).

In an epidemiological study in Greece (26), 474 men were examined, and the years of studying and urban residence were factors strongly influencing the prevalence of myopia, which was higher in the more educated group.

In our study, although the difference in the frequency of myopia between the educated and non-educated males was more obvious than among females, the relationship between the level of education and myopia was significant for both sexes. This contradicts what the Framingham Offspring Eye Study Group (27) reported that a larger number of years of education was associated with myopia in men but not in women.

One theory has it that myopia develops because of increased near work. Many epidemiological studies support this (22-28). In theory, emmetropic eyes that accommodate for prolonged periods during near work grow in length so that excessive accommodation is no longer necessary (6). Indeed myopia can be induced in growing animals confined to small living spaces (29, 30). An increase in near work activities by those with more schooling has been used to explain the educational association.

Richler and Bear (4) examined the effect of educational status and near work activities for persons younger than 60 years and the two factors taken together accounted for a substantial proportion of refraction variance. Their study suggested that near work accounted for more variation than the educational status. In our study, the higher frequency of myopia among non-educated females than non-educated males (26% vs 8%) is most probably related to their doing more near work. In our community, non-educated females tend to spend more time at home than non-educated males who tend to spend longer outdoors. These females spend long hours with near work like knitting and sewing.

A genetic explanation for the association between level of education and myopia can be assumed. Some studies suggested that persons with myopia have higher scores on intelligence tests than persons without

myopia (21, 31). One can assume that if myopia and intelligence are inherited together, persons with myopia may read more and spend more years in schooling and education. In a study that examined years of schooling and intelligence level, Rosner and Belkin (21) found both factors seemed to be equally important in their relationship with myopia.

CONCLUSIONS

The number of subjects studied here is too few to permit any general conclusions, but there was a significant relationship between the level of education and the development of myopia. This is in agreement with numerous studies from different parts of the world.

We still need to know more about why myopia develops so we may be able to influence its development using medications and/or optical devices. Till we reach that stage, we can only recommend that parents avoid prolonged near tasks for their children.

Outdoor visual stimuli positioned at optical infinity minimize accommodation, thus probably reducing the development of myopia.

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