Incidence of refractive errors in diabetic patients

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**ABSTRACT**

The aim of the study is to find the incidence of refractive errors in diabetic individuals. Diabetes mellitus is highly prevalent in the current world in both developing and developed countries due to the lifestyle modifications. Refractive errors of eye are a very common group of disorder associated with diabetic people leading to the impairment of vision. Hence the study of incidence of refractive errors in patients with type 2 Diabetes mellitus was conducted. It was a cross-sectional study conducted at a tertiary health care centre and following was the methodology. One hundred eyes of fifty individuals were taken into consideration from Jan 2020 to March 2020, who were affected with type 2 Diabetes mellitus. These fifty individuals underwent subjective refraction of both the eyes. The results obtained were only 17 eyes (17%) being emmetropic, remaining 83 eyes (83%) were found to be ametropic. In the 83 ametropic eyes 22 eyes (22%) were myopic, 39 eyes (39%) were hypermetropic and 22 eyes (22%) had astigmatism. In the current Cross-sectional study refractive errors were noted in 83% of individual and hypermetropia being the most common error with a prevalence of 39%.

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**INTRODUCTION**

The prevalence of cases of diabetes mellitus is on its peak in the current world scenario in developing as well as in developed countries. Although there is a rise in both type 1 and type 2 cases there is a greater surge in the number of type 2 diabetes cases. This is because of the lifestyle modifications and reduced activity due to industrialization leading to obesity. The total number of diabetic cases in India is around 77 million. There is an estimated rise of number of patients affected by diabetes from 171 million in 2000 to around 366 million in 2030 globally (Wild et al., 2004).

Cataract and diabetic retinopathy are the two most common complications caused by uncontrolled glycemic levels over a long period of time leading to defect in normal vision. The main cause of impairment of vision is changes in the refractive power leading to refractive errors (Cheng et al., 2003).

There is still no proper agreement made on the course of progression of refraction error. But according to a study conducted by (Gwinup and Villarreal, 1976) there is a high association of myopia when the glycemic control is poor and there is a gradual shift noted towards hyperopia when the glycemic levels are in good control (Gwinup and Villarreal, 1976). Additionally, in the blue mountain study there was no correlation between refractive status of eye and glycemic levels (Guzowski et al., 2003; Shimizu, 2003).

When the eye has a proper state of refraction that is the parallel rays of light from infinity fall on
the retina with accommodation at rest, it is called emmetropia (optically normal eye). And when the rays of light don’t fall on the retina and instead fall in front or behind the retina in one or both the meridians it is termed as ametropia. It can be classified as a) Myopia, b) Hypermetropia, and c) Astigmatism. There might be a plethora number of causes for these conditions but the major causes are a) change in lenticular thickness, b) change in the refractive index of lens or the shape and curvature of lens and c) change in the axial length of eyeball.

MATERIALS AND METHODS

Study Design
Cross-sectional study.

Study area and Population
The study was conducted in a Tertiary care hospital, Saveetha Medical College, Tirumazhisai, Chennai, Tamilnadu.

Sample Size
A total of 50 diabetic patients were taken into consideration randomly who arrived at the out-patient clinics.

Inclusion criteria
Only eyes with clear optical media were included.

Exclusion criteria
All the patients who had opacification in the eye like cataract, corneal opacification, history of previous surgeries or suffering from macular edema and diabetic retinopathy were excluded.

Study duration
The study was carried out from January 2020 to March 2020.

Data Collection method
A case was defined to be myopic when the spherical equivalent refraction of an eye was less than or equal to -0.25D and hypermetropic when the spherical equivalent refraction of an eye was more than or equal to +0.25D. The data of the subjects were taken who fit the above criteria and they were informed about the study and confidentiality was maintained. In total 100 eyes were subjected to subjective examination and their type of error of refraction was done by cycloplegic refraction & by autorefractometer.

Ethical clearance
Ethical approval was obtained from the Institutional Review Board (IRB) and Institutional Ethics committee. Written informed consent was obtained from the study participants and information sheet regarding the study was given to all the participants, IRB approval number – SMC/IEC/2020/03/366

RESULTS AND DISCUSSION

Table 1: Distribution of Refractive errors

| S.No | Refractive error | Percentage |
|------|-----------------|------------|
| 1.   | Emmetropic      | 17%        |
| 2.   | Myopia          | 22%        |
| 3.   | Hypermetropia   | 39%        |
| 4.   | Astigmatism     | 22%        |
| Total|                 | 100%       |

Out of the total 100 eyes examined 17% (17 eyes) were emmetropic and the remaining 83% (83 eyes) were found to be ametropic. In the group of ametropic eyes 22% (22 eyes) and 39% (39 eyes) were found to be myopic and hypermetropic respectively. And the remaining 22 eyes were found to be astigmatic consisting of 22% ($). The study population had a 60:40 ratio of men:women comprising of 60 men and 40 women. In the above study comparing the prevalence of refractive errors and gender there was no significant correlation found between the two (p value = 0.913). Hence there is no correlation between the gender and prevalence of refractive error. Major group of population belonged to the age group of above 40 and below 70 years. There were no subjects less than the age of 20 years.

In the present study out of the total 100 eyes 83% were affected by a refractive error and only 17% were Emmetropic which is a contrasting feature when compared to the study of (Miu and Gadzhiev, 1990) who had 46.2% of emmetropia. In our study hypermetropia was the most frequent with a preponderance of 39% (39 eyes). This finding is similar to that of (Shrestha and Kaini, 2015) who had a 45% prevalence of hypermetropia in their study. Where as in the study of (Chen et al., 2008; Mwale et al., 2008) they had a significant fall in the prevalence of hypermetropia comparing to our study. Table 2 shows the findings of different studies conducted by different authors.

In our study the prevalence of myopia was around 22% which is comparable with the findings of Rani et al. (2010) (21%) and Miu and Gadzhiev (1990) (20.6%) where as Chen et al. (2008) study had a high frequency of Myopic cases (57%). This increase in the frequency of myopic cases may be explained by the ethnic variations seen. According to the study conducted by Rani et al.
Table 2: Prevalence of refractive errors in studies conducted by different authors

| Study                  | Population type | Hypermetropia | Myopia  | Astigmatism |
|------------------------|-----------------|---------------|---------|-------------|
| Miu and Gadzhiev (1990)| Diabetic        | 33.2%         | 20.6%   | -           |
| Shrestha and Kaini (2015)| Diabetic      | 45%           | 25.2%   | 29.8%       |
| Chen et al. (2008)     | Diabetic        | 24%           | 57%     | 88%         |
| Mwale et al. (2008)    | Diabetic        | 19%           | 39.5%   | 6.8%        |
| Rani et al. (2010)     | Diabetic        | 39%           | 21%     | 47%         |

Table 3: Distribution of cases of refractive errors according to different age groups

| Age       | Emmetropia | Myopia | Hypermetropia | Astigmatism | Total |
|-----------|------------|--------|---------------|-------------|-------|
| 21-30 years | 2          | 0      | 0             | 0           | 2     |
| 31-40 years | 1          | 4      | 0             | 3           | 8     |
| 41-50 years | 7          | 10     | 16            | 5           | 38    |
| 51-60 years | 3          | 4      | 9             | 4           | 20    |
| 61-70 years | 2          | 4      | 12            | 6           | 24    |
| 71-80 years | 2          | 0      | 2             | 4           | 8     |
| Total     | 17         | 22     | 39            | 22          | 100   |

Table 4: Distribution of refractive errors in relation with different genders

| Gender  | Male | Female | Grand Total |
|---------|------|--------|-------------|
| Emmetropia | 7    | 10     | 17          |
| Myopia   | 6    | 16     | 22          |
| Hypermetropia | 14   | 25     | 39          |
| Astigmatism | 13   | 9      | 22          |
| Grand Total | 40   | 60     | 100         |

There was increase in the prevalence of the hypermetropic and astigmatic cases in older age group. The same trend was found in our study depicted in Table 3 and thus we come to a conclusion that progression of age is an important factor for refractive error in old age group.

As shown in Table 4, it can be observed that Hypermetropia is likely to be seen more in women (25%) than in men (14%). This correlation was noted by Rani et al. (2010). This might be due to the reduced axial length of eyeball and also the anterior camber being shallow while compared with that of men and hence there might be a greater association of hypermetropia with females.

CONCLUSIONS

As we all know that refractive errors are a crucial cause of visual impairment in diabetic individuals, and its further research and discussion is the need of the hour. Also there is no relevant significance statistically found relationship between fasting blood glucose levels and refractive status of an individual. This indicates that for prescription of spectacles there is no need of testing of fasting blood glucose levels. But there should be regular eye checkup done to detect and avoid early complications of diabetes mellitus on the eyes. Therefore in the current situation of rapidly increasing number of diabetes cases there is a pressing priority to spread awareness of the eye complications and the advantages of regular eye checkup.

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Conflict of Interest

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