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Prevalence Of Common Visual Defects Among Middle Aged Individuals –An Epidemiological Study

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Abstract:
Background: *Ocular disorders causing defective vision is common in middle age. There is a high prevalence of ocular comorbidities associated with systemic diseases. Early signs of age-related eye diseases, begin in middle age and hence a baseline comprehensive eye exam is necessary.*
Aim and objective: *Assessment of prevalence of common ocular disorders that exist in the selected 100 patients of the age group 30-60 year attending the Ophthalmology Department in Tirunelveli Medical College Hospital.*
Materials and methods: *The study is a hospital- based ,non- interventional, cross-sectional prospective study. Study group comprised of 100 patients (age 30-60 years) attending ophthal OPD. Estimation of visual acuity, anterior segment examination, slit lamp examination, intraocular pressure, retinoscopy, fundus examination, visual fields, gonioscopy are done to detail the defective vision .*
Results: *Data is analysed using SPSS. 29 patients with pathological changes in the visual apparatus had associated metabolic disorder diabetes mellitus and one of them had thyroid disease. 22 patients with hypertension were found to have organic changes in the visual apparatus. The patients with diabetes and hypertension with complaints of defective vision, have been found to have glaucoma(8%), cataract (24%) and retinal changes(19%) either alone or combined. 16 of them had refractory errors and 4 cases had corneal opacity.*
Conclusion: *Diabetes mellitus and hypertension affecting visual function are stress-related, modern life style diseases which can be either avoided or postponed by stress relaxation techniques and exercise. Early detection of ocular complication and prompt treatment is important to preserve vision for better living condition.*
Key words: *middle age, visual defects, diabetes mellitus, hypertension.*

I. Introduction

Vision is a means of communication of man with the external world. It helps the individual to adjust, adapt and to protect the individual in the available circumstances. The impact of visual loss due to ocular morbidities has profound implications for the person affected and the society as a whole[1]. The majority of people live in developing countries and generally their visual impairment, due to various ocular disorders, could have been avoided or cured. As the world's population increases and a greater proportion survives into late adulthood, the number of people with visual loss is likely to rise inexorably[2] .

India has been the first country in the world to initiate a public- funded program for the control of blindness as a national priority health problem. With the launch of 'Vision 2020' global initiative, the focus has shifted to all causes of avoidable blindness rather than to cataract and rapid assessment have been expanded to include all causes of avoidable blindness[3] .

Given the success of programmes in combating the common causes of blindness (infectious diseases and malnutrition) which generally affect the young, the projected demographic shift, towards the age-related eye diseases has become increasingly relevant[4]. Effective preventive measures for these diseases can only be established, as more is known about their etiology.

As the longevity of the world's population increases, the visual requirements at the workspace are also changing. People with low vision may be at disadvantage in many common activities, and may face unemployment – particularly in technological societies[5] . Efforts should be made to recognize and treat those affected, at an early stage, for the benefit of the individual and the society. With this view , this study has been undertaken.

II. Materials & methods

The present study is a hospital- based, non- interventional, cross- sectional study. For this study, 100 patients in the age group 30-60 years attending ophthamology out patient department in Tirunelveli Medical College Hospital were chosen.

Exclusion criteria- Patients with acute infection/ inflammation of eye, acute injury to eye, one eyed persons and those who have undergone previous ocular surgeries (eg keratoplasty,cataract surgery) were excluded from the study. Informed consent was obtained from all the selected individuals, who fit into the criteria. By way of providing proforma, the required data was collected with special reference to the presence of hypertension, diabetes etc.

Visual acuity testing – The presenting distant visual acuity (VA) for both eyes was measured seperately using a a standard Snellen's chart properly illuminated at a distance of 6m.

Each participant had an anterior segment examination, using a torch, to detect the signs of conjunctival disease and corneal disease.Slit lamp examination of cornea was done to determine the position, depth and site of corneal abnormality and lens opacities .

Recording of intraocular pressure – Schiotz indentation tonometer was used to record the intraocular pressure of the anaesthetized cornea.

Retinoscopy was performed after pupillary dilatation to elicit the refractive status of the eye. Fundus examination was carried out using direct ophthalmoscope. Visual field analysis-- done using automated static perimeter – for details. Gonioscopy – To determine the type of angle in the anterior chamber of the eye.

The following definitions are used for the study

1.Visual impairment – WHO Definitions

Category of visual impairment	Visual acuity with best possible correction	
	Maximum less than	Minimum equal to or better than
Low Vision		
1	6 /18	6 /60
2	6 /60	3 /60
3	3 /60	1 /60
Blindness		
4	1 /60	Light perception (PL)
5	No perception of light (NPL)	

2 .Corneal opacity: Loss of normal transparency of cornea.

3. Glaucoma: An intraocular pressure of more than 21 mm Hg associated with optic disc cupping and / or visual field defects.

4. Cataract: was defined as the presence of lens opacity of such magnitude as to cause a corrected visual acuity of <6/18

5. Myopia: defined as a spherical equivalent less than – 0.50 Diopter sphere; Hypermetropia: defined as a spherical equivalent greater than + 0.50 Diopter sphere ; Presbyopia: receding of near point beyond the distance at which the individual is accustomed to read or to work.

All the participants of this study had the following tests done.1.Estimation of blood pressure- done by using Sphygmomanometer with the standard technique.

2. Estimation of blood sugar and serum cholesterol- blood samples were collected and sent to the biochemical laboratory, Tirunelveli Medical College Hospital and the reports collected.

III. Results analysis

Of the 100 patients studied, the findings were tabulated from the data collected by using the proforma and after the detailed examination for the defects in the visual apparatus and the results were analysed.

Table - 1: Distribution of subjects by age and sex

Age group in years	Male	Female	Total
30-40	17	12	29
41-50	24	11	35
51-60	24	12	36
	65	35	100

Among 100 people examined, 65 were men and 35 were women.

Table - 2: Age specific distribution of visual defects.

Agegroup in yrs	Cornea	Elevated IOP	Lens	Retina	Refractive status	Others (mononeuropathy & thyroid)	Total
30-40	1	-	1	3	7	-	12
41-50	2	3	9	9	7	-	29
51-60	1	6	19	9	2	2	36
25+	4						

4 - 2 Subjects had lens opacity with diabetic retinopathy and Another 2 had lens opacity along with glaucoma.

In the age group 30-40 years, there were 29 patients complaining of defective vision; among them only 12 patients had defects in the visual apparatus on examination. Among the age group 41-50 years, 35 patients came with the complaints of defective vision and on examination, only 29 had defects in the visual apparatus. In the age group 51-60 years all the 36 patients had defects in the visual apparatus on examination (Table-2).

Table - 3: Age wise distribution of subjects with refractive errors

Age group in years	Total=16	Myopia	Hypermetropia	Presbyopia
	7	7	-	-
51-60	7	-	6	1
	2	-	-	2

Among the 100 patients examined, 16 of them had refractive errors as shown in the above table.

Table - 4: Distribution of ocular diseases depending on etiology

Diseases	No. of cases studied	Etiology		
		DiabetesMellitus	Hypertensions	Others
Corneal opacity	4	-	-	4
Glaucoma	9	3	5	1
Cataract	29	16	8	5
Refractive errors	16	3	-	13
Retinal disease	21	9	10	2
Mononeuropathy	1	1	-	-
Thyroid eye disease	1	-	-	1

The table indicates the number of cases of impaired vision as classified according to their etiology. Diabetes mellitus and hypertension are found to play a dominant role.

Table - 5: Association of common visual defects in diabetic patients

Age group in years	Mono Neuropathy	Glaucoma	Cataract	Diabetic Retinopathy	Refractive error
30-40	-	-	1	1	-
41-50	-	1	7	4	3
51-60	1	2	8	4	-
Total	1	3	16	9	3
			13+ 3		

Among the 31 diabetic patients examined, 29 patients (93.6%) had visual defects as shown in the table

Table - 6: Association of common ocular lesions in hypertensive patients

Age group in years	Glaucoma	Cataract	Hypertensive Retinopathy
30-40	-	-	1
41-50	1	2	5
51-60	4	6	4
Total	5	8	10
		7+ 1	

Duration of diabetes(years)	No: of subjects	Diabetic Retinopathy	Prevalence%

Out of 28 hypertensive patients examined, 22 had the ocular lesions (78.6%) as shown above, whereas, 6 patients were free from identifiable ocular lesions.

Table – 7: Distribution of retinopathy in relation to duration of diabetes

0 - 5	6	-	0
5 - 10	7	1	14 .3%
10 - 15	10	4	40%
15 – 20	8	4	50%

The table shows, as the duration of diabetes increases, the percentage of cases of retinopathy also increases.

Summarizing the results obtained:-

1. Out of 100 patients examined (among the patients who attended the ophthalmology out patient department with complaints of defective vision), 23 patients did not have any significant alterations in the visual apparatus on clinical examination.
2. 29 patients with varying pathological changes in the visual apparatus were found to have associated metabolic disorder --diabetes mellitus and one of them had thyroid disease.
3. 22 patients suffering from hypertension were also found to have organic changes in the visual apparatus.
4. The patients with diabetes and hypertension with complaints of defective vision, have been found to have glaucoma, cataract and retinal changes either alone or combined.
5. With increasing duration of the condition of diabetes mellitus, the incidence of retinal changes is also found to increase.

IV. Discussion

The 100 patients with the complaints of difficulty in vision selected for this study were examined thoroughly for the visual defects;- 23 of them did not have any significant alterations in the visual apparatus and therefore were treated as required.

16 patients were found to have refractory errors as follows:

7- myopia , 6- hypermetropia and 3- presbyopia (Table-3). Of these people only 3 hypermetropic patients were found to have associated metabolic disorder- Diabetes Mellitus; all others were considered to be age- related. Myopia of a transient or permanent nature can occur due to either of the following causes– less hydration, lens subluxation, nuclear sclerosis or malnutrition. Hypermetropia can occur in conditions of cortical cataract with increased refractive index of the cortex of the lens, relative to the nucleus, so that the overall refractive power of the lens decreases. Presbyopia, explained as the physiological failure of accommodation is due to the hardening of the lens; it may also be due to the weakness of the ciliary muscle found to be associated with the general debility, anemia and excessive use of the eyes particularly for close work. These findings correlate with the findings reported by Brown NA and Krishniah S.[6,7] .All these cases, who were found to have refractive errors, were provided with suitable glasses for improving the vision.

4 patients had defective vision because of the corneal opacity. Corneal scarring has been the final outcome of inflammation of the cornea due to mechanical injury followed by bacterial or viral infections. The prevalence rate and the findings of our study are consistent with those of Dondana L et al and Inaamul Haq et al.[8,9] The prevalence of corneal scar in any community is said to be a good indication of the general health, hygiene and nutrition of that community.

Out of 29 patients, who had structural alterations in the lens, 5 had age- related cataract and they did not have any associated medical illness; 16 of them had cataract associated with Type 2 diabetes mellitus and 8 of them suffered from cataract along with systemic hypertension.

The senile cataract (age-related) occurs because of the cumulative effect of the environmental factors, such as, exposure to ultraviolet light, toxins, metals, excessive sunlight, smoking, alcohol, malnutrition, dehydration, diarrhoea, x-ray irradiation, steroids, drugs etc,. These factors disrupt the cellular organization and intracellular homeostasis of the lens, eventually causing spatial density fluctuations, light scattering and absorption, which compromise vision. The prevalence rate of cataract in our study coincides with the findings reported by Arin chatteje et al.[10]

The pathogenesis of cataract in diabetes mellitus is explained by the following mechanisms – sorbitol accumulation, protein glycosylation and increased superoxide production in the mitochondria of lens fibre cells. The cataract diagnosed in the age group 30 – 40 years suggest the earlier onset of lens opacity in diabetes mellitus. The patients in the age group 50 – 60 years had longer duration of diabetes and /or impaired fasting glucose suggesting poor metabolic control. This finding of our study correlates with the previous report of harmful effects of diabetes on the lens by B.E.K. Klein and Gowri L Kanthan.[11,12]

Hypertension has been found to have influence on the prevalence of cataract as seen in our study. The same fact has also been suggested by Muhammed Shakil et al.[13]

9 patients had elevated intraocular pressure and diagnosed to have glaucoma. In one of these patients, the diagnosis of primary angle closure glaucoma was done taking into consideration the following associated factors- female sex and the anatomical factors of globe such as shallow anterior chamber depth, thick lens, small cornea, short axial length which were found to exist in this condition.

Among the other 8, who had primary open angle glaucoma, 3 were diabetic and 5 hypertensive. In these patients, the intraocular pressure is found to be increased with increasing age and associated with systemic diseases namely diabetes and hypertension. The incidence of glaucoma at 8% found in our study is almost double the value, reported in India (2.6% to 4.1%) in 2003 by Ramakrishnan et al (The Aravind Comprehensive Eye Survey).[14]

The intraocular pressure elevation occurs because of increased outflow resistance and decreased outflow facility in the uveoscleral and trabecular meshwork. In these cases , the so- called 'Cupping' i.e., the retinal change leading to visual field defects is due to alterations in the vascular tissues, resulting in changes in the neuronal and glial functions. The impaired metabolism of neurons and glia, in case of diabetes mellitus renders the retinal ganglion cells susceptible to additional stress, related to the open angle glaucoma and elevated intraocular pressure. Similar findings (association of diabetes and hypertension with elevated intraocular pressure) have been observed and reported by Leske MC et al.[15] The higher incidence found in our study has to be taken note of, and necessary awareness of the etiological factors is to be created ; diabetes mellitus and hypertension if treated earlier, can either prevent or delay the visual defect due to glaucoma.

Of the 21 patients who had retinal lesions, 19 patients have been found to have associated diabetes mellitus / hypertension. The vascular retinopathies occuring as a part of systemic disorder-- diabetes mellitus and hypertension are usually associated with pronounced changes in the retinal vessels. The retinal changes probably originate from a state of anoxia, which results in an increased permeability of the capillaries, the formation of microaneurysms and the local degenerative changes in the tissues of the retina.

Hyperglycemia ultimately leads to the increased oxidative stress within the endothelial cells in retina, that contributes to the various pathological changes in diabetic retinopathy.

Among the diabetics in our study, 9 of them (29%) had diabetic retinopathy, the incidence of which is similar to the earlier report by Narendran V et al in India.[16] We find that poor control of diabetic status, in our study participants, to be associated with diabetic retinopathy as suggested by other investigators in UK Prospective Diabetes Study Group.[17] The incidence of diabetic retinopathy is also found to increase with the length of time the patient has had diabetes; 14.3 % with duration 5 to 10 year to 50 % with duration 15-20 years. Similar findings have been reported by Klein R et al.[18]

The presence of retinal lesions in patients with hypertension resulted from injury to microvasculature as suggested by Lee AG et al.[19] Hypertensive retinopathy present among 10 hypertensives (35.7%) in this study is similar to the studies reported by Karti KTD in Nepal.[20]

The possible role of systemic risk factor such as hyperlipidemia has been implicated in the development of retinal arteriolar changes. Therefore earlier detection of hyperlipidemia / hypertension in younger age group individuals and suitable and adequate measures of life- style modifications and if necessary treatemt will help in either protecting the vision or delaying visual defects.

One had age- related macular degeneration (AMD) with low vision. The cause of AMD is multi factorial and influenced by age, ethnic background, and a combination of genetic and environmental factors. Loss of visual acuity typically results from progressive degeneration of the choriocapillaries, retinal pigment epithelium and photoreceptors – as suggested by Sanjeev K Gupta et al, in India.[21] The incidence of 1% AMD in our study is similar to that found in Beaver Dam Eye Study.[22] Antioxidants could prevent oxidative damage to retina, which could in turn prevent the development of AMD.[23] Richer S et al in a prospective double masked study involving lutein and antioxidant supplementation in a group of 90 individuals showed that visual function was improved with 10mg of lutein or a lutein / antioxidant formula.[24]

Another had retinitis pigmentosa as a cause for defective vision. Retinitis pigmentosa is a slow progressive disease of the retina, primarily affecting rods and cones almost occurring in both eyes, beginning in childhood and often resulting in blindness in middle age. This fact has also been explained by Massof RN et al.[25]

One patient with visual defect was found to have mononeuropathy (oculomotor nerve palsy) as a consequence of long- standing diabetes mellitus. This is due to the chronic microvascular complications leading to the cranial nerve palsy as a result of hyperglycemia. Yet another case of visual defect was found to have associated hyperthyroid condition, where the proptosis, as a result of retro- lental fibroplasia was the cause for defective vision; and the case has been referred to surgical department for further management.

V. Conclusion

The present study has been undertaken to find out the common visual defects prevalent among the middle aged individuals (30- 60 years). 100 patients with the complaint of defective vision have been clinically examined to find the causative factors in the visual apparatus.

16 of them had refractory errors namely myopia, hypermetropia and presbyopia that are common in this age group; the number of patients could have been reduced, if the socioeconomic conditions (contributing for malnutrition, anemia, counselling for close work etc.,) can be improved, since these conditions are found to be the major risk factors for the visual defects, though unavoidable because of aging.

4 cases of corneal opacity resulting from mechanical injury superadded with infections.

29 patients with defects in the visual apparatus were found to have associated diabetes mellitus, and 22 patients had associated hypertension, which has resulted in defective vision. The conditions of diabetes mellitus and hypertension, which affect the microvasculature and the nervous tissue, are found to have enormous effect in causing the various defects in the functioning of the visual apparatus.

Both these conditions are called stress-related, modern, lifestyle- diseases; they can be either avoided or postponed, by suitable stress- relaxation techniques, such as, simple deep breathing exercise and alteration in the lifestyle, avoiding sodium rich fatty junk food and practicing walking or other simple physical exercises.

By adopting the various changes mentioned, these conditions could be prevented if possible. Otherwise, they have to be detected early and treated properly, so that the deterioration of the visual function can either be avoided or reduced or postponed. By these means, the vision can be preserved for a better living condition.

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