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ORIGINAL ARTICLE

A Study of Prevalence and Some Epidemiological Determinants of Blindness in different Age Groups

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ABSTRACT:
Background: Nearly 39 million people worldwide were blind and 246 million had low vision as estimated in 2010. 80 % of all visual impairment can be prevented, treated or cured. However, a large population of these affected remain blind for want of access to affordable eye care. Blindness is one of the significant social problem in India. **Aims and Objectives**: This study has been designed to know the prevalence and epidemiological determinants of blindness in an Urban Slum of Muzaffarnagar. **Materials and Methods**: A community based cross- sectional study was carried out in 345 families with 1603 study subjects of all age groups. **Results**: The information was collected on a predesigned and pretested proforma .The prevalence of blindness was 3.1% and it was more in females (3.6 %) as compared to males (2.5 %). It was present in 0.4 % in the age group of 15-59 years and in 17.9% in the age group of 60 years or more. The most important cause of blindness was cataract in 71.4 %, posterior segment causes in 20.4 %, ocular injury in 6.1% and corneal opacities in 2 % cases. Alcohol intake in 3.9%, smoking in 4.2%, ocular injury in 7.3%, hypertension in 7.1 % and diabetes mellitus in 24.3% cases were responsible for blindness. **Conclusion** : In the present study the blindness was found in 6.1 % of participants and it was found to be with a marginal higher prevalence in females (3.6%) as compared to the males (2.5 %). It was present mostly in the age group of 60 years or above (17.9%). The major causes of blindness were cataract followed by posterior segment causes, ocular injury and corneal opacities. The blindness was significantly associated with hypertension and diabetes mellitus. There was no significant correlation with alcohol consumption and smoking habit.

Keywords: Blindness, Cataract, Alcohol, Ocular injury, Smoking, Hypertension, Diabetes Mellitus.

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INTRODUCTION

In several gifts of nature, vision is best among them. It is difficult to imagine life without it. Globally ,in 2010 it was estimated[1] that 285 million people were visually impaired worldwide,39 were blind and 246 million had low vision .About 80 percent of blindness is avoidable, treatable or potentially preventable .However, a large proportion of those affected remain blind for want of access to affordable eye care.[2,3]About 90 percent of the world's visually impaired people live in developing countries where it is a major health problem.[3] In India alone 53thousand per million populations are living with visual impairment. Earlier as estimated in 2001, 1201 million people with blindness were living in this Region.[3,4]Blindness is one of the significant social problems in India.[5]The estimated prevalence of blindness in India for the year 2004 was about 11.2 per 1000 population, of this 0.1 per 1000 population was in age group 0-14 years, 0.6 in age group 15-49 years and 77.3 in 50 + age group. In men the prevalence was 10.2 per 1000 population and in women 12.2 per 1000 population.[6]According to Rapid National Survey on blindness 2006-07, the prevalence rate reduced from 1.1 percent to 1.0 percent and estimated national prevalence of childhood blindness / or low vision was 0.8 per 1000.[7]Five conditions : cataract, refractive errors/ low vision, trachoma, onchocerciasis and vitamin A deficiency and other causes of childhood blindness were determined to be responsible for 75% of all blindness

worldwide.[8] These are treatable and preventable causes of blindness. Effective and cost efficient intervention strategies are available for each of these diseases.
In the national survey on blindness, 2001-2002 conducted in the country, cataract accounted for 62.6 percent of all cases. Uncorrected reflective error was responsible for about 19.7 percent of blindness, overall prevalence of glaucoma was about 5.8 percent, posterior segment pathology accounts for about 4.7 percent cases. Corneal opacity and other causes were responsible for 0.9 percent and 6.2 percent of cases respectively.[9]

In India child population in 2010 was 345 million and number of blind children were 2,80,000. The prevalence of blindness has declined to 1.4% after Vision 2020.[10] Childhood eye morbidity is defined as any eye disease or condition that requires ophthalmic care and treatment, which if untreated can often progress to serious and sight threatening disease.[11]

An estimated 19 million children are visually impaired. Of these,12 million are visually impaired due to refractive errors, a condition that could be easily diagnosed and corrected. 1.4 million are irreversibly blind for the rest of their lives. Children do not complain of defective vision and may not be aware of their problem. They adjust to the poor eyesight by sitting near the blackboard, holding the books closer to their eyes, squeezing the eyes and even avoiding work requiring concentration .Cataract is the most common easily correctable cause of blindness in the developing regions of the world.[12] In India alone 3.8 million people become blind from cataracts each year.[13] The Glaucoma is also a leading cause of blindness globally, after cataract.[3] The epidemiology of corneal blindness is complicated and encompasses a wide variety of infections and inflammatory eye diseases that cause corneal scarring, which ultimately leads to functional blindness. Trachoma and corneal ulceration are significant causes of corneal blindness, which are often underreported, but may be responsible for millions of new causes of monocular blindness every year.[14]

There is an estimate that 3-4 million persons are blind due to corneal opacity. With declining incidence of trachoma and xerophthalmia, the consequences of ocular trauma and corneal ulcerations are emerging as important causes. According to an estimate 6.5 million are affected with, and 1.3million eyes become blind due to corneal ulcer every year in the South- East Asia Region.[15]

A study of pattern of ocular diseases is very important because some eye conditions which are just causes of ocular morbidity, invariably lead to blindness considering the fact that 30 percent of India's blind lose their eye sight before the age of 20 years and many of them are under five when they become blind, importance of early detection and treatment of ocular diseases and visual impairment is thus obvious.

Population based cross sectional surveys depicting the magnitude of blindness among the population in India particularly in slums are scanty hence the present study has been undertaken.

AIMS AND OBJECTIVES:

The study the prevalence and some epidemiological determinants of blindness in different age groups.

MATERIAL AND METHODS:

The present cross sectional study was planned to carry out a baseline survey to assess the prevalence and some epidemiological determinants of blindness in different age groups in an urban slum of Muzaffarnagar City. The sample size was calculated 1600, keeping in view the estimated prevalence of ocular morbidities in the general population (p) 20%, Confidence Limits 95%, and relative Precision (L) 10%. Taking the study unit as the family (since individuals of all age groups were to be studied) and the average family size is about five,[16] the number of families to be studied was calculated to be 1600/5= minimum 320. So, to cover a minimum sample size of 320 families, 31 families from each of these eleven colonies were selected by simple random sampling techniques using simple random number table. Approval from Institutional Ethics Committee was obtained. A house to house survey was done for 31 randomly selected families in each colony of the area. Consent for information and examination was sought from head of the family in all cases. In case of children below 14 years information was obtained from parents. Each member of the family was interviewed using oral questionnaire method. The information from each family was collected on a pre-designed and pre-tested proforma and any complaint pertaining to eye problems in any of the family members . Each of the family members was examined for visual acuity and then a torch examination was done for any sign of ocular morbidities in the anterior segment of the eye. The suspected cases were then confirmed by examination by an expert of the Department of Ophthalmology, Muzaffarnagar Medical College, Muzaffarnagar.

Data Processing and Analysis:

The data thus collected was first coded and then transferred to a master chart from which simple and correlation tables were prepared, analysed and statistically evaluated. Limitations of the Study:

1. Only the anterior segment eye problems were considered as these could be easily recognized under torch light examination.

2. Examination by sophisticated instruments, even of the anterior segment, could not be done due to the patients being reluctant to visit the medical college for these examinations

Definitions of the Terms used in the Study :

Case:

Any person having any symptom or sign of ocular morbidities was termed a case.

Norman Vision :[17]

Individuals more than 6 years were tested for vision.

An individual was said to possess normal distant vision if-

-Could read till 6/6 in the Snellen's chart.

Low vision :[17]

A person was said to have low vision if-

- His distant vision was <6/18 on the Snellen‟s chart in daylight in the better eye or,
- Persistent impairment of visual function after treatment and/or refractive correction

Blindness :[17]

A person was said to be blind if his vision in the better eye was <3/60 in the Snellen‟s chart or he could not count fingers from a distance of 3 metres in daylight from his better eye.

Corneal Opacity :[17]

Any opacity on the cornea was termed as Corneal Opacity.

RESULTS:

The present study was conducted on 341 families distributed over 11 colonies in the study area. From each of these colonies, 31 families were studied. Of the total 1720 individuals from these 341 families, 1603 individuals could be examined for ocular morbidities.

DEMOGRAPHIC CHARACTERISTICS OF THE POPULATION:

The demographic characteristics of 1720 individuals in the population covered for the purpose of this study has been analyzed as under:

AGE AND SEX DISTRIBUTION:

Age and sex distribution of the population covered in this study have been shown in Table 1. It is seen that maximum number of individuals (57.7%) were in the age group of 15-59 years and minimum (2.3%) in the age group of 0-1 year. The same was the case in male and female distribution. The sex ratio in the study population was 913 females per thousand males. The average family size was found to be 5.4.

BLINDNESS:

Blindness is actually a disability arising due to various ocular morbidities and it is a major health problem. Table 2 shows the prevalence of blindness in the study population. Blindness was present in 3.1% of the population. Blindness as a ocular morbidity was more in females (3.6%) as compared to males (2.5%) but this difference was not significant statistically ($p > 0.05$).

CAUSES OF BLINDNESS:

The causes of blindness were cataract (71.4%), posterior segment pathologies (20.4%), ocular injuries (6.1%) and corneal opacity (2.0%) as shown in Table 3.

BLINDNESS IN DIFFERENT AGE GROUPS:

Table 4 shows cause wise distribution of Blindness in the different age groups

In 0-14 age groups of children, none was found to be blind . In 15-59 years of age group, 0.4% and in the age group of 60 years and above 17.9% were found to be blind.

ALCOHOL INTAKE ANDBLINDNESS:

The prevalence of blindness in alcoholics was 3.9% as compared to 3.0% in non-alcoholics (Table 5) and the difference in the prevalence of blindness with alcohol intake was not significant ($p>0.05$

SMOKING AND BLINDNESS:

Table 6 shows a difference in the prevalence of blindness with the habit of smoking. Blindness was more prevalent in smokers (4.2%) as compared to non-smokers (2.8%) and this difference in the prevalence of blindness with the habit of smoking was not found to be statistically significant ($p>0.05$).

INJURY AND BLINDNESS:

As table 7 shows that ocular injury was present in 3 (6.1%) participants among 49 blind cases**.**

HYPERTENSION ANDBLINDNESS:

As seen in Table 8, blindness was more prevalent in people with hypertension (7.1%) then in people with no hypertension (2.4%) and this difference in the prevalence of blindness in relation to hypertension was statistically significant ($p<0.01$).

DIABETES MELLITUS ANDBLINDNESS:

As seen in the Table 9, blindness was more common in people with Diabetes (24.3%) as compared to people without Diabetes (1.5%) and this relationship between blindness and diabetes was found to be statistically significant ($p<0.5$)

Table 1. Age and Sex Distribution of Study Population

Age	Males		Females		Total	
	Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**
0-1 Year	23	2.6	16	1.9	39	2.3
2-4 Years	60	6.7	58	7.1	118	6.9
5-14 Years	152	16.9	149	18.1	301	17.5
15-59 Years	541	60.2	452	55.1	993	57.7
≥ 60 Years	123	13.7	146	17.8	269	15.6
Total	**899**	**100.0**	**821**	**100.0**	**1720**	**100.0**

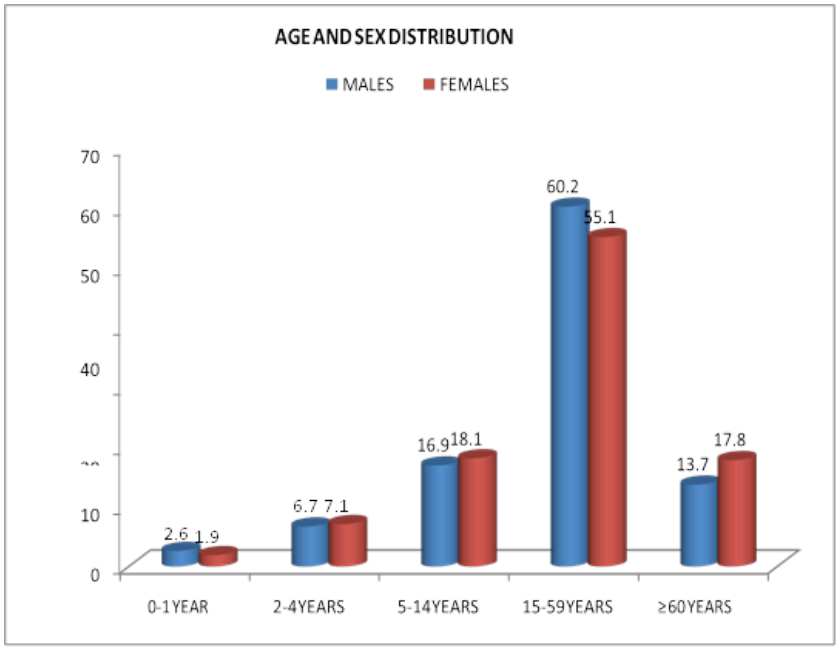


Table 2 : Prevalence of Blindness.

Sex	Total no. of people	No. of Blind	Percentage
Male	834	21	2.5
Female	769	28	3.6
Total	**1603**	**49**	**3.1**
x^2=1.73 at df=1 The P-Value is 0.188411. The result is not significant (p > 0.05)			

Table 3 : Causes of Blindness

Causes of Blindness	No. of People with Blindness	Percentage
Cataract	35	71.4
Posterior segment Causes (DR)*	4	8.2
Posterior segment Causes (Other Causes)	6	12.2
Ocular Injury	3	6.1
Corneal Opacities	1	2.0
Total	**49**	**100.0**
DR stands for diabetic retinopathy		

Blindness not arising due to anterior segment pathology was termed as being due to posterior segment pathology which included various types of retinopathies

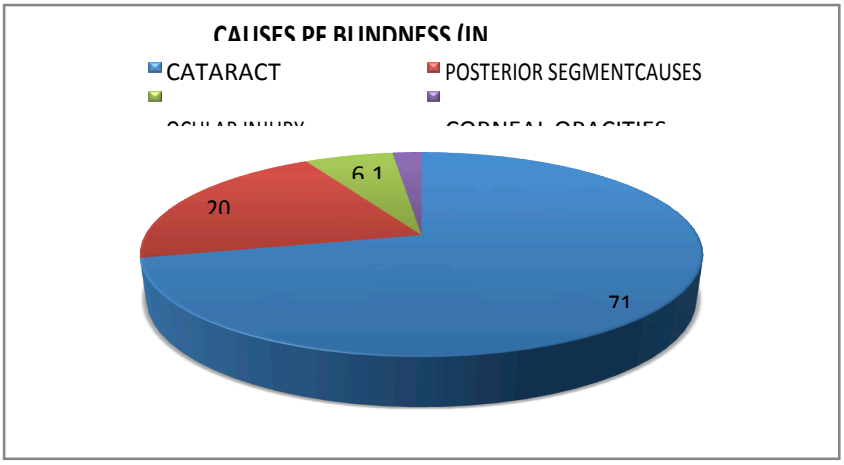


Table:4Prevalence of Blindness in Different Age Groups

Causes of Morbidities	0-1 yr		2-4 yrs		5-14 yrs		15-59 yrs		≥ 60 yrs		Total	
Number	34	%	102	%	261	%	954	%	252	%	1603	%
Blindness	0	0	0	0	0	0.0	4	0.4	45	17.9	49	3.1

In 0-14 age groups of children, none was found to be blind . In 15-59 years of age group, 0.4% and in the age group of 60 years and above 17.9% were found to be blind.

Table 5 : Prevalence of Blindness with Alcohol Intake

Alcohol Intake	No.	Blindness	Blindness (%)
Present		4	3.9
Absent		45	3.0
Total	**1603**	**49**	**3.1**

x^2=0.27 at df=1

The P-Value is 0.603332. The result is not significant (p > 0.05).

Table 6 : Prevalence of Blindness with habit of Smoking

Habit of Smoking	Total No.	Blindness	Percentage
Present	306	13	4.2
Absent	1297	36	2.8

x^2=1.81 at df=1

The P-Value is 0.178508. The result is not significant (p > 0.05).

Table 7 :Ocular Injuryand Blindness

	Total no. of cases	Positive history of ocular injury	Percentage
Blindness	49	3	6.1

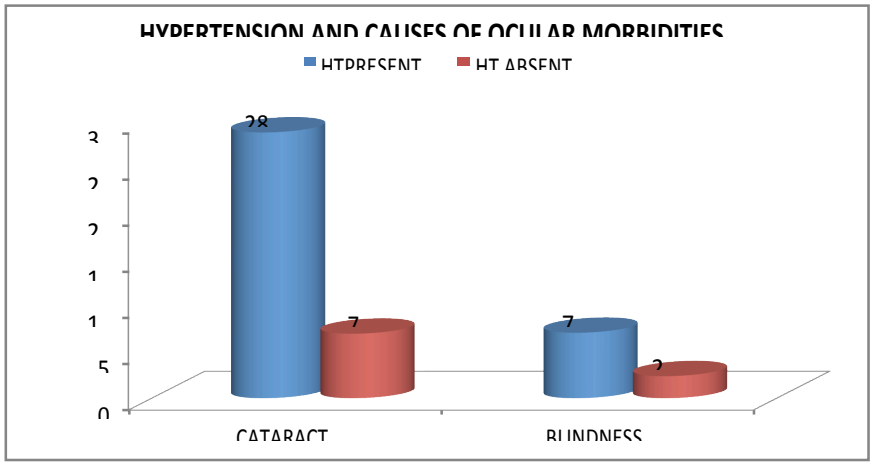
HYPERTENSION AND BLINDNESS:

Table 8 : Hypertension and Blindness

History of Hypertension	Total no.	Blindness	Percentage
Present	212	15	7.1
Absent	1391	34	2.4
Total	**1603**	**49**	**3.1**

x^2=13.31 at df=1

The P-Value is 0.000264. The result is significant (p < 0.01)



DIABETES MELLITUS AND BLINDNESS:

Table9: Prevalence of Blindness in Relation to Diabetes Mellitus

Diabetes Mellitus	Total no.	Blindness	Percentage
Present	107	26	24.3
Absent	1496	23	1.5
Total	**1603**	**49**	**3.1**
x^2= 9.76 at df=1 The P-Value is 0.001783. The result is significant (p < 0.01)			

As seen in the Table above, blindness was more common in people with Diabetes (24.3%) as compared to people without Diabetes (1.5%) and this relationship between blindness and diabetes was found to be statistically significant (p<0.01

DISCUSSION

The present study was conducted on 341 families distributed over 11 colonies in the study area, which is registered under the Urban Health and Training Centre of the Department of Community Medicine, Muzaffarnagar Medical College, Muzaffarnagar. From each of these colonies, 31 families were studied. These families had 1720 individuals out of which 1603 were available and examined for blindness. In India, very few studies have been carried out on this topic in such elaborate details, particularly in urban slums and therefore, all the findings of this study may not be comparable to other studies.

In the present study, out of the total 1720 individuals, 899 (52.7%) were males and 821 (47.3%) were females. So, the sex ratio was 913/1000, which is comparable (908/1000) to our study state of Uttar Pradesh.[18] However, this ratio is much lower as compared to the National sex ratio of 940/1000 (Census of India,2011).[18]

In this study, the maximum number of individuals i.e. 993 (57.7%) belonged to the age group of 15-59 years. The proportion of population in the 0-4 years age group, 5-14 age group, in the 15-59 years age group and ≥60 years age group was 9.2%, 17.5%, 57.7 % and 15.6% respectively, which is comparable to 9.7%, 19.4%, 62.6% and 8.3% respectively as reported in the Sample Registration System Statistical Report, 2010 by Government of India.[19]

.The prevalence of blindness was found to be 3.1 % in the present study, (males - 2.5% and females - 3.6%) which was almost similar to 3.7% as reported by Serge et al[20] (2004). But, Khadse at al[21] (2014, Central India) reported only 1.33% prevalence of blindness in their study.

Cataract was the major cause of blindness in 71.4% of cases, which was lower than 81% as reported by Limberg et al[22] (1996), but similar to 72.7% reported by Agrawal et al[23] (2011, Meerut). In this study other causes of blindness were posterior segment causes (20.4%) and corneal opacities (2%) which were similar to the findings of Limberg et al[22] (28% and 2% respectively) and Agrawal et al[23] (20% and 1.8% respectively). No significant relationship was observed between the prevalence of blindness and habit of alcohol consumption ($p>0.05$). Alcohol consumption may be indirectly associated with ocular morbidities in being a determinant for the other chronic systemic diseases complicated into ocular morbidities.

Prevalence of blindness (4.2%)was also found to be significantly($p<0.05$)related to the habit of smoking. This finding was also corroborated by Klein et al[24] (1998) and also in the study of Hepson et al[25] (2001, Scandinavia), whose study implicated smoking as a significant risk factors in tobacco induced toxic optic neuropathy, thyroid ophthalmopathy and cataract. Similarly, a study by Shroti et al[26] (2012, Central India) had observed significant ($p<0.01$) correlation between smoking and ocular morbidities (100% in smokers as compared to 23.8% in non-smokers)

In this study, blindness in the people with history of ocular injury was and was similar to the study of Agrawal et al[23] (2011, Meerut; 9.1%), but were different from the findings of Mathew et al[27] (1988, Pondicherry; 20.3%). Ocular trauma was responsible for 6.1% of the blind people in this study, almost similar to the study of Agrawal et[23] (2011, 5.5%) while in a study of Rekhi et al[28] (1991, Jaipur) ocular trauma accounted for 11.8% of blindness.

In the present study prevalence of blindness was also found to be statistically higher ($p<0.01$) in hypertensives (7.1%) as compared to non–hypertensives (2.4%). However, this difference was higher as compared to 2.6% reported by Rekhi et al[28] (1991, Jaipur). This difference might be due to the fact that in the present study, most people with hypertension had also diabetes mellitus and the higher prevalence of blindness may be due to the synergistic effect of both hypertension and diabetes mellitus.

In the present study, blindness was also found to be significantly ($p<0.01$) associated with diabetes mellitus (24.3%). This was similar to the conclusion drawn from Diabetic Retinopathy Study[29] (1973) and another study by King et al[30] (1998). However, the findings were different from those reported by Narendran et al[31] (2002, Southeren India) and Mohan et al[32] (2005, Chennai), for blindness due to diabetic retinopthy (26.8% and 20.8% respectively). This difference might be due to the fact that in the present study, most people with hypertension also had diabetes mellitus and the higher prevalence of blindness may be due to the synergistic influence of both hypertension and diabetes.

CONCLUSIONS

The present study was conducted in an urban slum of Muzaffarnagar, which was purposefully selected as it is the urban field practice area of our study institution, Muzaffarnagar Medical College, Muzaffarnagar.

The aim was to study the prevalence and some epidemiological determinants of blindness in different age groups in this urban slum. A total of 341 families distributed over 11 colonies were studied having 1720 individuals of whom 1603 individuals could be examined for ocular morbidities.

The following conclusions were drawn based on the present study:-

The age and sex distribution of the population was typical of the developing countries with 26.7% of the population was below 15 years of age, 57.7% were between 15-59 years of age and 15.6% of the individuals were ≥60 years of age.

The prevalence of blindness was found to be 3.06% with a small difference of prevalence in males and females (2.5% and 3.6% respectively, $p>0.05$).

The major cause of blindness was cataract (71.4%) followed by posterior segment causes (20.4%), ocular trauma (6.1%) and least by corneal opacity (2.0%).

In this study,0.4% blindness was observed in age group 15-59 years and 17.9%, in age group ≥60 years.

There was no significant relationship observed in prevalence of blindness and alcohol intake.

Blindness was also found to be significantly higher in individuals who smoked. Blindness in the people with history of ocular injury was found to be 6.1%.

Prevalence of blindness was also found to be significantly higher in hypertensives (7.1%) as compared to non–hypertensives (2.4%).Blindness was also found to be significantly associated with diabetes mellitus (24.3%).

RECOMMENDATIONS

On the basis of this study, the following suggestions and recommendations are being made:

It was seen that the maximum number of blindness was present in

≥60 years old population and constituted mainly of cataract which is treatable. It is therefore, suggested that the aged as well as population as a whole should be educated and told about the benefits of screening for eye problems and also that cataract is treatable and the surgeries are free and easily available. Mass campaign through mass media, to encourage eye donations may be undertaken with setting up of more eye banks. Arrangements should be made for proper training of personnel to manage corneal transplantations on a large scale successfully, in order to limit disabilities arising out of corneal opacities. Ocular injuries also constituted to the blindness and it is suggested that to combat it, along with health education, awareness creation and motivation, the factories and the work places should also be monitored for proper safety measures.

Blindness was also found to be associated with smoking, alcohol intake, hypertension and diabetes mellitus and therefore, it is necessary to educate the people regarding the adverse effects of smoking, alcohol intake and uncontrolled/undiagnosed hypertension and diabetes mellitus. Screening camps may be organized to detect hypertension and diabetes mellitus in the community and health workers should be trained to monitor the blood pressure and blood sugar of those seeking health services at first contact and if found hypertensive or diabetic, those patients should be advised to go for eye examinations annually.

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