Study of uncorrected refractory error, cataract and selected diseases of eye in urban and rural area near Chennai, Tamil Nadu

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ABSTRACT

Background: Uncorrected refractory error and cataract are leading causes of preventable blindness in India. **Objectives:** To estimate prevalence and risk factors associated with uncorrected refractory error, cataract and selected eye diseases in urban and rural area near Chennai, Tamil Nadu. **Methods:** The present cross-sectional study was conducted in urban and rural areas near Chennai during May–August 2009. EPI 30-cluster sampling method was used and individuals in age group 5–70 years were selected with 450 subjects in both areas. Detail ophthalmic examination was done and socio-economic history for risk factors was obtained by trained interviewer. Data was analysed using SPSS version 15.0 software. To compare data sets chi-square test was used and Odds ratios calculated to assess association of risk factor. **Results:** 33.3% of the rural population had uncorrected refractory error as compared to 22.2% urban population (p < 0.001); 24.2% rural population were having cataract compared to 13.1% urban population (p < 0.001). Prevalence of pterygium and external hordeolum were 3% and 1% among total study population. Prevalence of internal hordeolum, corneal opacity and blepharitis were less than 1%. Subjects residing in rural area with low standard of living and using wood or cow-dung as cooking fuel were at significant higher risk of developing cataract (OR:2.43 and 2.88 respectively). They were also at significant higher risk of having refractory error (OR: 2.35 for low standard of living and 2.08 for wood or cow-dung as cooking fuel). **Conclusion:** Prevalence of uncorrected refractory error and cataract was high especially in rural area in the present study.

Keywords: Cataract, eye diseases, uncorrected refractory error

INTRODUCTION

Blindness is not only a health problem but one of the most important social problems worldwide with enormous economic implications. The global burden of blind people will grow to 75 million by the year 2020 unless special efforts are taken.[1] Every five seconds one person in the world goes blind and a child goes blind every minute.[2] Diseases of the anterior segment like cataract, refractory error and corneal opacity are the leading causes of blindness in the world and the most common causes of preventable blindness in India.[3] Cataract was identified as the top most cause of preventable blindness in more than 70% of the cases in India,[3,4] next is the refractory error which ranks the second important cause of preventable blindness in India, especially in rural areas.[5] In India there are an estimated 12 million blind people, of which over 90% live in rural areas.

OBJECTIVES

1. To estimate prevalence of uncorrected refractory error, cataract and selected eye problems in urban and rural area near Chennai, Tamil Nadu.
2. To assess various risk factors associated with uncorrected refractory error and cataract in the study area.

MATERIAL AND METHODS

STUDY SETTING: The community based cross-sectional study was conducted in both urban and rural areas near Chennai, Tamil Nadu during May–August 2009. Alandur municipality of Kancheepuram district with a total population of 146287 was selected as urban area and Poonamallee block of Thiruvallur district with total population of 172300 was selected as rural area for the study purpose. Individuals in the age group 5–70 years were targeted as study subjects.

SAMPLING AND DATA COLLECTION: The EPI 30-cluster sampling method was used to select the study subjects from both urban and rural area. Based on literature from 'Moderate visual impairment in India',[6] the prevalence of cataract of 40% was used for sample size calculation. With limit of precision taken as 16%, the sample size obtained was 450. 30-clusters were selected by probability proportionate to size (PPS) method and 15 individuals were selected from each cluster to obtain the sample of 450 individuals in both the areas. After brief introduction regarding purpose of the study and obtaining informed consent, relevant information about family, and household environmental condition was obtained using a pre-tested structured questionnaire by a trained interviewer. It took nearly 30 minutes to complete the interview and examination per person.

OCULAR EXAMINATION: Torch light examination was done on both the eyes to assess presence of any lens opacity as cataract. 'Snellen's chart' was used to observe presence of any refractory error. Torch light and bright daylight examination was also carried out to find out presence of pterygium, blepharitis, external and internal hordeolum and corneal opacity in the study subjects by trained ophthalmic assistant.

DATA ANALYSIS: Data was entered and analysed using Statistical Package for the Social Sciences for Windows (SPSS Inc., Chicago, Illinois, USA) software version 15.0. To compare data sets chi-square test was used (Yates' correction applied wherever applicable) and $p < 0.05$ was considered statistically significant. Odds ratios (ORs) with 95% Confidence Intervals (CIs) were calculated to find out the association of risk factor.

ETHICAL CONSIDERATION: Permission to conduct the field based study was obtained from Institutional Ethical Committee, Sri Ramachandra Medical College and Research Institute, Chennai. Verbal informed consent was obtained from each study subjects before data collection and ocular examination. Subjects requiring ophthalmic consultation were guided for further management as and when required.

RESULTS

BACKGROUND CHARACTERISTICS OF STUDY POPULATION: Majority (63.8%) of the study population belonged to age group 15–45 years. 44.1% subjects were male and 55.9% were females. 95.3% urban population belonged to families with medium or high standard of living as compared to 84.9% rural population. 85.3% urban population were literate compared to 75.3% rural counterpart. 94% urban population were using LPG gas as cooking fuel compared to 77.1% rural population. Urban-rural difference in respect to standard of living, education and type of cooking fuel used was statistically highly significant ($p < 0.001$). 39.7% and 26% of the total study population were known diabetic and hypertensive and 92.9% were exposed to television. 72.4% urban population were exposed to computer screen as compared to 51.6% rural population ($p < 0.001$). (Table 1)

PREVALENCE OF SELECTED EYE DISEASES: In the present study, 33.3% of the rural study population had uncorrected refractory error as compared to 22.2% urban population ($p < 0.001$); and 24.2% rural population were having cataract compared to 13.1% urban population ($p < 0.001$). Prevalence of Pterygium and external hordeolum were 3% and 1% respectively among total study population. Prevalence of internal hordeolum, corneal opacity and Blepharitis were less than 1% among all study subjects. (Table 2)

RISK FACTORS FOR CATARACT AND UNCORRECTED REFRACTORY ERROR: Subjects residing in rural area with low standard of living and using wood or cow-dung as cooking fuel were at significant higher risk of having cataract (OR:2.43; CI:1.07–5.61, p = 0.02 and OR: 2.88, CI: 1.36–6.14, p = 0.002 respectively). They were also at significant higher risk of having refractory error (OR: 2.35; CI: 1.17–4.76, p = 0.009 for low standard of living and OR: 2.08; CI: 1.01–4.33, p = 0.031 for using wood

Table 1: Background characteristics of study subjects

Characteristics	Total N = 900	Urban N = 450	Rural N = 450	Chi square value [p value]
Age in years				
Upto 15	74 (8.2)	35 (7.8)	39 (8.7)	7.33 [0.062]
15–45	574 (63.8)	306 (68)	268 (59.5)	
46–60	211 (23.4)	91 (20.2)	120 (26.7)	
More than 60	41 (4.6)	18 (4)	23 (5.1)	
Sex				
Male	397 (44.1)	191 (42.4)	206 (45.8)	1.01 [0.314]
Female	503 (55.9)	259 (57.6)	244 (54.2)	
Standard of living				
Medium/High	811 (90.1)	429 (95.3)	382 (84.9)	27.54 [<0.001]
Low	89 (9.9)	21 (4.7)	68 (15.1)	
Education				
Literate	723 (80.3)	384 (85.3)	339 (75.3)	14.24 [<0.001]
Illiterate	177 (19.7)	66 (14.7)	111 (24.7)	
Cooking fuel used				
Gas	770 (85.6)	423 (94)	347 (77.1)	51.93 [<0.001]
Wood/Cow-dung	130 (14.4)	27 (6)	103 (22.9)	
Known diabetic	357 (39.7)	182 (40.4)	175 (38.9)	0.23 [0.633]
Known hypertensive	234 (26)	124 (27.6)	110 (24.4)	1.13 [0.287]
Exposure to television	836 (92.9)	421 (93.6)	415 (92.2)	0.61 [0.437]
Exposure to computer screen	558 (62)	326 (72.4)	232 (51.6)	41.67 [<0.001]

(Figures in parenthesis indicate percentages)

Table 2: Prevalence of uncorrected refractory error, cataract and other selected eye diseases among study population

Characteristics	Total N = 900	Urban N = 450	Rural N = 450	Chi square value [p value]
Uncorrected refractory error	250 (27.8)	100 (22.2)	150 (33.3)	13.85 [<0.001]
Cataract	168 (18.7)	59 (13.1)	109 (24.2)	18.30 [<0.001]
Pterygium	27 (3)	16 (3.6)	11 (2.4)	0.95 [0.329]
External hordeolum	9 (1)	1 (0.2)	8 (1.8)	4.04* [0.044]
Internal hordeolum	6 (0.7)	4 (0.9)	2 (0.4)	0.17* [0.682]
Corneal opacity	4 (0.4)	-	4 (0.9)	NA
Blepharitis	3 (0.3)	-	3 (0.7)	NA

(Figures in parenthesis indicate percentages)
*Yates' corrected

or cow-dung as cooking fuel respectively). There was no significant difference or association between age, sex and known diabetic status in respect to cataract or uncorrected refractory error in rural or urban area. (Table 3)

DISCUSSION

Present study has revealed that the prevalence of cataract, refractory error, external hordeolum, blepharitis and corneal opacity was more among rural population than urban population. Study subjects were also exposed significantly to the risk factors of eye diseases like low standard of living, harmful cooking fuel, exposure to television, computers and with high prevalence of diabetes and hypertension, and possibly not seeking health care

services properly. Study conducted by Haq et al (2009) showed 16.2% prevalence of cataract in urban India,[7] which is almost similar to the prevalence of cataract in present study (13.1%).

Current study showed prevalence of cataract among wood or cow-dung fuel users as 25.4% and 49.5% respectively in urban and rural area, and study done by Haq et al (2009) showed 24.9% cataract prevalence for the people using wood fuel.[7] Study conducted by Thulasiraj et al (2003) at Aravind Eye Hospital, South India showed that age related cataract was the most common potentially reversible blinding disorder which is about 72% in rural south India[8] and present study showed the prevalence of cataract in rural population as 24.2% which is less compared to the study done by Thulasiraj et al,

Table 3: Risk factors associated with cataract and uncorrected refractory error among study population

Characteristics	Cataract			
	Urban N = 59	Rural N = 109	OR [95% CI]	Chi square value [p value]
Age in years				
Upto 45	1 (1.7)	6 (5.5)	1	1.70
46–60	44 (74.6)	82 (75.2)	0.31 [0.01–2.75]	[0.427]
More than 60	14 (23.7)	21 (19.3)	0.25 [0.01–2.58]	
Sex				
Male	18 (30.5)	44 (40.4)	1	1.60
Female	41 (69.5)	65 (59.6)	0.65 [0.31–1.34]	[0.206]
Standard of living				
Medium/High	48 (81.4)	70 (64.2)	1	5.38
Low	11 (18.6)	39 (35.8)	**2.43 [1.07–5.61]**	**[0.020]**
Cooking fuel used				
Gas	44 (74.6)	55 (50.5)	1	9.20
Wood/Cow-dung	15 (25.4)	54 (49.5)	**2.88 [1.36–6.14]**	**[0.002]**
Known diabetic				
Yes	55 (93.2)	103 (94.5)	1	0.00*
No	4 (6.8)	6 (5.5)	0.80 [0.19–3.55]	[0.994]
Characteristics	Uncorrected refractory error			
	Urban (N = 100)	Rural (N = 150)	OR [95% CI]	Chi square value [p value]
Age in years				
Upto 45	42 (42)	48 (32)	1	3.38
46–60	40 (40)	77 (51.3)	1.68 [0.92–3.08]	[0.185]
More than 60	18 (18)	25 (16.7)	1.22 [0.55–2.70]	
Sex				
Male	55 (55)	72 (48)	1	1.18
Female	45 (45)	78 (52)	1.32 [0.77–2.27]	[0.278]
Standard of living				
Medium/High	85 (85)	106 (70.7)	1	6.84
Low	15 (15)	44 (29.3)	**2.35 [1.17–4.76]**	**[0.009]**
Cooking fuel used				
Gas	86 (86)	112 (74.7)	1	4.68
Wood/Cow-dung	14 (14)	38 (25.3)	**2.08 [1.01–4.33]**	**[0.031]**
Known diabetic				
Yes	34 (34)	61 (40.7)	1	1.13
No	66 (66)	89 (59.3)	0.75 [0.43–1.32]	[0.287]

(Figures in parenthesis indicate percentages); *Yates' corrected
(No subject upto 15 years age had cataract and only one in urban area had uncorrected refractory error)

probably because they studied people aged more than 40 years of age as study subjects. Another study conducted by Dandona et al (2002) in Andhra Pradesh state showed an overall prevalence of cataract as 39.9 %.[6]

In Malaysia a study conducted by Zainal et al (2002) showed the prevalence of Pterygium was 1.6% among urban Malaysian population,[9] and present study showed prevalence of Pterygium was 3.6% in urban population. In India a study conducted by Singh et al (1997) showed the prevalence of Pterygium was 5.2% in rural Indian population,[10] and present study showed prevalence of Pterygium was 2.4% among rural population.

A statistically significant association was found between low standard of living and wood or cow-dung fuel with cataract and refractory error in the present study, particularly in rural area. This may be because individuals residing in rural areas are mostly agricultural labourers or construction workers leading to more exposure to the UV-rays and majority of the females in rural areas use cow-dung[11] and wood as cooking fuel which produce more smoke resulting in solidification of lens protein which may lead to cataract.

CONCLUSION

Prevalence of uncorrected refractory error and cataract remains high in the present study and especially in the rural area. Prevalence of other selected eye diseases was low among study population. Low standard of living and use of wood or cow-dung as cooking fuel proved as risk

factors for both cataract and refractory error. This study reiterates the need of frequent ophthalmic screening and health education programme regarding risk factors towards blindness prevention among general population.

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