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ORIGINAL RESEARCH

Prevalence of dry eye disease in rural population of district: Shahjahanpur, Uttar Pradesh, Northern India: A prospective study

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ABSTRACT

Title: Prevalence of dry eye disease (DED) in rural population of district: Shahjahanpur, Uttar Pradesh, India: A prospective study. **Material& methods:** A prospective study was conducted from 01/04/2022 to 31/03/2024 for two years. The entire rural population of specific area (block wise) having 272500 persons were contacted. 76196 persons were found symptomatic and were subjected to standard Shirmer's test without anesthesia in field area. The data was recorded separately for age and sex groups. The DED determination was done on the basis of positive Shirmer's test reading less than 10 mm. There were three age groups 0 to 25 years, 25 to 50 years and more than 50 years. Male and female were recorded separately. **Results:** Prevalence of DED in females 0-25 year group 5.5%, 25-50 years 15.1% and more than 50 years 57.01%. Males had 0-25 years group 4.1%, 25-50 years 15.9% while more than 50 years 65.1%. Overall prevalence for 0-25 years 4.77%, 25-50 years 15.5% and more than 50 years was 60.87%. The DED prevalence in rural population was determined 19.2% which is in the same order with previous studies. **Conclusion:** However more resources required conducting other diagnostic test for DED in field settings, then the prevalence may be more in rural population as accepted theoretically.

INTRODUCTION

Dry eye disease (DED) is one of the most prevalent eye conditionsaffecting millions of people. It is also known as tear film dysfunction and one of the most common ocular disorders affecting the general population.It can cause disabilities ranging from mild irritation to severe debilitation due to loss of homeostasis of the tear film. Tear film is a 3-layered structure of mucin, aqueous and lipid layer. The muco-aqueous layer reduces friction and hydrates the ocular surface, while the lipid layer decreases surface tension and minimizes evaporation. Each blink drives capillary movement, upward drift of the lipid and muco-aqueous layers, which contributes to proper tear distribution across the corneal and conjunctival surfaces (1,2,3).In ancient Indian medical literature the DED named as *Shushkakshipaka*described as *SarvagataNetraroga* in Ayurveda text SushrutaSamhita 600 BCE by the great Indian surgeonSushruta in ShalakyaTantra (4,5). However, in the modern medicinal system the phrase "Dry Eye" was first used in 1950 by Andrew de Roetth a dacryologist (6) and was considered mainly due to reduction in water secretion in tears (7). The Prevalence ranges from 5% to 35%, depending on the geographic region (8, 9, 18, 19).DEDdefinedas"disorders of tear film due to reduced tear production and or excessive tear evaporation associated with symptoms of ocular discomfort" (10).DED is a multi-factorialdisorderand manifests as loss of the tear film stability (9, 10, 11). The etiology is nonspecific except reduced tear production.

Variousetio-pathological explanations have been given but being multi factorialnoneisable to explain fully. Researchers all over the world are working on it

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as the magnitude of DED is very high. The dry eye disease industry 2019 global market research report projected that theDED industry will be over7 billion dollars by 2025(12,14).The symptoms included discomfort, burning sensation, tearing, stinging, Itching, gritty feeling, foreign-body sensation, frequent blinking, redness, blurry or fluctuating vision, light sensitivity, ocular pain, heavy eyelids, eye fatigue and finally vision loss (16)

Assessment of large-scale DED prevalence and incidence has been hindered by inconsistencies in the definition and diagnostic criteria among prior studies. When the diagnosis is based on symptoms (with or without signs), meta-analysis yields prevalence values ranging from 5% to 35%; when signs alone are used, and the prevalence is as high as 75% in certain cohorts (13,14,15,17,18,19,27). There is a paucity of research from rural area, so the possible effects of regional differences have gone largely unstudied. Ophthalmic fraternity can never forget the contribution of HenrikSjögren who explained Sjögren's Syndrome in 1933 (20). The diagnosis of dry eye disease was revolutionized by German ophthalmologist Schirmer by a simple test known as Schirmer's test in 1903(21).Presently there is no single gold standard diagnostic marker of DED available (19). The prevalence of dry eye ranges from 5% to35% globally, depending on the geographic region (19, 20, 21, 27).

Prevalence in India is 32% as 9.9% (496/5000) had mild DED; 61.2% (3060/5000) Moderate DED; and 28.9% (1444/5000) severe DED in an urban hospital (21). There is a major difference between rural and urban environment in terms of living and working conditions thus the present study was done in rural population of northern India.

The prevalence of dry eye was higher in East Asian countries (22). Dry eye prevalence was maximum in those above 70 years of age (36.1%) followed by the age group 31-40 years(20%). It was more common in rural residents 19.6% than in urban 17.5% and highest among farmers/labourer25.3% (23). The prevalence was studied mainly in urban area in India and no major study was conducted in rural area exclusively.

MATERIAL AND METHODS

The Present Study was conducted in rural population of tehsil - Tilhar, District –Shahjahanpur, Uttar Pradesh, India. The rural population of tehsil Tilhar is approx.6, 81,745 distributed in 627 villages with sex ratio 866 (24, 25). We organized 155 camps in rural area during the study period of two years (Apr 2022 to March2024). The population of these villages varies from 500 to 5000 and total population covered during screening was 2, 72,500, approx.40% of total rural population under study.125 screening camps were organized under National Program for Control of Blindness and Visually Impaired (NPCB & VI) (26) and 30 camps under arrangement of VarunArjun Trust as social service medical camps. All willing persons residing in rural area of all age groups were included in this study during 155 camps.

A simple questionnairerelated to DED symptoms was given to patients during screening to answer as:-

1. Do you have discomfort in eyes?
2. Do you have burning in eyes?
3. Are you having gritty feeling in eyes?
4. Are you having foreign body sensation in eyes?
5. Do you have tearing in eyes?
6. Do you feel dryness in eyes?
7. Is there itching in your eyes?
8. Is there redness in eyes?
9. Is there discomfort in eyes on exposure to bright light/ sun light?
10. Do you have blurred vision in Eyes?

These questions were related to DED and Individuals were also enquired about vision and other symptoms of eyes as this was organized under NPCB & VI program. Responses were recorded and documented. Persons with positive symptoms were subjected to ophthalmic examination andSchirmer's test (28).

We used Whatman filter paper no 41 (measuring 5 mm × 35 mm) which was placed in the lower fornix at the lateral one-third of the lower lid margin. The extent of wetting of the strip was measured after 5 minutes andless than 10 mm of wetting was taken as dry eye (28).Schirmer's test was done without anesthesia. All 76,196 Individuals with positive answers were recorded in the format of symptoms with age and gender distribution.

RESULTS

Table 1: Population profile

	Urban	Rural	Male	Female	Total
Total Population	1,28,621	6,81,745	4,34,280	3,76,086	8,10,366
Screened population	-	2,72,500	1,38,975	1,33,525	2,72,500

Table 2: Age and sex distribution of study population

Age Group in yrs	0-25	25-50	More than 50 yrs	Grand total
Male	65,400	49,050	24,525	1,38,975
Female	59,950	46,325	27,250	1,33,525
Total	1,25,350	95,375	51,775	2,72,500

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Table 3: Distribution of Symptoms

Symptomatic Cases	Male	Female
76,196	40,376	35,820

Out of 2, 72,500 patients screened, 76,196 (28 %) were symptomatic. Out of which 40,376 (52.98 %) were males and 35,820(47.06 %) were females.

Table 4: Clinical symptoms of dry eye disease in study population

Symptoms	Male	Female	Total
Discomfort / unwell feeling	**40376**	**35820**	76196
Burning	35576	30650	66226
Gritty feeling	34600	26465	61065
Foreign body sensation	20764	19650	40414
Tearing	19250	17650	36900
Dryness	11800	9093	20893
Itching	9880	8660	18640
Redness	4670	3450	8120
Discomfort in eyes on exposure to bright light.	3560	2580	6410
Blurring of vision	8070	6890	14960

Discomfort/ un-well feeling were present in all the cases. Burning sensation followed by gritty feeling were the two more common symptoms and noted in 86.91% and 80.14% patients respectively.

Table 5: Schirmer's test readings in study population

Reading	Male 0-25 yrs	Male 26 - 50 yrs	Male> 50 yrs	Female 0-25 yrs	Female 26 – 50 yrs	Female>50 yrs	Grand Total
0-5 mm	177	1671	6258	102	1653	5710	15571
5-10 mm	2504	6134	9718	3208	5350	8830	35744
>10 mm	6516	5010	3835	4300	2105	3115	24881
Total	9197	12815	19811	7610	9108	17655	76196

Out of 76196 suspected dry eye disease screened patients, 51315 (67.34%) were having dry eye out of which 26462 (51.56%) were male and 24853 (48.44%) were female.

Table 6: Age and gender distribution of dry eye disease cases

Schirmer's reading	Male 0-25 yrs	Male 26 -50 yrs	Male> 50 yrs	Female 0-25 yrs	Female 26 – 50 yrs	Female>50 yrs
0-5 mm	177	1671	6258	102	1653	5710
5-10 mm	2504	6134	9718	3208	5350	8830
Total	2681	7805	15976	3310	7003	14540

Dry eye disease was more common in patients above the age group of more than 50 years with gender predisposition of 60.87% and 57.01% cases in males and females respectively. The disease prevalence was least in the age group of less than 25 years in both males and females.

DISCUSSION

The DED is most prevalent ocular disorder with multi factorial patho-physiology. The DED refers to disorders of the tear film due to reduced tear production and or excessive tear evaporation associated with symptoms of ocular discomfort (10). There has been excellent development in the diagnosis and management of DED in last century. Various diagnostic tests have been developed and now being used for the same. The gold standard tests are tear film breakup time(29), ocular redness measurement using the validated bulbar redness (30,31), Schirmer's Test (28,32), fluorescein dye clearance test (33), tear fluid osmolarity test (34,35), measurement of MMP-9 in tear fluid (36) and meibomian gland imaging(37). Schirmer's test is the most convenient for outdoor procedure and the same was adopted in present study. There are many studies based on urban population in India and abroad but noneisbased on rural population. A K Bansal, P M Livingstonetalconducteda study in Australia anddiagnosedDED 10.8% by rose bengal, 16.3% by Schirmer's test, 8.6% by tear film breakup time, 1.5% by fluorescein staining. It showsthe importance toSchirmer's test duetohighest sensitivity& positivity (38).

However, Lin PYet al in their study of Taiwan population observed that amongst 37.7 % symptomatic persons the62.5% had lowSchirmer's test result (39).

In India, a clinical study done by Gupta N et al observed thatthe overall prevalence of dry eye based on OSDI was 29.25 %(40), andSchirmer's test was an effective tool in diagnosing dry eye. The global prevalence of DED varies from 5 to 35% (1, 2). Indian studies done in urban population shown overall prevalence 26% (42). Thepresent study was done as

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population based observational study in rural area based on the questionnaire andSchirmer's test result.

A hospital-based population study in West Bengal, Eastern India by Samar K Basak et al (42) showed that dry eye diseases were significantly higher in women than in men i.e., 51.9% versus 48.1% ($p < 0.01$).J STitiyalet al, observed that the prevalence of DED in North India is 32%, with the age group of 21-40 years (43). However in our study of rural population, male predominance with age more than 50 years was noted which could be due to exposure and outdoor work in sun light.

In our study the screeningwasdone for 2, 72,500ruralpopulations of all age groupsand 76196personswere found symptomatic, accounting for 28%population. The DED determination was done on the basis of Schirmer's test reading less than 10 mm. There were three age groups 0 to 25 years, 25 to 50 years and more than 50 years. Male and female were recorded separately. Prevalence of DED in females 0-25 year group 5.5%, 25-50 years 15.1% and more than 50 years 57.01%.

Males had 0-25 years group 4.1%, 25-50 years 15.9% while more than 50 years 65.1%. Overall prevalence for 0-25 years 4.77%, 25-50 years 15.5% and more than 50 years was 60.87%. The DED prevalence in rural population was determined 19.2%. The prevalence rate found in present study falls within the results of various studies done earlier. During analysis we also found that DED is not significantly more in rural population and there is no major difference in female versus male population. The field work and data collection requires much more resources and has got limitations of investigational tools thus the questionnaire method and single diagnostic method (Schirmer's test) was adopted. However more diagnostic tests for DED required due to environmental differences in urban and rural setting (44, 45) , then the prevalence may be more in rural population as accepted theoretically.

CONCLUSION

The dry eye disease screening was conducted for 2, 72,500 rural populations of all age groups and 76,196 persons were symptomatic accounting for 28% screened population. The dry eye disease was more commonly seen in males than females. In both the groups, the disease was more common in the age group of more than 50 years.

Due to life style and environmental changes, now the dry eye disease is also seen commonly in rural population and screening of rural population is advocated to prevent the burden of the disease.

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