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Population Based Prevalence of Dry Eye Disease in the Adult Indian Population

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Dry eye syndrome is a chronic and progressive ocular surface disorder that can substantially affect quality of life (Schaumberg DA et al., 2003).<sup>1</sup> It is a common clinical condition that leads to symptoms of discomfort like itching, burning, tiredness and foreign body sensation. The etiopathogenesis of dry eye is thought to be multi-factorial that usually results from qualitative and/or a quantitative decline in tear film composition and ocular surface inflammation.<sup>2</sup>

Literature-reported prevalence of dry eye varies greatly, from 4.3% to 16.6%,<sup>1,3-7</sup> due to lack of standardization in the type of subjects enrolled and in the questionnaires and clinical tests employed in various studies. Several population based studies have reported a higher prevalence rate of dry eye in the Asia Pacific region.<sup>8-12</sup> In the Indian population, only hospital based prevalence of dry eye is available that has been reported to vary from 18% to 27% in adults.<sup>13-15</sup>

To the best of our knowledge, population based prevalence of dry eye disease is not available for the Indian population. The present study was, therefore, designed to determine the true prevalence of dry eye in the general population using standard dry eye questionnaires (Ocular Surface Disease Index Questionnaire) and clinical tests like Schirmer’s test and tear film break up time (TBUT).

MATERIALS AND METHODS

A population based cross-sectional study was undertaken from March 2011 to May 2012 in the rural North Indian population. The study protocol was approved by the Institutional Ethics Committee and adhered to the tenets of the Declaration of Helsinki. Written informed consent was obtained from all the eligible subjects. The study was conducted in 15 randomly selected villages of District Gurgaon, state of Haryana, India using cluster random sampling procedure. All individuals aged 40 years and above in the selected clusters were enumerated and socio-demographic profile including detailed medical and ocular history was recorded for all eligible individuals. Thereafter, the subjects completed the Ocular Surface Disease Index (OSDI) questionnaire.

The OSDI Questionnaire consists of 12 questions distributed into 3 subscales: a vision related scale, an ocular symptoms scale and an environment trigger scale. The total OSDI score is calculated based on the following formula:
OSDI = \( \frac{1}{4} \times \left[ \text{Sum of scores for all questions answered} \right] \times 100 \)

(Total number of questions answered)

The Index score can range from 0 to 100. Higher scores represent greater disability. This index demonstrates sensitivity and specificity in distinguishing between normal subjects and patients with dry eye disease.

All patients were then subjected to detailed ophthalmic examination and tear film assessment by Schirmer’s reflex secretion test. For Schirmer’s test, pre-sterilized Whatman #41 filter paper strips were placed in the lower fornix of both eyes at the junction of lateral one-third and medial two-thirds of the eyelid for a span of 5 minutes. After 5 minutes, the extent of wetting of the filter paper strip was recorded. A value of less than 10mm wetting was taken as an indicator of dry eye.

A tear film study was then carried out which included the assessment of tear film meniscus and debris with the aid of the slit lamp. TBUT (the time, in seconds, from the last blink to appearance of the first dark spot on the cornea) of less than 10 seconds was taken as abnormal.

Dry eye disease was defined as Schirmer’s test value of less than 10 mm and TBUT test value of less than 10 seconds.

**Statistical analysis**

Data was presented as number (%) or median (range) as appropriate. Categorical variables were analyzed between groups using chi-square test and continuous variables were analyzed between groups using Wilcoxin Rank sum test. A p-value of less than 0.05 was considered to be statistically significant. The data was compiled and subjected to statistical analysis using STATA 10 computer software system.

**RESULTS**

The total enumerated population in the 15 village clusters was 7822. Out of a total of 1849 eligible individuals above 40 years of age, 1538 villagers (83.7% coverage) completed all study procedures. The mean age (SD) of the study population was 55.0 (12.3) years (age range=40-99 years). Females comprised of 54.7% (841 of 1538) of the study population. The prevalence of dry eye (on the basis of Schirmer’s test and TBUT) was 24.71% in this rural population. Out of the 380 subjects with dry eye, 54.1% were females (p=0.39). The mean age of the subjects with dry eye was 57.7 years (range= 40- 99 years). The prevalence of dry eye in relation to various age categories and gender is depicted in Table 1. The prevalence of dry eye varied in different age groups and this was statistically significant (p<0.001). The prevalence was highest in the age group category 80 years and above (56.6%) as compared to all other age groups.
Occupation (p=0.29) and systemic disease (p=0.22) appeared to have no effect on the risk of developing dry eye. Majority of the subjects with dry eye were involved in housework (49.6%) followed by non-agricultural laborers.

All the subjects were clinically assessed for dry eye using the Schirmer’s test. The mean Schirmer’s test value in subjects with dry eye was 6 mm as against 19 mm in subjects who did not suffer from dry eye. The difference in values was statistically significant (p = .001). The mean TBUT was 5.8 seconds subjects with dry eye.

**DISCUSSION**

The present study was undertaken to detect the true prevalence of dry eye in the Indian population. In previous reports, dry eye prevalence ranged from 0.46% to 34%, depending upon the diagnostic criteria employed and the population studied. The high prevalence reported in some studies is due to inclusion of patients with systemic disease with proven dry eye components like in rheumatoid arthritis and Sjogren's syndrome. Therefore, comparison between studies is difficult. To the best of our knowledge, till date, this is the first community based study to investigate the prevalence of dry eye disease in India.

In the present study, the prevalence of dry eye (on the basis of Schirmer’s test and BUT) was 24.71% in the Indian population. Out of the 380 subjects with dry eye, 54.1% were females (p=0.39). Subjects aged 70 years and above (p<0.001), co-existent refractive error (P=.01), exposure to indoor kitchen smoke (P=0.02) were more likely to have DED. There was no significant association of dry eye with systemic disease, use of ocular or oral medications and exposure to alcohol or cigarette smoking.

The prevalence of dry eye in our study is 24.7% which is higher than reported in literature. Other studies which have reported a higher prevalence than
usual, especially in Asian populations have taken only symptom based assessments in consideration. Hence, we recommend that symptom-based assessment should always be combined with clinical evaluation to assess the true prevalence.

Dry eye, if left untreated, can lead to increased risk of infection and visual impairment. Thus, early detection of dry eye disease in individuals at risk becomes important to arrest progression and complications like the development of epithelial defects, visual loss, infection, superficial punctate keratitis, filamentary keratitis, corneal erosions, ocular surface keratinization, corneal ulceration, corneal thinning, and sterile corneal melting with possible perforation.

In conclusion, to our knowledge, the study provides, for the first time, the true prevalence data on dry eye in the Indian population. Dry eye disease is common in rural Indian population with an estimated prevalence of 24.7% in elderly Indians. Dry eye causes considerable economic impact and affects quality of life significantly. Therefore, measures directed against modifiable risk factors and its timely detection and management may provide a positive impact on public health and prevent sight threatening complications.

REFERENCES


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**The Cost of doing Rapid Assessment for Avoidable Blindness Survey in Andhra Pradesh, India**

**Dr. Srinivasa Pallerla**, Dr. Rohit Chandramohan Khanna, Dr. Padmaja Rani, Dr. Gullapalli Rao

Reliable information is required for the planning and management of eye care services. While population based epidemiological surveys provide reliable estimates, they are expensive, time consuming and resource intensive. The Rapid Assessment (RA) methods are useful tools when the resources are limited and the data are needed quickly. Since 1990’s RA methods are used for cataract, onchocerciases, trachoma and for main causes of avoidable blindness and visual impairment. The Rapid Assessment of Avoidable Blindness (RAAB) is a rapid methodology to conduct a population based survey of visual impairment and eye care services among people aged 50 years and over. The RAAB package was developed and programmed by Hans Limburg, Walter Meester with major contribution by Hannah Kuper and Sarah Polack in collaboration with International Centre for Eye Health.

The Andhra Pradesh RAAB group conducted RAAB survey in the tribal areas of Andhra Pradesh State India. Three teams conducted in three different tribal areas of the AP State simultaneously in the year 2009. All three teams were trained by WHO certified RAAB trainer at International Centre for Advancement of Rural Eye Care (ICARE) LV Prasad Eye Institute.

The purpose of the present study was to determine the cost of doing a Rapid Assessment for Avoidable Blindness in Andhra Pradesh India.
MATERIALS AND METHODS
The average cost of doing RAAB survey was arrived by calculating the mean expenditure of the three surveys. The expenditure was divided into two parts. The first part was the pre-survey cost included the cost for preparation, training, purchase of survey equipment, stationary and the cost of the pilot study. The expenditure involved in pre-survey was common for all the three teams as the exercise was done by a single WHO certified RAAB trainer for all the three teams at the same time and place. The second part of the expenditure was calculated as per actuals involved for each team under heads of human resources, Travel, Transport and other miscellaneous expenses. The pre-survey cost was divided equally among the three teams and the cost of RAAB survey for each team was arrived by adding the pre-survey cost to the survey expenditure.

RESULTS
The table No. 1 shows the pre-survey cost common for all the three teams.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Item</th>
<th>Cost (In Indian Rupees)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.</td>
<td>Human Resources</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cost of the external trainer Honorarium for 4 days</td>
<td>24000.00</td>
</tr>
<tr>
<td></td>
<td>Training cost of trainees of 3 teams - Travel allowance, accommodation and boarding</td>
<td>24000.00</td>
</tr>
<tr>
<td>II.</td>
<td>Materials</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stationary</td>
<td>15000.00</td>
</tr>
<tr>
<td></td>
<td>Survey Equipment</td>
<td>24000.00</td>
</tr>
<tr>
<td></td>
<td>Computer hire charges (3 computers)</td>
<td>10000.00</td>
</tr>
<tr>
<td>III.</td>
<td>Transport</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transport of the 3 teams to the pilot survey study site</td>
<td>7000.00</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>104000.00</td>
</tr>
</tbody>
</table>

The Average cost for each team – Rs. 34666.66

Table 2 shows the survey cost at field level.

<table>
<thead>
<tr>
<th>I. Human Resources</th>
<th>Team A</th>
<th>Team B</th>
<th>Team C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honorarium for Ophthalmologist, Mid Level Ophthalmic Person, Community eye care worker / social worker</td>
<td>37500.00</td>
<td>52750.00</td>
<td>65500.00</td>
</tr>
</tbody>
</table>
Table 3 shows the total cost for doing RAAB for each team.

**Table 3: Total Cost for Doing RAAB Survey (in Indian Rupees)**

<table>
<thead>
<tr>
<th></th>
<th>Team A</th>
<th>Team B</th>
<th>Team C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Survey Cost</td>
<td>34666.66</td>
<td>34666.66</td>
<td>34666.66</td>
</tr>
<tr>
<td>Survey Cost at Field Level</td>
<td>129389.00</td>
<td>218587.00</td>
<td>239649.00</td>
</tr>
<tr>
<td><strong>Total Cost for doing RAAB survey</strong></td>
<td><strong>164055.66</strong></td>
<td><strong>253253.66</strong></td>
<td><strong>274315.66</strong></td>
</tr>
</tbody>
</table>

The average cost of doing RAAB survey was arrived by calculating the mean expenditure of the 3 teams. It comes to Rs. 230541.66 (US $ 4433.50).

**DISCUSSION**

The survey of cost of Team B and Team C were near to the same whereas the Team A cost was very much less. This can be explained by two factors. The Team A’s principal investigator being an ophthalmologist the honorarium incurred for ophthalmologist services was less for Team A. The survey areas of Team B and Team C was difficult terrains than that of Team A.

As per the RAAB instruction manual published by ICEH the cost of doing the RAAB survey is US $ 20000 to 30000. No data is available regarding the cost for doing RAAB survey in developing countries including India. In the present study the cost of doing RAAB survey in India comes to US $ 4433.50 compared to US $ 20000 to 30000 mentioned in the manual. This was very much less and comes to 17.7% of the cost mentioned in the manual.

In conclusion, as the cost of doing RAAB survey is less in India, this will encourage the young researchers to undertake the rapid assessment surveys with limited budget and can easily be repeated every 5 years to know the trends. The RAAB can be used for planning and monitoring the eye care services at district level by district blindness control society with limited resources.

**REFERENCES**

2. Back of the Cover page of RAAB Instruction Manual version 4.02 for winners August 2007, International Centre of Eye Health London School of Hygiene and Tropical Medicine, UK.

3. Page No.19 of RAAB Instruction Manual version 4.02 for winners August 2007, International Centre of Eye Health London School of Hygiene and Tropical Medicine, UK.

**Acknowledgements**

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