Original Article

Health-seeking behavior and the initial economic impact of patients with open globe injuries seeking treatment in a tertiary care center in India

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Purpose: The aim of this study was to assess the health-seeking behavior and the costs of primary treatment in the immediate aftermath of open globe trauma among patients seeking care at a tertiary eye care center in South India. **Methods:** This prospective observational study was carried out from June to December 2019. Details of the patient's demographic profile, health-seeking behavior immediately following the trauma and total cost incurred till the completion of primary treatment were collected. **Results:** Eighty-five patients were recruited. Majority of patients were men (53, 82.8%), came from rural areas (65, 76.4%) and were the main breadwinners (44, 68%) of their family. After the initial trauma, a vast majority of the patients (68, 80%) visited the nearest eye care provider to obtain treatment and a majority of them (47, 69.1%) reached there within 3 h. The remaining patients (17, 20%) came directly to our center, the base hospital (BH). The mean distance travelled to the BH was 113.6 km. The mean total cost incurred was INR 20107.6 ± 10441.3. Approximately 84.8% of the patients reported a monthly income less than this amount. **Conclusion:** The economic impact of receiving primary definitive care following open globe injuries is higher than the average monthly income of more than 2/3rd of the patients. To replicate the success stories like the cataract outreach programs, there is a need to implement an integrated program encompassing workplace safety, legal protection to primary eye care providers and providing economic support for definitive treatment for the vulnerable population.

Key words: Cost analysis, health-seeking behavior, open globe injuries

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Ocular trauma is a major cause of uniocular visual impairment and blindness.[1] The World Health Organization (WHO) estimates that annually, approximately 55 million eye injuries occur, restricting activities for 1 or more days.[2] There is a wide discrepancy with regard to prevalence of trauma between the developed and the developing countries. While studies in the developed countries like the United States of America show the prevalence of trauma to be 3.15 per 1000 population, the prevalence in India is almost 10 times higher and is reported to be 2.5%–4% in the general population.[3-5]

It has been reported that 1 in 25 people residing in urban areas in India are affected by some form of ocular trauma and 1 in 167 people in this population are estimated to have become blind in one eye due to trauma.[4] This high number emphasizes the need to consider ocular trauma as a public health issue of paramount importance from an Indian perspective. Ocular trauma is divided into open and closed globe injuries. Open globe injury (OGI) is defined as a full-thickness wound of the eye wall. They are an important cause of preventable blindness across the world and are more prone for increased rates of hospitalization and a poor visual outcome.[2,6] A study done in Australia in 1995 showed that while the OGIs comprised only 2% of all ocular injuries, they were responsible for 44% of expenditure on ocular injuries.[7]

The sudden nature of occurrence and the pain and distress associated with this condition do not give enough time to the patients and their family to ensure financial planning to tide over the crisis. An understanding of the health-seeking behavior of the patients as well as the availability and the utility of health-care resources in these settings are critical components to achieve optimal treatment outcome. The initial economic impact in such conditions is a big financial burden to these patients, as they often do not have an economic reserve to fall back on.

This study seeks to understand the health-seeking behavior, resource availability along with its utility, and the direct and the indirect costs incurred by the patient in the course of primary treatment of an OGI among patients seeking care at a tertiary eye hospital in India.

Methods

Patients with OGIs requiring surgical intervention reporting to our base hospital (BH) from June 2019 to December 2019 were included in this study. The study adhered to the tenets of the

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Declaration of Helsinki and was approved by the institutional review board.

On presentation to the hospital, after establishing that the general condition of the patient was stable, a detailed clinical history was elicited and a comprehensive ocular examination including, visual acuity measurement by Snellens chart, slit-lamp biomicroscopy examination and fundus examination (wherever possible) was performed. X ray orbit was done to rule out intraocular foreign bodies. The injuries were classified according to the Birmingham Eye Trauma Terminology (BETT) classification.[8]

On the day of discharge, a validated questionnaire was administered to the patient in their native language by one of the study authors. It was a questionnaire-based assessment on the journey of a patient from the time of trauma to the point of definitive treatment. The questionnaire data were intentionally collected only after the treatment was completed (on the day of discharge) so that the patients and their attenders were comfortable to answer these questions. The questionnaire included details about the patient's socio-demographic profile, household income, nature and occurrence of the trauma, the choice of the preferred treatment facility and other health-seeking behavior following the incident. We calculated the distance travelled as per the patient's response to the questionnaire. Data on the direct and indirect costs which included cost of travel, food, accommodation and loss of wages of both the attender and the patient along with costs of previous treatment incurred, if any due to the current medical condition were also collected. Data on the nature and severity of the trauma, the investigations performed, and the management provided were collected from the medical records. In case of children, the income, expenditure, and the education of the parent were collected. The socioeconomic classification of patients were based on the modified Kuppusamy's scale.[9]

Continuous variables have been presented using descriptive statistics like mean (SD), while the data regarding categorical values have been represented as frequency (percentage). Visual acuity was converted into logMAR values. Previously reported protocols were used to convert low visual acuity like hand moments to logMAR for analysis.[10] The parameters such as age, gender, whether they were breadwinners of the family or not were compared with the total cost spent using two sample independent *t* tests. The parameters such as education and monthly income were compared with the cost spent using the analysis of variance (ANOVA) test. A value of $P < 0.05$ was considered statistically significant. All statistical analysis was performed using statistical software STATA 14.0 (Texas).

Results

Socio-demographic profile

A total of 85 patients with OGIs reported to the hospital during the study month period. This included 64 (75.3%) adults and 21 (24.7%) children. Males significantly outnumbered the females among both adults ($n = 53$, 82.8%) and children ($n = 15$, 71.4%). The mean age of presentation was 33 ± 19.5 years. The major bulk of our study population ($n = 39$, 45.8%) were illiterate or had an educational background of primary schooling or less [Table 1]. More than three-fourths of the study population ($n = 64$, 75.2%) reported a monthly income of income of less than INR 15,000. More than two-thirds of the adult patients ($n = 44$, 68%) were the primary breadwinners of the family. Three-fourths of our study population ($n = 65$, 76.4%) hailed from the rural areas. The occupation involved is listed in Table 1. A total of 31 (36.4%) patients had work place injuries and only six (7.0%) patients gave history of wearing protective glasses.

Table 1: Socio-demographic profile of patients with open globe injuries

Socio-demographic profile	*n* (%)
Age category	
Children	21 (24.7)
Adult	64 (75.3)
Gender	
Male	68 (80.0)
Education	
Illiterate	22 (25.8)
Primary school	17 (20.0)
Middle school	20 (23.5)
High school	11 (12.9)
College	15 (17.6)
Income INR per month)	
<2000	2 (2.4)
2000-6000	13 (15.7)
6000-10000	31 (37.3)
10000-15000	18 (21.7)
15000-20000	6 (7.2)
20000-40000	6 (7.2)
>40000	7 (8.4)
Occupation	
Unemployed	5 (5.8)
Student	16 (18.8)
Homemaker	7 (8.2)
Industrial worker	2 (2.3)
Agriculture worker	15 (17.6)
Shop owner	3 (3.5)
Professional	7 (8.2)
Construction worker	3 (3.5)
Daily wage worker	2 (2.3)
Others	25 (29.4)

Health-seeking behavior

After the initial trauma, a vast majority of the patients ($n = 68$, 80%) visited the nearest eye care provider to obtain treatment. The distance travelled to the primary health-care provider was as follows: less than 10 km in 29 patients (43.2%), 10–20 km in 24 patients (35.8%), and more than 20 km in 14 patients (20.8%).

The mean distance travelled by these patients to the nearest eye care provider was 17.75 ± 28.9 km. The remaining patients ($n = 17$, 20%) came directly to our center, the BH, even though other eye care service providers were available nearer to their residence or place of work. No difference was observed between these two groups of patients with respect to age ($P = 0.6380$), income status ($P = 0.5188$), gender ($P = 0.1331$) and the literacy level ($P = 0.9225$)

Table 2: Mode of Injury of patients with open globe injuries

Mode of Injury	*N* (%)
Vegetative matter	25 (29.4)
Metal Object	25 (29.4)
Blast	6 (7.0)
Blunt Object	2 (2.4)
Glass	2 (2.4)
Stone	4 (4.7)
Unknown	2 (2.4)
Others	19 (22.3)

Of the 68 patients who had visited their nearest eye care provider seeking primary treatment, a significant majority of them (n = 47, 69.1%) accessed the treatment facility within 3 h following the trauma. More than half of these patients (n = 36, 52.9%) consulted ophthalmologists in private practice. The next common facility of access was the primary vision centers set up by our institution at the village level to which 11 (16.1%) patients reported to. For 10 (14.7%) patients, our tertiary center was the center closest to their place of residence or work. Nine patients (13.2%) accessed the nearest Government hospital, whereas two patients (2.9%) accessed private hospitals where no ophthalmologists were practicing. Of the patients who visited other hospitals before accessing our center, 45 (66.1%) patients visited one hospital, 10 (14.7%) patients visited two hospitals and 3 (4.4%) patients visited three hospitals before coming to the BH.

Almost two-thirds of the 17 patients (n = 11, 64.7%) who chose to come to the BH directly reached our center within 12 h of trauma. In contrast, among the group of patients who visited their nearest eye care service provider, less than half (n = 28, 41.1%) of them could manage to reach the BH within 12 h. In patients who were referred from other hospitals, 23 (39.7%) patients were able to come within 12 h, 17 (29.3%) patients came within 24 h, and 18 (31.0%) patients presented after 24 h.

The distance travelled to the BH by the patients were as follows: less than 100 km in 38 patients (44.7%), 100–200 km in 35 patients (41.1%), and more than 200 km in 12 patients (14.1%). The mean distance travelled by the patients to reach the BH was 113.6 km (SD = 101.9 km). The patients who had come to the BH directly had to travel shorter distances (mean = 67.5 ± 78.5 km) as compared with the patients who had gone to other hospitals (mean = 135.0 km ± 104.9 km). The mean duration between the trauma and the time of surgery was 52.9 ± 69.1 h. The mean time to surgery from the time of presentation to the BH was 6.8 ± 13.5 h. The mean number of attenders accompanying each patient was 2 ± 0.8. Eleven patients (12.9%) self-medicated with over the counter eye drops. Two patients (2.3%) used native treatment. The mode of injury is provided in Table 2.

Costs involved

The mean total cost per patient from the time of injury to discharge was INR. 20107.6 ± 10441.3. The mean cost incurred by the patients including treatment costs and miscellaneous costs like food expenses, before they reached the BH was INR 901 ± 3123.3 (4.4% of the total cost). This cost was significantly more in the group of patients who went to the neighboring hospitals before coming to the BH (mean INR 1254.3 ± 3730.2) than the group of patients who had come directly to the BH (mean INR 142.4 ± 368.3).

Table 3: Total Cost spent at base hospital by the patients with open globe injuries

Parameters	*n*	Total cost spent Mean (SD)	*P*
Age			
0-16 years	21	21907.86 (7231.41)	0.096*
Above 16 years	64	19517 (11283.86)	
Gender			
Male	68	19928.5 (10954.5)	0.721*
Female	17	20824.41 (8317.04)	
Education			
Illiterate	18	14992.5 (6301.05)	0.044@
Primary	17	18343.76 (9254.01)	
Middle	20	22327.45 (5670.44)	
High School	11	26775.45 (20005.89)	
Diploma	4	22465 (11463.33)	
UG/PG	11	17685.91 (7749.36)	
Not applicable	4	25490 (7968.63)	
Monthly Income			
<2091	2	8620 (1725.34)	0.032@
2092-6213	13	15489.23 (7478.58)	
6214-10356	31	18673.13 (7092.52)	
10357-15535	18	21354.22 (6017.51)	
15536-20714	6	22220 (8411.03)	
20715-41429	6	29665 (26549.5)	
Above 41430	7	25000 (9061.45)	
Bread Winner			
No	41	20454.61 (7496.97)	0.386*
Yes	44	19784.41 (12667.52)	
Time to near hospital			
<1 h	25	21599.36 (7597.95)	0.121@
1-3 h	21	21334.62 (5834.29)	
> 3 h	22	20031.91 (16515.77)	
Time of visiting AEH			
<1 h	1	27400	0.788@
1-3 h	12	18973.33 (8196.74)	
3-6 h	14	21301.64 (8268.25)	
6-12 h	12	19745.42 (5396.99)	
12-24 h	23	17516.22 (8353.4)	
24-48 h	9	19947.11 (10712.63)	
>48 h	14	24036.29 (18177.37)	

*Mann Whitney U test; @ANOVA test

The mean travel cost for each patient to reach the BH was INR 1078.9 ± 1772.5 (5.3% of the total cost). The travel costs of the patients who visited neighboring hospitals (INR 1383.1 ± 2021.9) were significantly more than the patients who came directly to BH (INR 425.6 ± 734); (P = 0.02). After they reached the BH, the average amount spent on investigations was INR 1111.7 ± 2310.6 (5.5% of the total cost). The mean cost spent on medication and the primary surgery was INR 13,022.5 ± 6455.4 (64.7% of the total cost). Mean miscellaneous

costs were INR 1657.7 ± 1942.5 (8.2% of the total cost). The mean loss of wages for the patient and the attender during the period of hospital stay was INR 2335.4 ± 3605.6 (11.7% of the total cost).

There was no statistical correlation between the money spent and the gender ($P = 0.72$), age of patient ($P = 0.09$), and time of presentation after trauma ($P = 0.78$). The same amount of money was spent whether they were the primary breadwinners of the family or if they were the dependents of the family ($P = 0.38$). There was a statistically significant increase in the money spent with increasing education ($P = 0.04$) and higher financial status ($P = 0.03$) with the money spent [Table 3].

Discussion

Common ophthalmic conditions like cataracts and refractive errors are insidious in onset, gradual in progress and painless. India has had a long history of screening programs and community outreach activities targeted toward the treatment of these disorders. Such targeted interventions and the non-emergency nature of these conditions help the patients to be well prepared mentally as well as financially to seek appropriate treatment. In contrast, when a sudden health catastrophe, like an ocular trauma, strikes an economically disadvantaged person, decisions with regarding accessing eye care and arranging for financial resources have to be done in an emergency. This paper traces the sequence of events in real life situations with regard to health-seeking behavior and estimation of the initial costs incurred by the patients following an OGI.

In concordance with previous studies, there was a significant male preponderance in our study.[4,11] They constituted more than three-fourths of the total subjects. While this can be attributed to the increased deployment of men in the overall work force (especially involved in manual labor), the same observation of a significant male preponderance was found in the pediatric group as well. This finding may reflect the element of increased risk taken by the male gender, irrespective of the age and hence male gender has a disproportionately higher risk of sustaining OGIs.

More than half of the patient population in this study were the primary bread winners of the family implying the significance of profound sustained economic loss not only limited to the present situation, but also due to the possibility of consequent unemployment following a vision loss. Two thirds of our patient population were residents of rural areas.

In this study, we found that only 2.3% of the patients used native medications following the trauma. This is in contrast to our observation in the Aravind Comprehensive Eye Survey published around 15 years back, where we reported that 20.6% of the people who sustained trauma had used traditional eye medicines.[1] Considering that the patient population in both the studies were from a similar socioeconomic background, this reduction in the usage of traditional eye medicines over the past 15 years imply that the attitude of the patients to receive contemporary modern eye care had significantly improved probably because of increased awareness and the improved access to a qualified eye care service provider. Both patients who admitted to the use of traditional eye medicines were illiterate.

More than half of the patients presented to their nearest eye care service provider within 3 h of the injury. This gives an insight into the patient behavior of understanding the importance of seeking eye care at the earliest possible time and also about the accessibility and availability of a health-care facility reasonably closer to the place of the injury. However, since primary surgical repair facility was not available in these settings, these patients were referred to the BH. Even though most of these patients reached a health-care facility within 3 h, paradoxically, they received the definitive treatment later than the group of patients who accessed the BH directly. It was also found that patients who visited multiple hospitals before coming to the BH had travelled longer distances and arrived later than the patients who had come directly to the BH.

The average total cost incurred by each patient for obtaining primary surgical repair was found to be INR 20107.6 This amount has to be put in a perspective that only 13 (15.2%) of the study patients had a monthly income more than this cost. Thus, the average cost incurred by each patient in our study, just for the primary definitive treatment, far exceeded the mean monthly income of more than three- fourths of the study group. This burden is further compounded by the fact that this financial requirement had to be arranged as an emergency, since most of these families would not have any economic contingency plan to be used during such requirements.

Patients who came directly to the BH had a lower total expenditure (mean INR 17737.9) as compared to the patients who had visited other centers (mean INR 21210.8), probably due to increased costs associated with additional transport requirements and its associated logistics.

The major proportion of the total cost was spent on surgery (64.7%). The cost of surgeries for trauma may differ in different health-care settings. In our study, the mean cost of surgical repair was INR 13,022.5. To put this in perspective, at our BH, the cost of a manual small incision cataract surgery with intraocular lens implantation (MSICS) is INR 8000 and the cost of a phacoemulsification procedure with a hydrophilic acrylic intraocular lens is around 13,000 rupees. It is relevant to note that though the cost of the surgery for the patients in our study is higher than a MSICS and close to that of phacoemulsification procedures, the visual outcomes may be suboptimal leading to potential dissatisfaction among them.

Our study has several limitations. This is an observational analysis pertaining to a single institution with its inherent limitations associated with this study type. We are aware that one of the drawbacks of this study, being retrospective and questionnaire based, will have recall bias. However, ocular trauma being an acute and painful condition and since patients reported to us early, we presume that recall bias would not affect the outcomes significantly. Unfortunately the reasons for referral to the BH by the primary eye care provider were not noted in the study.

It does not calculate the total economic burden incurred to the patient due to trauma. However, our primary interest was to study the sequence of events surrounding the immediate aftermath following the injury and estimate the acute economic burden which the patient had to arrange as an emergency. The perspective that this amount itself is significantly higher than their monthly income underscores the magnitude of the monetary loss. The costs of subsequent surgeries, if any, the frequent post-operative follow up, the lost wages and the possibility of permanent loss of livelihood will have substantial

long term economic impact and has not been addressed in this study.

Indian health system, through the Governmental and Non-Governmental initiatives has a long and a successful track record of having robust community ophthalmology initiatives to reach out to the people having vision related problems. This has resulted in India having one of the highest cataract surgical rates among the developing countries. However, as this paper highlights, there is a lot of scope for improvement in the holistic delivery of eye care following a trauma and specific steps can be taken to address this issue. The government, through its special insurance program, covers the costs incurred by patients of lower socio economic status, for complex treatments like retinal detachment, collagen cross linking and keratoplasties, even when they get these treatments at authorized private hospitals. Such a support system may not be easily available for majority of the patients with ocular trauma. Special insurance for emergency condition such as "Ayushman Bharat" insurance scheme should be made available to all patients

Unlike cataract surgery, the visual results following open globe surgical repair may be suboptimal and may even preclude the patient from pursuing the same occupation which he/she had pursued earlier, denting the family income permanently. Importantly, the cost of the treatment is also high without commensurate return of good visual function. Considering all these parameters, it is very clear that the thrust should be focused on preventive measures and the responsibility of a health-care provider needs to expand beyond providing treatment to an individual patient. A holistic and a comprehensive program including, understanding the barriers from the perspective of the patient, active lobbying for safety legislation in workplaces, legal protection to primary eye care providers and recommending state funding to cover the costs for the treatment of ocular trauma for the economically underprivileged is the need of the hour.

Conclusion

The economic impact of receiving primary definitive care following open globe injuries is higher than the average monthly income of two-thirds of the patients in India.

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Conflicts of interest

There are no conflicts of interest.

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