



## A study on mechanical ocular injuries in a tertiary government hospital- Tirupati

Sidda Naik B<sup>1</sup>, Sushma M<sup>2</sup>, Shankar Reddy Dudala<sup>3</sup>

1- Professor (Ophthalmology), S.V.Medical College Tirupati, Andhrapradesh, 2-Senior Resident, 3- Assistant Professor in Community Medicine, S.V.Medical College Tirupati, Andhrapradesh.

### Abstract:

Eye injuries have been known since ancient times. Although nature has provided a protective bony wall and lids to cover the eye to protect it from injury, it is still exposed to all types of trauma. The role of ocular injuries in causation of blindness has been a subject of immense importance and will remain so because of the rapid industrialization and mechanized farming which is coining up in our country. Cross-sectional observational study. Patients attending the outpatient Department of Ophthalmology, SVRRGG Hospital, Tirupathi with a history of mechanical ocular injuries. A total of 187 patients with mechanical eye injuries have been enrolled. In the present study, 73.8% were male and 26.2% were female. The lens was involved in most cases and accounted for 42.2% cases while iris was involved in 59.4% cases, cornea was involved in 49.7%, Anterior Chamber was involved in 32.6% of cases and optic nerve was involved in 1.6%.

**Key words:** Blunt Trauma; Mechanical eye injury; Perforation; Rupture

### Introduction

Sense of vision, the choicest gift from the Almighty to the humans and other animals, is a complex function of the eyes. Mechanical trauma of the eye can result in serious morphological and functional impact on eye structures [1]. Ocular trauma is a common cause of monocular visual impairment and blindness worldwide, with significant socioeconomic impact [2]. As many as half a million people in the world are blind as a result of ocular injuries [3]. One third to 40% of monocular blindness may be related to ocular trauma [4,5]. Worldwide interest in ocular trauma is growing since effective techniques for prevention and treatment are currently available [6].

The role of ocular injuries in causation of blindness has been a subject of immense importance and will remain so because of the rapid industrialization and mechanized farming which is coining up in our country. A total Incidence of about 1.43% and 2.7% of ocular injuries attending general Ophthalmic outpatient had been noted in various studies in India [7,8]. The overall age and gender adjusted prevalence of history of eye injury in rural population of Andhra Pradesh was noted as 7.5% by Andhra Pradesh Eye Disease Study [9]. The incidence of mechanical injury was 92% as compared to chemical and thermal injuries which constituted only 8% [8]. Total blindness (person with less than 6/60 vision

are almost PL, PR) of 14.6% has been noted by Jain study in India [7].

Eye injuries can be caused by various agents. In underdeveloped countries, as well as in rural areas, they are most frequently caused by wood [10], by branch or thorn, while in industrially developed countries they most frequently occur at place of work, sport grounds, or during recreation [11]. Children are injured more at home or while playing, with blunt or sharp objects [12]. Although nowadays we do have powerful drugs and microsurgery reached unimagined limits, prognosis for serious eye injuries is still poor, in general [13]. Eye injuries request long-lasting care, including hospital treatment, a long period of conservative medication, with a possibility of one or repeated surgeries.<sup>14</sup> In many studies, particularly in those dealing with epidemiology of eye injuries, the full attention has been given to preventive measures [9,14].

### Material and Methods

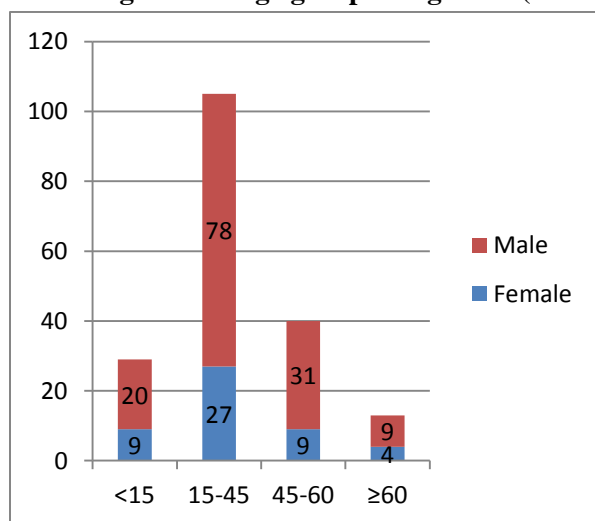
Hospital based cross-sectional observational study conducted in the Department of Ophthalmology, SVRRGGH, Tirupati from September 2010 to September 2012. **Source of Data:** Patients attending the outpatient Department of Ophthalmology, SVRRGG

Hospital, Tirupati with a history of Ocular Trauma. A total of 187 patients with mechanical eye injuries have been enrolled in this study taking into consideration of both inclusion and exclusion criteria. Inclusion criteria: Cases of ocular injuries due to mechanical trauma, willingness to participate in the study. Exclusion criteria: Superficial foreign bodies which needed out patient care where excluded from study, chemical injuries, thermal, radiational, electrical, barometric injuries are excluded from study and patients who were not willing to participate in the study. **Method of collection of data:** A proforma was designed based on the objectives. The proforma was pre-tested and modified. Ethical Committee approval from Institutional Ethics Committee, S.V.Medical College, Tirupati was taken. Written consent was taken from the enrolled patients. The study subjects were interviewed in outpatient Department of Ophthalmology, SVRRGGH, Tirupati. The data base was entered in Microsoft Office Excel 2007 and analysis was performed using EPI INFO 3.5.1. Appropriate descriptive statistics (percentages and mean) were used to analyse the findings and draw inferences.

## Results

A total of 187 patients were enrolled in the present study. Out of them 105 (56.1%) were in the age group of 15-45 years followed by 45-60 years age group- 40 (21.4%). This can be attributed to the fact that they are more active in this age group and hence are more vulnerable for ocular injury. In the total study population of 187 patients, the mean age was 35.07 years (median of 34 years, ranging from 3 years to 80 years). (Table 1)

**Figure 1: Distribution of ocular injured patients according to their age group and gender (n=187)**

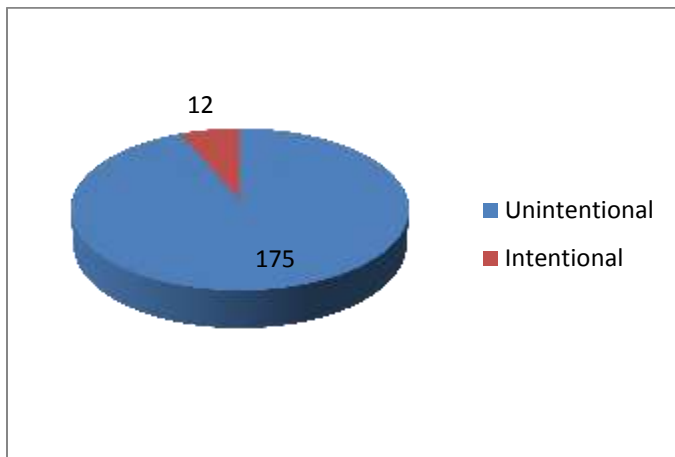


A total of 187 patients were enrolled in the present study. Out of them 49 (26.2%) were females and 138 (73.8%) were males. Of the total males in this study 56.5% were in the age group of 15-45 years and 22.5% were in the age group of 45-60years. Of the total females in this study 55.1% were in the age group of 15-45 years and 18.4% were in the age group of 45-60years. In the present study males outnumber the females in the occurrence of ocular injuries. This is because of the preponderance of males in active work both in agriculture and industry. Chi square=0.787 with 3 d.f, p=1.0. Hence there is no significant association between age group and sex in relation to occurrence of ocular injuries. (Figure 1)

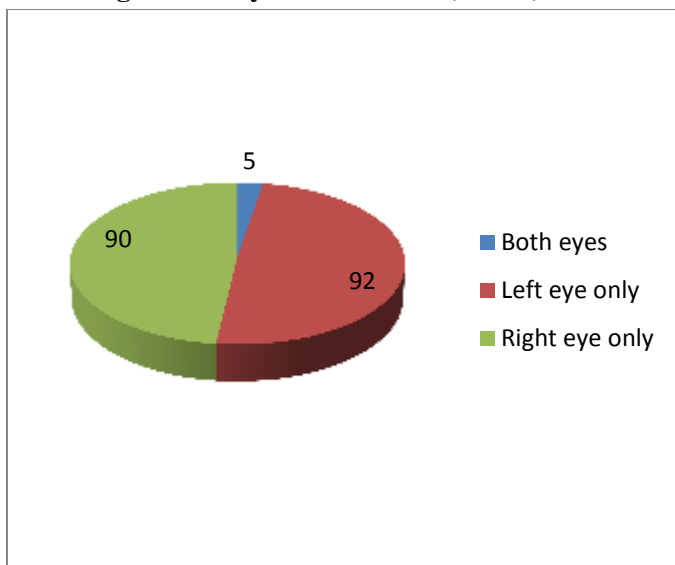
**Table 1: Distribution of ocular injured patients according to their occupation (n=187)**

Occupation	Frequency	Percent
Farmer	83	44.4
Student	39	20.9
House wife	15	8.0
Unemployed	11	5.9
Labourer	7	3.7
Children	6	3.2
Welder	5	2.7
Electrician	5	2.7
Carpenter	4	2.1
Manson	4	2.1
Driver	3	1.6
Mechanic	3	1.6
Stone cutter	2	1.1
<b>Total</b>	<b>187</b>	<b>100.0</b>

**Figure 2: Distribution of ocular injured patients according to Intent (n=187)**



**Figure 3: Distribution of ocular injured patients according to their eye involvement (n=187)**



Of the injuries occurred in enrolled patients 96.6% were unintentional and followed by 6.4% of enrolled patients were intentional injuries of eyes.

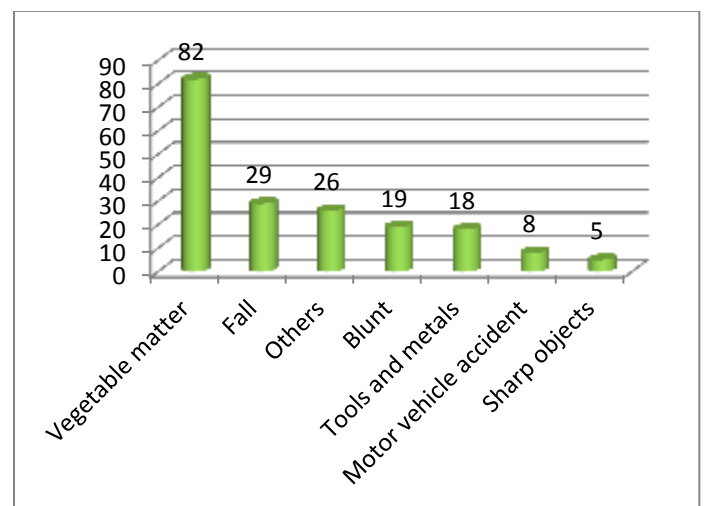
The lens was involved in most cases and accounted for 42.2% cases while iris was involved in 59.4% cases, cornea was involved in 49.7%, Anterior Chamber was involved in 32.6% of cases and optic nerve was involved in 1.6%.

**Table 2: Distribution of ocular injured patients according to their location where trauma occurred (n=187)**

Location where trauma occurred	Frequency	Percent
Work place	93	49.7
Domestic	55	29.4
Playground	19	10.2
Others	11	5.9
Street and Highway	9	4.8
<b>Total</b>	<b>187</b>	<b>100.0</b>

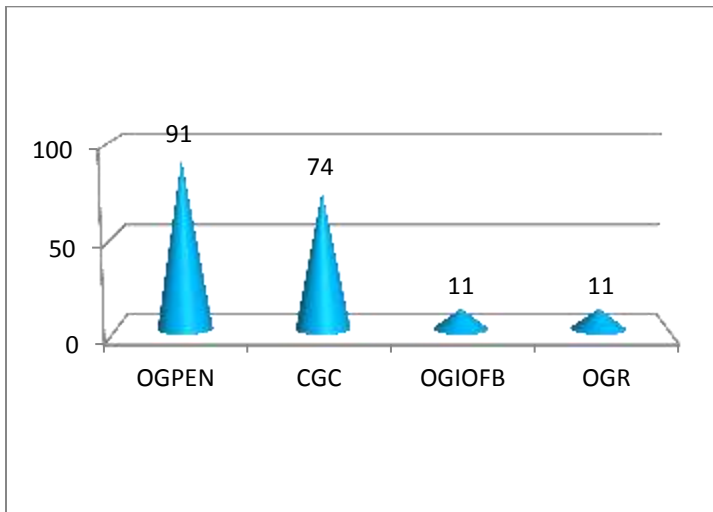
The present study shows that ocular injuries occurs most commonly in Work place 93(49.7%) (Agriculture, Industrial workers, Mechanics, Welders, labourers and Manson). Next to Work place activities, 55 (29.4%) occurred in domestic set-up.

**Figure 4: Distribution of ocular injured patients according to object causing injury (n=187)**



The maximum number of injuries were due to Vegetable matter (thorn, plant leaves, wooden pieces, branches) 82 (43.9%) followed by injury due to fall 29 (15.5%).

**Figure 5: Distribution of ocular injured patients according to type of injury (n=187)**



The maximum number of injuries were Penetrating injuries- 91 (48.6%), followed by Contusions-74(39.6%). Intra ocular foreign bodies and Globe rupture caused 5.9% each.

**Table 3: Distribution of injured patients according to zone of injury (n=187)**

Zone of injury	Frequency	Percent
<b>ZONE-I (cornea including limbus)</b>	58	31.0
<b>ZONE-II (limbus to 5mm post. into the sclera)</b>	88	47.1
<b>ZONE-III (post to ant 5mm of sclera)</b>	41	21.9
<b>Total</b>	<b>187</b>	<b>100.0</b>

In the present study most of the injuries involved zone I 58 (31%). Zone II injuries were seen in 88 cases (47.1%) and zone III injuries were seen in 41 cases (21.9%). Zone I injuries are more common due to the anterior location of the cornea, hence it is more exposed than the other parts of the eye.

In the present study most of the injuries had Grade 4 Ocular injuries 122 (65.2%), Grade 5 Ocular injuries- 28 (15.0%), Grade 3 Ocular injuries- 24 (12.8%), Grade 2 Ocular injuries- 13 (7.0%).

**Table 4: Distribution of injured patients according to grade of injury (n=187)**

Grade of injury	Frequency	Percent
<b>4</b>	122	65.2
<b>5</b>	28	15.0
<b>3</b>	24	12.8
<b>2</b>	13	7.0
<b>Total</b>	<b>187</b>	<b>100.0</b>

**Table 5: Distribution of ocular injured patients according to the involvement of pupil (n=187)**

Involvement of pupil	Frequency	Percent
<b>Absent</b>	<b>179</b>	<b>95.7</b>
<b>Present</b>	<b>8</b>	<b>4.3</b>
<b>Total</b>	<b>187</b>	<b>100.0</b>

In the present study only 5.9% injuries had pupil involvement.

**Table 6: Distribution of ocular injured patients according to the structures involved (n=187)**

Structures involved	Frequency*	Percent
<b>Conjunctiva</b>	35	18.7
<b>Cornea</b>	91	49.7
<b>Sclera</b>	10	5.3
<b>Corneo Sclera</b>	28	15
<b>Anterior Chamber</b>	61	32.6
<b>Iris</b>	111	59.4
<b>Lens</b>	79	42.2
<b>Angle recession</b>	13	6.9
<b>Vitreous</b>	15	8
<b>Retina</b>	25	13.4
<b>Optic nerve</b>	3	1.6
<b>Orbit and Adnexa</b>	32	17.1

\* Multiple involvement

## Discussion

The current study is a cross sectional observational study which included 187 cases with a history of mechanical trauma to the eye from September 2010 to September 2012. Baseline data from patients was collected and clinical examination of eye was done.

**Age and Sex:** In the present study 56.1% of the enrolled patients were in the age group of 15-45 years, 21.4% were in the age group of 45-60 years, 15.5% were below 15 year age group and 7.0% were above 60 year age group. Among the enrolled patients 73.8% were males and 26.2% were females. Mean age was 35.07 years.

The findings were similar more or less with other studies done in relation to age and sex.

Study	Male	Female	15-45 year age group	<15 year age group
Jovanovic et al [15]	83.6%	16.4%	44.05%	18.51%
Singh et al [16]	88.5%	11.5%	55.9%	33.5%
Krishniah et al [9]	61.16%	38.84%	64.56%	6.06%
Present study	73.8%	26.2%	56.1%	15.5%

Grown up men are more frequently exposed to eye injuries at work, in traffic, during recreation and fight. Ocular trauma seems to be more prevalent in the productive age group of 15-45 years. These groups should be focused and made aware of the ocular trauma, its consequences and measures for prevention and early visit to eye care centre.

## Occupation:

Of the enrolled patients 44.4% were farmers, followed by students-20.9%. The findings were similar more or less with other studies done in India. The study done by Singh et al was in Delhi, hence the percentage of farmers were less when compared to our study.

Study	Farmers	Students	House wife	Mechanic
Singh et al [16]	8.9%	38.2%	8.9%	1.1%
Present study	44.4%	20.9%	8%	1.6%

The most common setting where the ocular trauma occurred was during agricultural labour.<sup>9</sup>

## Eye involvement:

Of the injuries occurred in enrolled patients 49.2% of ocular injuries had left eye injury, 2.7% had both eyes involvement and 48.1% had right eye injury. The findings were similar more or less with other studies.

Study	left eye	right eye	both eyes
Jovanovic et al [15]	49.5%	50.5%	1.4%
Singh et al [16]	46.8%	50.1%	3.1%
Present study	49.2%	48.1%	2.7%

## Location where trauma occurred:

The present study shows that ocular injuries occurs most commonly in Work place 93(49.7%) (Agriculture, Industrial workers, Mechanics, Welders, labourers and Manson).

Study	Work place	Domestic	Playground	Street and Highway
Jovanovic M et al [15]	38.2%	12.4%	4.8%	5.0%
Addisu Zelalum [17]	33.2%	39.7%	7.0%	14.1%
Present study	49.7%	29.4%	10.2%	4.8%

**Structures involved:**

The lens was involved in most cases and accounted for 42.2% cases while iris was involved in 59.4% cases, cornea was involved in 49.7%, Anterior Chamber was involved in 32.6% of cases and optic nerve was involved in 1.6%.

Study	Lens	Iris	Cornea	AC	Vitreous	Retina	Optic nerve
Vats et al <sup>18</sup>	22.8%	15.3%	41.8%	-	-	1.3%	-
Potocova et al <sup>1</sup>	51.28%	-	48.72%	51.39%	52.78%	41.67%	-
Raju KV et al <sup>19</sup>	44.55%	59.9%	43.64%	54.55%	9.09%	5.46%	14.55%
Present study	42.2%	59.4%	49.7%	32.6%	8%	13.4%	1.6%

The findings were similar more or less with other studies.

**Object causing injury:**

Between the studies conducted in developing countries like India and the developed western countries there is a difference seen in the nature of the agents causing injury. The level of urbanisation and industrialisation changes the profile of the injuries and the agents causing the injury.

In our study maximum number of injuries were due to Vegetable matter (thorn, plant leaves, wooden pieces, branches) 82 (43.9%) followed by injury due to fall 29 (15.5%). This can be co-related to the fact that most people who presented to the hospital were engaged in agricultural activities. Injury with metal objects is relatively less as this part of the state is less industrialised and less people are exposed to the dangers of metal particle injury.

Similar findings were seen in studies conducted by Jovanovic et al <sup>15</sup> and Singh et al <sup>16</sup>. Most patients sustained injury with non-metallic objects (74.56%), stick being the most common (40.31%). <sup>18</sup>

**Type of injury:**

In our study 60.4% were open globe injuries and 39.6% were closed globe injuries. The maximum number of injuries were penetrating injuries- 91 (48.6%), followed by Contusions- 74 (39.6%). Intra ocular foreign bodies and Globe rupture caused 5.9% each. The findings were similar more or less with other studies.

Study	Closed Globe	Open Globe
Singh DV et al <sup>16</sup>	44.2%	55.8%
Jovanovic M et al <sup>15</sup>	47.5%	50.8%
Present study	39.6%	60.4%

**Zone of Injury:**

In the present study most of the injuries involved zone I 58 (31%). Zone II injuries were seen in 88 cases (47.1%) and zone III injuries were seen in 41 cases (21.9%). Zone I injuries are more common due to the anterior location of the cornea, hence it is more exposed than the other parts of the eye.

Study	Zone I	Zone II	Zone III
Singh DV et al <sup>16</sup>	37.48%	19.32%	43.21%
Present study	31%	47.1%	21.9%

The findings were similar more or less with other studies.

### Conclusion

It is clear from this study as well as other epidemiological studies conducted over past 15 years, that ocular trauma is associated with varying degrees of loss of vision and earning capacity with social and economic consequences. This is an area for further research additional investigation is also needed to develop and evaluate new interventions for prevention and management of all types of eye injuries. Inter disciplinary approaches and community based strategies will be important to make progress in this area of study to save and salvage vision.

### Recommendations

Awareness on the use of the use of ocular protection and of the possible benefits for eyes from using such protection has to be increased. Electronic and mass media should be used to disseminate ocular trauma related information. A targeted approach focusing on productive ages and males also may be required in addition to the general approach to health promotion. Additionally, advocacy is required for policy level changes that may mandate the use of such eye protection. Prevention is possible at any age, any place and in all activities mentioned. It might be concluded also that prevention is necessary and that it should be our major task in future.

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**Conflict of Interest:** Nil

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**Corresponding Author:**

Dr. Shankar Reddy Dudala, MD

Assistant Professor,

Dept of Community Medicine,

SV Medical College, Tirupati, A.P

Email ID: [drshankarreddy1979@gmail.com](mailto:drshankarreddy1979@gmail.com)