

# Profile, risk factors and outcome of occupational injuries reported to the emergency department in a tertiary care hospital in South India

Divya L. Regina<sup>1</sup>, Kanagalakshmi V<sup>2</sup>, Reginald George Alex<sup>1</sup>

<sup>1</sup>Department and Accident and Emergency Medicine, <sup>2</sup>Community Medicine, Christian Medical College, Vellore, Tamil Nadu, India

## ABSTRACT

**Background:** India is an industrialised country and most work is labour intensive. There is very scarce data on occupation related injuries **Aim:** To evaluate the prevalence, profile, severity and risk factors for occupational injuries presenting to the emergency medicine department of a tertiary care hospital. **Materials and Methods:** A cross-sectional study was done in the emergency department of Christian Medical College, Vellore among the patients who presented with occupational injuries. The risk factors for occupational injuries like age, gender, shift work, work experience and type of work and their severity and outcome were evaluated. **Results:** Older age group, working in shift duty, working longer hours were significant risk factors for occupational injuries. **Conclusion:** Training and use of safety protective measures will decrease occupational injuries.

**Keywords:** Emergency, occupational injuries, risk factor, workplace

## Introduction

India is a rapidly industrializing country that is developing at a fast rate. Tamil Nadu occupies an important place in the industrial development of India and therefore occupational injuries here are ever rising. The induction of sophisticated machinery and technology has eased human beings out of most sectors of working life, but the work of average men is still labor-intensive and involves hands-on work with machinery. In Turkey, an average of 70, 000 to 80, 000 workers per year visit health facilities due to occupational injuries.<sup>[1]</sup> Among the trauma related injuries in the emergency departments of Pakistan, 28.7% were occupation related.<sup>[2]</sup> The compensation for death and disability

from work related injuries has increased from Rs 8 million to 186 million from 1961 to 1997. Data regarding occupational injuries are scarce in India. Hence, we have decided to evaluate the prevalence, profile, various risk factors, severity and outcome of occupational injuries presenting to the emergency department of a tertiary care hospital in southern India and this study is the first one on this subject in India.

## Methodology

This study was conducted in the Emergency Department (ED) of Christian Medical College, Vellore, a tertiary care institution located in South India with 2800 inpatient beds and 7000 out-patient visits per day. The emergency department has 45 beds capacity with an average of 200 patients visiting daily. A cross sectional study was done among the patients presented to our ED with injuries related to their specific occupation.

**Address for correspondence:** Dr. Kanagalakshmi V, Department of Community Medicine, Christian Medical College, Vellore - 632 004, Tamil Nadu, India. E-mail: kanagasathish@yahoo.co.in

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Sample size was calculated as 300 considering the prevalence of occupational injuries among all injuries in emergency department (25%) and relative precision of 5%.

All patients from organized and unorganized industrial sectors, above the age of 18 who have sustained injury in the workplace and presented to ED were included. At arrival to the ED they were clinically evaluated and were triaged into three priorities according to the ED protocols for triaging.

The injuries have been classified as traumatic or non-traumatic. Traumatic injuries include direct mechanical like crushing/cutting injuries, fall from height, assault, etc., while non-traumatic include injuries due to exposure to chemicals, electricity, heat etc., The immediate management was given for all the patients as per ED protocol. Once the patients were stabilized, a semi-structured questionnaire was applied to all study patients or relatives, if the patients were sick after taking written consent. The questionnaire includes patient's occupational profile (age, sex, occupation, time of injury, type of industry, details about the shift schedule, part time job, working hours, experience), specific mode of injury, time of injury, time of presentation to the emergency department, severity and description of injury, percentage in case of burns were collected. Severity of the injuries for trauma and non-trauma were assessed by using 2 separate scoring systems, Sequential Organ Failure Assessment (SOFA) score for non-trauma,<sup>[3]</sup> Revised Trauma score (RTS) for trauma.<sup>[4]</sup> Outcome from Emergency department, ward, ICU (stable and discharged, death, discharge against medical advice) were assessed.

For analysis, mean and standard deviation were calculated for continuous variables and categorical variables were presented as percentages. The association of risk factors was assessed using odds ratio and 95% confidence interval. Exact *P* values were computed using a Fisher's exact procedure. Multivariate analysis was done using binary logistic regression model incorporating significant exposure factors. Adjusted ORs with 95% confidence interval (CI) and two-sided tests of significance were calculated. Analysis of the data was done using the SPSS Version 17.0. The study was approved by the institutional review board of Christian Medical College, Vellore (IRB Min.No. 8286) and funded by Fluid research fund.

## Results

During the period of the study, a total of 304 patients reported to the emergency department with injury at workplace and out of which 300 patients were included in the study. The period prevalence of patient reporting to emergency department with injury at workplace is 0.67% (304 out of 45,362 patients). The description of the study population (*n* = 300) is given in the Table 1.

Out of 300 patients, 275 were traumatic injuries, 18 were non-traumatic injuries and 7 patients sustained both traumatic and non-traumatic injuries. Age range was between 18-73 with

mean 35.8 (SD = 13) and median 35 years. The working hours ranged from 3 to 14 hrs with median of 11.5 hours. Their work experience ranged from 1 to 40 yrs with median of 11.6 years.

The RTS score for trauma patients are as follows: 78% had mild injuries, 16% had moderate injuries, and 6% had severe injuries. The SOFA score for non-traumatic injuries (25 patients): 48% had mild injuries, 24% had moderate injuries and 28% had severe injuries.

Out of the 25 patients who sustained non-traumatic injuries, the site of injuries were thorax 10 (40%), Abdomen and pelvis 9 (36%), right hand 8 (32%), face and neck 8 (32%) and in traumatic patients were abdomen and pelvis 86 (31%), right hand 86 (31%), and left hand 80 (29%).

Considering the different occupation groups, the varying grades of injuries among those injured in each occupation is given in the Table 2.

The significant risk factors associated with varying grades of injuries in the workplace are shown in the Table 3. However, in the multivariate analysis working in shifts is the only significant risk factor for severe injury after adjusting for co-variables as shown in Table 4.

Among the 300 patients with occupational injuries, 17 patients were admitted to the ICU, 96 were admitted to the ward and

**Table 1: The description of the study population**

Parameter	N (%) N=300
Sex	
Male	258 (86)
Female	42 (14)
Age at presentation	
18-30 years	114 (38)
31-44 years	102 (34)
>45 years	84 (28)
Shift schedule	
Yes	215 (71)
No	85 (29)
Working hours	
<8 hrs	14 (5)
>8 hrs	286 (95)
Working experience	
<5 yrs	109 (36)
5-10 yrs	42 (14)
11-20 yrs	108 (16)
>20 yrs	41 (14)
Work place	
Quarry	80 (27)
Construction work	60 (20)
Glass and chemical manufacturing	30 (10)
Agriculture, forestry, fishing	34 (11)
Electrical and plumbing	37 (12)
Others	59 (20)

**Table 2: Distribution of severity of injuries within different occupations**

Occupation	Mild n (%)	Moderate to severe injuries n (%)
Electrical and plumbing work	22 (60)	15 (40)
Construction work	44 (73)	16 (27)
Quarry	64 (80)	16 (20)
Glass and chemical manufacturing	25 (83)	5 (17)
Agriculture	29 (85)	5 (15)
Office	46 (78)	13 (22)

**Table 3: Risk factors associated with moderate to severe injuries in work place**

Risk factors	Moderate and severe	Mild	Odds ratio (CI)	P value
Age >35 yrs	46 (31.5%)	100 (68.5%)	2.49 (1.42-4.35)	0.001*
Male	65 (25.2%)	193 (74.8%)	2.49 (0.92-6.60)	0.075
Shift duty	59 (27.4%)	156 (72.6%)	2.54 (1.26-5.13)	0.007*
Working >8 hrs a day	69 (24.1%)	217 (75.9%)	4.13 (0.53-31.17)	0.201
Work experience, >10 yrs	22 (14.6%)	129 (85.4%)	2.79 (1.56-4.92)	0.005*
Repeated injury	17 (34.7%)	32 (65.3%)	3.85 (1.02-3.85)	0.044*

\*Significant

**Table 4: Multivariate analysis of risk factors**

Exposure factors	Odds ratio	CI
Age>35 years	1.261	0.449-3.539
Experience >10 years	2.136	0.753-6.063
Shift duty	2.395*	1.170-4.903
Repeated episodes	1.792	-3.565

\*Significant

187 were treated in the emergency department as out-patients.

In our study, 143 patients were stable and discharged from Emergency department, 88 patients were discharged from ward and all 17 patients who were admitted in ICU subsequently improved and got discharged. There were 41 patients who got discharged against medical advice and 11 deaths.

Among the 11 patients who died, 10 had severe injuries and 1 had moderate injuries. Out of the 11 deaths, 10 occurred in the ED and 1 in the ward. The mortality was more among the electricians (11%) followed by agriculture related workers (6%). The other occupations were quarry and construction workers with less than 2% of all those who were injured. Severe injuries contribute to 43% of mortality among the electricians.

## Discussion

Occupational injuries in India are on the rise, due to rapid industrialization. However, the knowledge and awareness regarding occupational injuries are still very limited. In our study, the point prevalence of occupational injuries among those reported in the emergency department was found to be 0.67%, while the prevalence of occupational injuries in the rural communities of India was 22.9%.<sup>[1]</sup> The prevalence of occupational injuries among the injuries reported to tertiary teaching hospital in Ghana was 3%.<sup>[5]</sup> This discrepancy is due to the fact that the study was conducted in a multispecialty tertiary

care centre with wide range of emergency cases covering all specialities and also minor injuries from the workplace which would have either gone unreported or been treated in other hospitals. Also, other studies have shown that, among those with work-related injuries about 60% of them has seen primary care physician.<sup>[6]</sup>

In our study, unskilled daily labourer in quarry (27%) and construction workers (20%) constituted the major number of occupational injuries. This has been similar to the findings in other studies done in various parts of world.<sup>[7,8]</sup>

The majority of our patients with occupational injuries were males 258 (86%), and this finding correlates with the other studies (68%).<sup>[8,9]</sup>

The injuries are more prevalent among the age group 18–30 (38%) similar to the other studies. The injuries may also be common among the younger age group due to lack of experience.<sup>[8-10]</sup> Meanwhile, we also found that as age increases, the severity of injuries increases. Patient above the age of 35 have sustained more severe injuries when compared to patients below the age of 35. So increasing age is a risk factor for severe occupational injuries. Studies have shown that though the risk of injuries are less in older individuals, the injuries prove to be more fatal.<sup>[11]</sup> Also, this finding is in alignment with the findings in similar studies involving construction workers with aged  $\geq 45$  years were 3.16 times more likely to be injured when compared to workers in the 14 – 29 years age group.<sup>[2]</sup> Studies have shown that jobs that require lifting heavy weights, kneeling, stooping and crouching has an increased risk of occupational injuries in elderly.<sup>[12]</sup> This finding may represent that reduced physical capabilities (such as strength, balance, and processing speed) are associated with old age.<sup>[7,13]</sup> Hence, aged workers should avoid heavy manual labour.

The most common injury sites in trauma were abdomen and pelvis (31%) of patients, right hand (31%), and left hand (29%). The most common mode of injury in trauma was fall from height as most of the study population were from construction work.<sup>[14]</sup> The next common injuries were to the hand which occurred while handling heavy machineries.

The most common sites of non-traumatic injuries were thorax (40%), abdomen and pelvis (36%), right hand (32%), face and neck (32%). Most of non-traumatic injuries were due to electric shock. Most chemical injury splashes occurred over face and neck. This is similar to other studies where hand and abdomen are the common site of occupational injuries.<sup>[15]</sup>

In our study, 71% patients were on a shift schedule. Workers who are in shift schedule are 2.54 times more susceptible to occupational injuries.<sup>[15]</sup> This could be due to altered sleep pattern which causes change in circadian rhythm, depression and fatigability. Our study reports that, there was no significant difference in occupational injuries based on working hours. However, studies show working hours >8 hours/day raised the odds of occupational injury by 14.06 folds compared to those who work <8 hours.<sup>[16]</sup>

The median work experience was calculated as 10 years. Our study data shows that workers having more than 10 years of experience sustained more severe (32%) injuries. The risk of severity is increased by 2.8 times. This might be either due to over confidence in their work or due to aging factor.<sup>[9]</sup> However, studies found that, workers who did not undergo vocational training on their current work were 2.37 times more likely to have injury than those workers who underwent vocational training.<sup>[17]</sup>

Our study reports that, there were no significant difference in occupational injuries based on time of injury. Hence, time of injury is not a risk factor for occupational injuries. Our study depicts that 49 (17%) sustained repeated occupational injuries. Among them 17 (34.7%) had sustained severe injuries. Hence repeated episode is a risk factor for occupational injuries. This can be explained by lack of awareness and negligence of safety measures.<sup>[18,19]</sup>

We found that mortality was more among the electricians 11% and most of them sustained severe injuries. Studies on electrical injuries show that higher mortality and morbidity are due to higher rate of medical complications and requiring greater number of surgical interventions.<sup>[20-22]</sup>

To summarize, occupational injuries are more common among construction and quarry workers and fall from height was most common mode of injury. Moderate to severe injuries are mainly among construction and quarry workers followed by those who work in electrical and plumbing. Shift duties, work experience more than 10 years, repeated injuries and age more than 35 are significant risk factors for severe work related injuries.

Primary care physicians not only make a diagnosis and prescribe treatment, but they also go to the extent of prognosis and assisting in rehabilitation and also suggesting the kind of work they can do after recovery.<sup>[23]</sup> They provide therapeutic as well as preventive services with regard to occupational injuries.<sup>[6]</sup> These findings of profile, risk factors and outcome of occupational injuries will help them manage workers with occupational injuries effectively at the first point of care.

## Limitations

Since this study was done in a tertiary care institution, mild workplace injuries would not have presented to this hospital. Also person with chronic occupational illnesses would have reported to our regular out-patient department rather than the ED and so would not have got included in the study. Hence, the study results could not be extrapolated to the community. Data regarding the use of Personal Protective, Equipment's (PPEs) and formal training in their vocation and injury prevention measures were not collected in our study which could have been a bias in this study.

## Recommendations

Good practice guidelines with multidisciplinary approach at all level of staff including workers, supervisors, employers, safety personnel and occupational health physicians need to be implemented to prevent occupational injuries. The interventions need to be aimed at work place, equipment, job task, workers, and organizations. Adequate and periodical training especially on injury prevention and diligent use of personnel protective equipment's need to be encouraged and made mandatory in both organized unorganized sectors. Adequate rest should be ensured for employees involved in shift work. Immediate availability and accessibility to an Occupational Physician should be made possible in all major workplaces.

## Conclusion

Since India is rapidly industrializing, occupational injuries are also on the rise both in the organized and un-organized sectors of industries and it is quite common among the younger age group. The risk factors for severe injuries in workplace are older age, working in shift duty, repeated episodes and work experience more than 10 years. Most of these injuries are preventable with proper training and education and appropriate use of PPEs and primary care physicians can play an important role in the prevention of occupational injuries. Hence, both Government and Private sectors should take necessary and active steps in implementing preventive strategies to mitigate these injuries in the workplaces.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients

understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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## Conflicts of interest

There are no conflicts of interest.

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