

ORIGINAL ARTICLE

Assessment of Non-Fatal Occupational Injuries at a Tertiary Care Hospital

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Abstract:

Occupational injuries are responsible for more lost time from work, productivity and working years of life than any other health conditions. The fatality due to occupational injuries are increasing but nonfatal injuries due to same cause are much more larger in number and most of them go without reporting. An effort has been made in this study to determine the pattern of nonfatal occupational related injuries. It is a cross sectional study. Data was collected from OPD and IPD patients of occupational related cases which had come to hospital. Qualitative color test for alcohol was performed. 50 cases of patients with non-fatal occupational injuries were studied. Majority of cases in agriculture occupation sector i.e., 29 cases (58%). 90% of cases were male and 10% of cases were female and age group between 18-27yrs (34%) followed by 30% of cases between 28-37 yrs and 24% between 38-47yrs. Majority of accidents occurred between 12pm-4pm and 4pm – 8pm i.e., 19 cases (38%) and 16 cases (32%) respectively. 60% of cases occurred in workers who had work experience of >5years, followed by 24% in 6 months 2 years of work experience. In majority of cases safety equipments were not available (72%) and 14% of cases had the habit of alcohol consumption and 8% of cases were tested positive for colour test of alcohol. Among cases, predominant type of injury was punctured wounds (36%), followed by laceration/avulsion (16%) and predominant body part affected were upper limbs (36% of cases) and lower limbs (30% of cases). Analysis of the data in our study revealed a number of factors that were strongly associated with occupational injury. Particular care should be exercised in educating the workers about workplace hazards, training and experience of workers employed in dangerous jobs, pre-recruitment medical check up and screening health examinations should be conducted regularly at work place.

Keywords: Occupational; Nonfatal; Injuries; Work place; Workers.

Introduction:

An occupational injury is any personal injury, physical damage to body tissues or death from an occupational accident. Occupational injuries are responsible for more lost time from work, productivity, and working years of life than any other health conditions.¹

Injuries are the leading cause of morbidity and mortality among the workers. Thousands of people are killed annually in industrial accidents, and the number of disabling injuries is also a staggering figure. Many workers suffered job related injuries that resulted in lost work time, medical treatment, loss of consciousness, restriction of work or motion, or transfer to another job. Today injuries continue to claim the lives, damage the physical and psychological well being and consume the resources of workers and their families. The overall human, social, and financial toll of traumatic occupational injury is enormous, rivalling the burden imposed by such health threats as cancer and cardiovascular disease.¹ As with all injuries, a substantial share of those that occur on the job can be prevented.

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An improved understanding of the circumstances associated with occupational injuries should contribute to more effective preventive strategies.²

The past 20 years have witnessed the expansion of industries in India. Of the total employed population in India during 2001, 17.8% (i.e. 270 lakh) was in the organized sector (registrar general of India 2001). Among the 830 lakh engaged in the unorganized sector (i.e. 82.2%) agriculture was the major activity, followed by manufacturing, retail trade and other activities.³

It is estimated that 19 fatal and 1930 (1:100) non-fatal accident occurs annually per 1 lakh worker (Nag and Patel in 1998).³ Verghese et al in 1990, in a cohort of 25,000 people from 9 villages of Haryana observed that the incidence rate of work related injuries to be 31% over 1 year period.³ From a study of 2682 workers in Digboi, Assam, Sharma et al. 2001 reported that nearly 35% of total injuries occurred at workplace. An incidence of 3.6/1000 workers/ years was reported from Jaipur by Mathur and Sharma in 1998.³ In a study by WHO in municipal areas of Delhi, it was seen that 2% of the total injuries were work related (WHO 2003 b).³

The fatality due to occupational injuries are increasing but nonfatal injuries due to same cause are much more larger in number and most of them goes without reporting. In this altered scenario there is very much a need for studying various patterns

of nonfatal occupational injuries and attributed causative factors in order to form preventive strategies or to shape existing preventive strategies to minimize the occupational related injuries. An effort has been made in this study to determine the pattern of nonfatal occupational related injuries.

Material and Methods:

The present study of 50 cases of occupational injuries has been carried out in the Department of Forensic Medicine & Toxicology, during the period of December 2013 to November 2014. It is a cross sectional study, data was collected from OPD and IPD patients of occupational related cases which had come to Hospital. Information furnished by patients/relatives,

Table 1. Shows sector wise distribution of nonfatal cases.

| Occupation | Frequency | Percent |
|---------------------|-----------|---------|
| Agriculture | 29 | 58.0% |
| Construction | 2 | 4.0% |
| Mining & Quarry | 0 | 0.0% |
| Electrical | 2 | 4.0% |
| Transport | 3 | 6.0% |
| Metals & Non-metals | 5 | 10.0% |
| Others | 9 | 18.0% |
| Total | 50 | 100.0 |

Table 2. Depicts time of occurrence of nonfatal cases.

| Time of occurrence | Frequency | Percent |
|--------------------|-----------|---------|
| >12am to 4am | 0 | 0.0% |
| >4am to 8am | 6 | 12.0% |
| >8am to 12pm | 8 | 16.0% |
| >12pm to 4pm | 19 | 38.0% |
| >4pm to 8pm | 16 | 32.0% |
| > 8pm to 12 am | 1 | 2.0% |
| Total | 50 | 100.0% |

Table 3: Depicts work experience of nonfatal cases.

| Experience | Frequency | Percent |
|-------------------|-----------|---------|
| <6months | 4 | 8.0% |
| 6months - 2 years | 12 | 24.0% |
| >2years – 5 years | 4 | 8% |
| > 5years | 30 | 60.0% |
| Total | 50 | 100.0% |

Table 4. Depicts safety measures of nonfatal cases.

| Safety measures | Frequency | Percent |
|-------------------------|-----------|---------|
| Not available | 36 | 72.0% |
| Available- Utilized | 2 | 4.0% |
| Available- Not utilized | 12 | 24.0% |
| Total | 50 | 100.0% |

examination findings, details of OPD and IPD records, MLC register and telephonic information from relatives and friends etc were obtained.

Data was entered in Microsoft excel sheet and analyzed by using SPSS (Statistical Package for the Social Sciences) Software version 19. All categorical data was summarized in terms of frequency and percentage. Cases belonging to all ages above 14 years were included in the study and in cases where the history and details not available and visitor's to work place were excluded. The ethical clearance for the study was obtained from the Institutional Ethical committee. Informed consent was obtained from the patients/relatives in the hospital.

Color test for alcohol: Oxidation of Alcohols: Alcohols undergo

several types of chemical reactions. The most important reaction alcohols undergo is oxidation to carbonyl compounds. Primary alcohols are oxidized to aldehydes, which themselves are sensitive to oxidation to carboxylic acids. Oxidizing agents convert secondary alcohols to ketones, and tertiary alcohols lack the ability to undergo oxidation.¹⁵

Qualitative test:¹⁶ Applicable to urine, stomach contents and scene residues.

Reagents: 1. Potassium dichromate solution (2%).

2. Conc. sulphuric acid.

Method: To one ml of distillate is added 0.2ml of 2% potassium dichromate solution, followed by 1ml of conc. sulphuric acid.

Result: The yellow colour of the dichromate changes to green or blue.

Sensitivity: 2mg.

The oxidising agent used in these reactions is potassium dichromate (VI) acidified with conc. sulphuric acid. If oxidation occurs, the orange solution containing the dichromate (VI) ions is reduced to a green solution containing chromium (III) ions.¹⁷

Socio-economic status: Modified B G Prasad's socio-economic status classification Jan-2014¹⁸ is used (Class I: Rs 5410 & above, Class II: 2705 – 5409 Rs, Class III: 1623-2704 Rs, Class IV: 812-1622 Rs, Class V: <812 Rs).

Table 1: Shows majority of cases in agriculture occupation sector i.e., 29 cases (58%) followed by 9 cases (18%) which belongs to others. And also there were 5 cases (10%) of metals & non metals, 3 cases (6%) which are transportation related, 2 cases (4%) of construction and 2 cases (4%) of electrical.

Working schedule and work shift: It showed that in 27 cases (54%) accidents occurred among victims who were working on 8hrs schedule and 23 cases (46%) were working on 12hrs schedule. Work shift - 44 cases (88%) of occupational accidents occurred during morning shift and only 06 cases (12%) during night shift.

Pre-recruitment medical check up and regular medical check up at work place: Shows in 45 cases (90%) procedure of recruitment medical check up was not followed and only 5 cases (10%) have followed this procedure. Regular medical check up at work place - only in 12 cases (24%) of occupational victims had facility and undergone regular medical check up, whereas 38 cases (76%) didn't have such facility of regular medical check up at work place.

First aid treatment at work site: Shows that the facility of first aid was not available in majority of the cases (70%, 35 cases) and only 15 cases (30%) had undergone first aid treatment at work site.

Disabilities: Shows 4 cases of occupational injuries (8%) had vision problem and 2 cases (4%) had hearing problem.

Habits: Majority of the victims, 31 cases (62%) had no habits, 7 cases (14%) had the habit of alcohol consumption, 5 cases (10%) had the habit of smoking alone, 6 cases (12%) of the victims had the habit of alcohol with smoking, 1 case (2%) of the victims had

Table 5. Shows distribution of nature of injury among nonfatal cases.

| Nature of injury | Frequency | Percent |
|---|-----------|---------|
| Abrasion | 2 | 4.0 |
| Laceration/Avulsion | 8 | 16.0 |
| Punctured wound | 18 | 36.0 |
| Burns (Dry & wet/Electrical burns/wounds) | 7 | 14.0 |
| Fracture of bone | 5 | 10.0 |
| Crush injury | 5 | 10.0 |
| Surgical Sutured wound | 1 | 2.0 |
| Infected wound | 2 | 4.0 |
| No visible injuries | 2 | 4.0 |
| Total | 50 | 100.0 |

Table 6. Shows distribution based on body part affected among nonfatal cases.

| Body part affected | Frequency | Percent |
|--------------------|-----------|---------|
| Head | 2 | 4.0 |
| Neck | 1 | 2.0 |
| Chest | 0 | 0.0 |
| Abdomen | 1 | 2.0 |
| Upper limbs | 18 | 36.0 |
| Lower limbs | 15 | 30.0 |
| Multiple Sites | 11 | 22.0 |
| Nil | 2 | 4.0 |
| Total | 50 | 100.0 |

other habits and 4 cases (8%) were responded positive for colour test for alcohol.

Table 2: Shows nonfatal cases, majority of accidents occurred in afternoon and evening hours i.e., 19 cases (38%) and 16 cases (32%) respectively.

Table 3: Shows 30 cases (60%) of occupational injuries occurred in worker who had work experience of >5years, followed by 12 cases (24%) between 6 months-2 years of work experience.

Table 4: Shows in majority of cases safety measures/ equipments were not available i.e., 36 cases (72%) were deprived of safety equipments at the work place and in 12 cases (24%) safety equipments were available but not utilised.

Table 5: Shows among nonfatal cases, 18 cases (36%) were due to punctured wounds, 8 cases (16%) were due to laceration/ avulsion, 7 cases (14%) due to burns (dry burns/wet burns, electrical burns & wounds), 5 cases (10%) due to crush injury, 5 cases (10%) due to fracture of bone, 2 cases (4%) due to infected wound, 1 case (2%) due to surgical sutured wound and there were no visible injury in 2 cases (4%).

Table 6: Shows among non fatal cases, upper limbs sustained injuries in 18 cases (36%), lower limbs in 15 cases (30%), multiple sites in 11 cases (22%), head in 2 cases (4%), neck and abdomen in 1 case each (2%) and no external injury in 2 cases (4%). Simple and Grievous Injury: Among nonfatal cases, 33 cases (66%) sustained grievous injury and 17 cases (34%) sustained simple injury.

Discussion:

In the present study few salient interesting observations were recorded and these have been analyzed, discussed and compared with findings of similar studies. In the present study there was majority of male victims i.e. 90% in contrast to females of 10%. These findings are similar to the studies by Zine K U et al.¹¹ where males constituted 76.54% compared to female of 23.46% and

Ergor A, Demiral Y, Piyal Y B⁵ in turkey where male outnumbered females. But according to Massachusetts occupational injuries and illnesses report, 2013⁴ males were injured in 55.5% and females in 44.2% which is in contrast to our study where number of females is less. This discrepancy could be of a reason as our study is conducted in Hubballi city, where number of patients visited to the hospital are from the rural side, and in rural side it is still a practice, where males are the one who work outside whereas females will take care of the household work.

The age group of the victims in the current study ranged from 14 years to >68 years. The maximum number of occupational injuries occurred in the age group of 18 years to 27 years (34%), followed by 28 years to 37 years (30%) and 38 years to 47 years (24%). Similar findings were also found with the studies by Gururaj G,³ report 2013⁴ and Etiler N, Colak B, Bicer U and Barut N⁶. According to him³ in his study observed that 25 to 30% of injuries occur in those 16-20 year of age, 30-45% in those of 21-35 years of age and about 30% in 36-45 years of age. Report 2013⁴ revealed injuries and illness to workers in the 25-34 years was 23.1%, 45-54 years was 21.1% and 35-44 year-old age categories was 21% and according to them⁶ in their study observed that, 38.2% occupational deaths occurred in the age group 25-34 years and 27.9% in 35-44 years. As adult and middle aged are the active working groups (18-45 years) in almost all occupation sectors, could be the reason for clustering of cases from 18-45 years.

In the present study, it was observed that majority of the victims were illiterates (68%), followed by 20% of cases had dropped out at their high school education. The socio-economic status showed classic crowding. The maximum number of cases occurred in Class IV (44%) and Class V (36%) of socio-economic status scale. This probably indicates the lack of knowledge, low purchasing power, limited application of safety measures, and compulsion to earn for livelihood.

In the current study, a high number of cases were from agriculture sector 58%, followed by others 18%, followed by metals & non metals 10%, which is followed by transportation 6%, construction 4% and electrical 4%. According to report, 2013⁴ the major industries were Educational Services, Health Care and Social Assistance and Public Administration. Educational Services reported a total of 700 cases, and a TRC incidence rate of 2.4 cases per 100 FTEs. Health Care and Social Assistance had a total of 900 cases and a TRC rate of 7.7 cases per 100 FTEs. Public Administration accounted for 1,400 cases and an incidence rate of 2.7 cases. These findings are in contrast to our findings, where agriculture sector had highest percentage. This could be of reason as ours is the biggest tertiary care hospital in North Karnataka, the catchment area consisting of agriculture based villages, towns and rapidly urbanizing city with mushrooming of tall buildings.

In the present study it was also observed that in 90% of the cases procedure of pre-recruitment medical check up was not followed and in 76% of the cases, facility of regular medical check up at work place was not available. The findings are in accordance with the report¹⁴ which states that an effective training and proper recruitment procedures can reduce number of injuries, death and

illness. Lack of these facilities had a clear impact on the outcome of accidents in our study.

Lingard H¹³ in her study observed that the first aid facilities and first aid training had positive effect on occupational safety and health behaviours of the workers. First aid appeared to reduce 'self-other' bias, also appeared to reduce worker's willingness to accept prevailing level of occupational safety and health risks and helped to improve risk controlled behaviour. In our study, it was observed that 70% of the cases, first aid facility as well as first aid training were not available and also majority of cases in our study are agriculture workers, where they don't carry first aid to the work place.

Folkard S and Toker P⁷ in their study observed that the risk was found to increase in an approximately linear fashion across three shifts showing an increased risk of 18.3% on the afternoon shifts and 30.4% on the night shifts. Similar findings were also observed in the present study that, number of occupational accidents was less in the morning hours (16%) as compared to afternoon (38%) and evening hours (32%) as shown in table 2. However, the risk decreased in the night hours (2%). This discrepancy was probably attributed to the fact that our study involved more number of agriculture sector victims (58%), who virtually come to rest in the night and also 88% victims were working on the morning shift.

In the current study it was also observed that, 54% of victims of occupational accidents were on 8 hours working schedule and 46% on 12 hours working schedule and 88% of victims were working in the morning shift compared to only 12% who were in the night shift. These findings are in accordance with the study conducted by Ergor A et al.⁵ revealed that, 90.5% of victims were on 8 hr shift and only 4.5% were doing overtime work and 61.1% were on day shift, followed by 15.6% in the evening shift and 11.1% in the night shift.

In the present study it was observed that, crowding of accident at afternoon (>12pm to 4pm- 38%) and evening hours (>4pm to 8pm- 32%) was probably attributed to fatigability and decreased alertness with increase in hours of work. These findings are in accordance with study from Zineku et al.¹¹ observed that 34.6% of cases had sustained accident between 12pm to 6pm. It was also observed in our study that 16% of cases had accidents in morning hours between 8am to 12pm as shown in table 2, this could be attributed to agriculture sector, as in our study majority are agriculture workers, where they have the habit of getting up early and go to work in the early morning hours.

According to John Everett Park⁹ approximately 50% of the employees had accident in first six months of employment followed by 23% in the next months and 3% subsequently. Benach J, Benarides FG, Jarque S¹⁰ in their article revealed that, 58% of the accidents involve workers on the temporary contract and 49% affects workers with less than one year of service in the company. However, in our study it was observed that highest number of accidents occurred in victims having more than 5 years (60%) experience, followed by workers having 6months- 2 years of experience (24%) and then followed by workers having < 6 months experience (8%) as shown in table 3. This discrepancy was probably due to the fact that most of the victims of our study

belong to the agriculture sector and construction sector. The agriculture sector is considered as a normal labour where experience wouldn't have much importance like other skilled works. Lack of concentration irrespective of work experience could have attributed to injuries in our study.

In the present study, it was observed that in 72% of the cases safety equipments were not available. Only in 4% of the cases equipments were utilized, however they couldn't prevent the accidents which can be attributed to equipment failure and 24% of cases in spite of safety equipments made available, it was not utilized, could be attributed to lack of knowledge and awareness about safety measures in workers.

According to study conducted by Alleyene BC, Stuart P, Copes R,⁸ examined a unique set of data on 459 deaths occurring at work. The only illicit drug found was cannabis for which 10 workers tested positive. Forty workers tested positive for alcohol, 28 for prescription, and 22 for non prescription drugs. However in our study, 14% of cases had habit of alcohol consumption, 10% had the habit of smoking alone, 12% of the victims had the habit of alcohol with smoking and 2% of the victims had other habits. And it was also observed that 8% of cases responded positive for alcohol by colour test, which suggest patient/deceased had consumed alcohol prior to sustaining injury or death. Influence of alcohol causes blunting of reflexes and hence chances of sustaining injuries increases.

The present study revealed that, among nonfatal cases, 36% of cases had punctured wound, 16% of cases had laceration/avulsion, 14% of cases due to burns, 10% of cases due to crush injury, 10% of cases due to fracture as shown in table 5. These findings are in contrast to Kamalinia M et al.¹² In their study of 200 cases of occupational accidents, it was observed that, there were 37 deaths and 163 non fatal cases. Among non fatal cases, predominant type of injury was due to fractures of bone i.e. 88 cases (53.9%), followed by soft tissue injury of 70 cases (42.9%), 20 cases (12.2%) of amputation, 3 cases (1.8%) of burns and 11 cases (6.7%) of rupture. This could be due to difference in the type of occupation and place of work. In our study majority of punctured wounds sustained over upper and lower limbs are due to snake bite at work place. As snakes are existing in majority of agriculture fields, hence snake bites are well known complications of agriculture occupation and injuries over limbs indicating transient lack of concentration at work.

It was also observed by Kamalisia M et al.¹² in their study that predominant body parts affected were upper limbs (45.5%), followed by 24% of cases involving head and neck, 20% of cases due to lower limbs, 9% of cases due to spinal cord, 8% due to multiple sites and least was due to abdomen and thorax. Similar findings were also observed in the present study, among non fatal cases, upper limbs were affected in 36%, lower limbs in 30% and 22% cases due to multiple sites as shown in table 6. And in our study it was also observed that 66% cases were grievous in nature compared to 34% cases of simple injury.

Limitations of the study: 1. Since ours is a tertiary care hospital, majority of minor occupational related non-fatal injuries will not visit to tertiary centre and will be treated at the level of primary health centre. Hence burden of total occupational related injuries

cannot be assessed.

2. Since we have analysed a sensitive test for alcohol (colour test) and not quantified and not analysed for other substance of abuse.

Conclusion:

- Occupational accidents are unpredictable. As lack of qualification gets higher, unqualified workers are employed temporarily at lower wages.
- Analysis of the data in our study revealed a number of factors that were strongly associated with occupational injury. Some of these factors were intrinsic to the job, while others reflected personal or socio-economic conditions.
- In our study it was observed that, illiteracy among workers, lack of safety equipment (measures), unwillingness to utilize the available safety equipments, lack of first aid at work site, lack of regular medical facilities and pre-recruitment medical check up and training at work place were all responsible.
- Particular care should be exercised in educating the workers about workplace hazards and usage of safety measures, training and experience of workers employed in dangerous jobs, pre-recruitment medical check up and screening of new workers for vision problem, hearing problem, chronic diseases etc and health examinations should be conducted regularly at work place.
- In our study majority of agriculture workers sustained injuries like snake bites and by sharp weapons over the extremities. Hence we suggest use of gumboots and gloves for agriculture workers to prevent such incidents.
- Prevention of occupational accidents would protect human lives, prevent problems arising in families due to death and disability and loss of labour power, and contribute to the country's economy.
- Additionally, the occupational accident recording and reporting system is inadequate. Hence reporting and updating of the records is very important and should be made mandatory for planning any strategies.

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References:

1. Jovanovic J, Arandelovic M, Jovanovic M. Multidisciplinary aspects of occupational accidents and injuries. *Facta Universitatis. Series;* 2004; 2(4): 325-333.
2. Wilkins K, Mackenzie SG. Work injuries. *Statistics Canada, Catalogue 82-003. Health reports August 2007;* 18(3): 1-18.
3. Gururaj G. Background papers. Burden of disease in India. Injuries in India: A national perspective. National Commission on Macroeconomics and Health. Ministry of Health and Family Welfare. Government of India New Delhi; 2005 September: p. 325-347.
4. Massachusetts occupational injuries and illnesses report, 2013. Available from <http://www.mass.gov/lwd/labor-standards/occupational-safety-and-health-statistics-program/illness-and-injuries-reports/> accessed on 20/05/2015.
5. Ergor A, Demiral Y, Piyal YB. A Significant Outcome of Work Life: Occupational Accidents in a Developing Country, Turkey. *J Occup Health* 2003; 45:74-80.
6. Etiler N, Colak B, Bicer U and Barut N. Fatal Occupational Injuries among Workers in Kocaeli, Turkey, 1990–1999. *Int J Occup Environ Health* 2004; 10(1): 55-62.
7. Folkard S and Toker P. In depth review: shift work, safety and productivity. *J Occupational Medicine*, 2003; 53: 95-101.
8. Alleyne BC, Stuart P, Copes R. Alcohol and others drug use in occupational fatalities. 1; *J occup med*. 1991. Apr; 33(4): 496-500.
9. Park K. Park's Textbook of Preventive and Social Medicine. 22nd ed: Banarsidas Bhanot publishers; 2013. Occupational health; p.754-755.
10. Benach J, Benavides FG, Jarque S. The impact of industrial accidents. [cited 2015 May 10]. Available from <http://www.eurofound.europa.eu/observatories/eurwork/articles/the-impact-of-industrial-accidents>
11. Zine KU, Wakde SD, Tandle RM, Varma NM, Jambure MP, Tasgaonker GV. Study of Deaths in Industrial areas around Aurangabad, 2012 April-June; 34(2): 111-113.
12. Kamalinia M, Mohammadi H, Mohrz MB, Arassi M, Faghieh MA, Mirzajani M. Investigation of Occupational Accidents Induce Sever Injury in Fars, Iran from 2005 to 2007. *Open Journal of Safety Science and Technology*, 2012; 2: 113-118.
13. Lingard H. The effect of first aid training on Australian construction worker's occupational health and safety motivation and risk control. *Journal of safety research*. 2002; 33(2):209-230
14. Effective safety training. Benefit of training programs. [cited 2015 Jun 19]. Available from https://en.wikipedia.org/wiki/Effective_safety_training.
15. Cady SS. Qualitative Analysis of Alcohols, Aldehydes and Ketones. East Stroudsburg University 2012. Available from [http://quantum.esu.edu/~scady/Experiments/Alcohols\(summer\).pdf](http://quantum.esu.edu/~scady/Experiments/Alcohols(summer).pdf). [cited 2014 Jan 01].
16. Pillay VV. Basics of practical analytical toxicology for human body fluid sample testing & water analysis for portability. Poison control centre. Amrita Institute of Medical Sciences & Research, Cochin. Kerala. 2010: 9-10.
17. Oxidation of Alcohols. Available from <http://www.chemguide.co.uk/organicprops/alcohols/oxidation.html> accessed on 05/01/2014.
18. Dudala SR, Reddy KAK, Prabhu GR. Prasad's socio-economic status classification- An update for 2014. *Int J Res Health Sci [Internet]*. 2014 Jul 31; 2(3): 875-8.