Occupational Accidents & Injuries

Bibliography (Indian Database)
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Occupational Accidents & Injuries Bibliography, November 2011
Preface

An “occupational accident” is an unexpected and unplanned occurrence, including acts of violence, arising out of or in connection with work, which results in one or more workers incurring a personal injury, disease or death. An “occupational injury” is any personal injury, disease or death resulting from an occupational accident; an occupational injury is therefore distinct from an occupational disease, which is a disease contracted as a result of an exposure over a period of time to risk factors arising from work activity.

Major industrial accidents are associated with the dangerous processes like thermal, mechanical, chemical and physical nature of the work combined with dangers associated with heavy machinery, movable objects or harmful chemicals, slips and falls.

Major accidents may generally be caused by human failures or errors, technical faults or external forces and are typically caused by such things as the elements, animals, spontaneous explosions (chemical reactions) and gravity. The leading causes of workplace accidents are tiredness, overexertion, carelessness and improper technique or lack of training also can cause accidents at work, especially when dealing with machinery or manually operated equipment. Common workplace injuries include head injuries, back and neck injuries, and sprains or broken bones result from employees doing physical activity around the workplace without proper precautions; unsafe work environment; fatal and traumatic accidents are more common in factory and unskilled laborer jobs such as construction or assembly line work. Workplace accidents can be prevented by avoiding over confidence, shortcuts; adopting safety procedures, following complete instructions when starting a task, maintaining good housekeeping, mental attention; and having good planning of work.

This bibliography is prepared on the basis of the available data on musculoskeletal disorders from India. The data were collected through searching various database such as pub med, Medline, Toxline and websites such as Google and consulting various journals. It is arranged chronologically. We are thankful to the Ministry of Environment and Forest (MoEF) for financial assistance and Shri Nilkanth Ghosh, Statistical Adviser, MoEF for constant encouragement and suggestions.

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National Institute of Occupational Health
1 Bali R, Sharma P, Garg A

**Incidence and patterns of needlestick injuries during intermaxillary fixation**


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Intermaxillary fixation (IMF) carries an appreciable risk of occupational exposure to bloodborne viruses. Our aim was to establish the incidence and patterns of needlestick injuries during IMF at DAV Dental College. We surveyed 12 residents working in the Department of Maxillofacial Surgery for 1 year (December 2008 to December 2009) to find out how many injuries occurred during IMF. A total of 40 needlestick injuries were recorded during 172 IMF procedures (23%). Most injuries occurred in the maxillary left quadrant (n=16, 40%). Procedures done during the night had a much higher incidence (13/29, 45%) compared with 27/153 (18%) done during the day. Of the 40 injuries, 31 (78%) were recorded as superficial, the rest being deep. All injuries affected the non-working hand, and 39 (98%) were caused by a wire. Surgeons are at high risk of occupational exposure to bloodborne viruses from needlestick injuries during IMF. Detailed attention to the pattern of these injuries could help to develop improved strategies to minimise the incidence.

2 Khanzode VV, Maiti J, Ray PK

**Injury count model for quantification of risk of occupational injury;**


Department of Industrial Engineering and Management, IIT, Kharagpur, West Bengal, India

Reduction of risk of occupational injuries is one of the most challenging problems faced by industry. Assessing and comparing risks involved in different jobs is one of the important steps towards reducing injury risk. In this study, a comprehensive scheme is given for assessing and comparing injury risks with the development of injury count model, injury risk model and derived statistics. The hazards present in a work system and the nature of the job carried out by workers are perceived as important drivers of injury potential of a work system. A loglinear model is used to quantify injury counts and the event-tree approach with joint, marginal and conditional probabilities is used to quantify injury risk. A case study was carried out in an underground coal mine. Finally a number of indices are proposed for the case study mine to capture risk of injury in different jobs. The findings of this study will help in designing
injury intervention strategies for the mine studied. The job-wise risk profiles will be used to prioritise the jobs for redesign. The absolute indices can be applied for benchmarking job-wise risks and the relative indices can be used for comparing job-wise risks across work systems.

3 Mathew SN, Field WE, French BF
Secondary injury potential of assistive technologies used by farmers with disabilities: findings from case studies
J Agromedicine. 2011 Jul-Sep;16(3):210-25
National Institute of Speech and Hearing, Trivandrum, Kerala State, India

In order to complete essential tasks, farmers with disabilities often make and use assistive technology (AT), which itself may cause further injuries known as secondary injuries. A set of 19 case studies was used to investigate the potential for injury on home-fabricated assistive technologies (ATs) used by farmers with disabilities. The case studies consisted of close-ended and open-ended interviews that were designed to help understand the farmers' perception of potential for injuries and safety measures implemented or not implemented. The qualitative study used grounded theory principles and the collected data were analyzed to arrive at a list of features on ATs that have substantial potential to cause injury to the user. Based on the case study results, AT user characteristics and environmental factors were also considered as factors that contribute to potential injuries. Findings were used to develop an instrument for use by rehabilitation professionals to evaluate ATs for potential injury causing hazards.

4 Chakravarthy M, Singh S, Arora A Sengupta S, Munshi N.
The epinet data of four Indian hospitals on incidence of exposure of healthcare workers to blood and body fluid: a multicentric prospective analysis
Department of Anesthesia, Critical care and Pain relief, Wockhardt Forits Hospitals, Bangalore, Karnataka - 560 076, India.

Background: Sharps injury (SI) and blood and body fluid exposure are occupational hazards to healthcare workers (HCWs). Although data from the developed countries have shown the enormity of the problem, data from developing countries, such as India, are lacking.
**Purpose:** The purpose of this study was to cumulate data from four major hospitals in India and analyze the incidence of SI and blood and body fluid exposure in HCWs.

**Materials and methods:** Four Indian hospitals (hospital A, B, C and D) from major cities of India participated in this multicentric study. Data ranging from 6 to 26 months were collected from these hospitals using Exposure Prevention Information network (EPINet), which is the database, created by International Healthcare Worker Safety Research and Resource Center, University of Virginia.

**Results:** Two hundred and forty-three sharp injuries and 22 incidents of blood or body fluid exposure were encountered in the cumulated 50 months of our study. The incidence of SIs was the highest among nurses (55%) of all the HCWs, akin to the global data. An injury rate of nearly 20% among housekeeping staff seems to be specific to the Indian data. Patient's room followed by operation theatre appeared to be common locations of injury in our study. The source of the injury was identified in majority (64%) of the injuries. A major part of the group was not the primary users of the sharp (38%). Disposable needles caused nearly half of the injuries. Suture needles contributed to a reasonable number of injuries in one of the hospitals.

**Conclusions:** The incidence of SI is the highest among nurses and the housekeeping staff (>30% each). A substantial number of injuries are avoidable.

5 Doctor AM, Mathew J, Ellur S, Ananthram AA

**Three-flap cover for total hand degloving**


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Re-surfacing after a total hand degloving injury is one of the most difficult management problems in hand surgery. We present one such case that was managed using three flaps for cover. The radial forearm flap is very thin and pliable, resulting in satisfactory coverage of first web space and the thumb remnant, and facilitates a mobile thumb. The groin-hypogastric flap covered the remnant fingers admirably. The patient had a good first web and could use the hand to lift objects and hold a pen to write legibly within 2 months of the injury.
Penetrating head injuries can be the result of numerous intentional or unintentional events, including missile wounds, stab wounds, and motor vehicle or occupational accidents (nails, screw-drivers). Penetrating head injuries in children constitute only a small part of the total number of traumatic head injuries seen in casualty. We report a case of neuro-trauma who was operated in our institution. Patient, 4 years male presented in casualty on 15/01/09 with a iron rod penetrating into the skull.

An injury severity model is proposed for assessment of injury incidents in industrial settings. A classification scheme for injury incidents considering interactions is also developed. The injury severity model considers injury potential in the form of unsafe conditions and analyzes its transfer to actual injury of varying severity. A case study was conducted in an underground coalmine of eastern India. An observed reduction in risk realization is explained through the model. Presence of interactions is found to be the most significant incident attribute of injury occurrences. The classification scheme and the results obtained from this study will help in improving accident/injury investigation reporting and devising preventive measures for reducing injury severity.
Background: Occupational accidents are a major point of concern in industries. The academic community should take the first step to address the long-neglected concerns of occupational safety.

Objective: To assess the prevalence and pattern of occupational accidents.

Materials and methods: A record-based, cross-sectional study was done in three tile factories of Mangalore city, in Karnataka. A total of 416 workers were analyzed for the year 2004, and data regarding age, sex, job duration, type and nature of injury, body parts involved, and time of injury were collected in a prestructured proforma.

Statistical analysis: Proportions, Chi-square test, Univariate and Multivariate analysis.

Results: The overall prevalence rate of accidents was found to be 18.5%. It was found that almost around 86% of the accidents had affected the limbs (upper limb 24.7%, lower limb 61%), around half (52%) of the injuries were contributed by superficial injuries, 40% of accidents were due to stepping/striking against objects and while handling. Hand tools and machinery in motion contributed to around 20% of the accidents. Accidents were more common among the younger age group and less-experienced workers. Multiple logistic regression analyses revealed that the age group of 30-39 years had an independent significant association with accidents (OR = 0.21, P = 0.04).

Conclusion: Accidents in tile industries are an important occupational health problem in this area of the country. There is a need for proper safety training of the workers.


Interventions to reduce needle stick injuries at a tertiary care centre

Background:
Occupational exposure to blood/body fluids is associated with risk of infection with blood borne pathogens like human immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus (HCV).

Materials and methods:
We carefully document needle stick injuries (NSI) and implement post-exposure prophylaxis (PEP). We report a four-year continuing surveillance study where 342 healthcare workers (HCWs) sustained NSI. PEP was given to HCWs injured from seropositive sources. If the source was HbsAg positive, HCWs were given a hepatitis B immunization booster. If the HCW was antiHBs negative, both hepatitis B immunoglobulin (HBIG) and hepatitis B vaccine were
administered. For HCWs who sustained injuries from HIV positive sources, antiretroviral therapy was started. Follow-up was done after three and six months of exposure. Recent interventions by the infection control committee at our hospital reduced NSI considerably during intravenous line administration and glucose monitoring.

**Results and discussion:**

Of 342 injuries, 254 were from known sources and 88 from unknown sources. From known sources, 37 were seropositive; 13 for HIV, 15 for HCV, nine for HBV. Sixty six sharp injuries were sustained through garbage bags, 43 during IV line administration, 41 during injection administration, 35 during needle recapping, 32 during blood collection, 27 during blood glucose monitoring, 24 from OT instruments, 17 during needle disposal, 16 while using surgical blade, 7 during suturing and 34 from miscellaneous sources.

**Conclusion:**

No case of seroconversion has taken place, so far, as a result of needle stick injuries at our centre.

**Muralidhar S, Singh PK*, Jain RK, Malhotra M and Bala M**

**Needle stick injuries among health care workers in a tertiary care hospital of India**

Indian J Med Res 131, March 2010, pp 405-410

**Background & objectives:** Percutaneous injuries caused by needlesticks pose a significant risk of occupational transmission of bloodborne pathogens. Their incidence is considerably higher than current estimates, and hence a low injury rate should not be interpreted as a non-existent problem. The present study was carried out to determine the occurrence of NSI among various categories of health care workers (HCWs), and the causal factors, the circumstances under which these occur and to, explore the possibilities of measures to prevent these through improvements in knowledge, attitude and practice.

**Methods:** The study group consisted of 428 HCWs of various categories of a tertiary care hospital in New Delhi, and was carried out with the help of an anonymous, self-reporting questionnaire structured specifically to identify predictive factors associated with NSIs.

**Results:** The commonest clinical activity to cause the NSI was blood withdrawal (55%), followed by suturing (20.3%) and vaccination (11.7%). The practice of recapping needles after use was still prevalent among HCWs (66.3%). Some HCWs also revealed that they bent the needles before discarding (11.4%). It was alarming to note that only 40 per cent of the HCWs
knew about the availability of PEP services in the hospital and 75 per cent of exposed nursing students did not seek PEP.

**Interpretation & conclusions:** The present study showed a high occurrence of NSI in HCWs with a high rate of ignorance and apathy. These issues need to be addressed, through appropriate education and other interventional strategies by the hospital infection control committee.

**Key words:** Disposal practices - health care workers - needlestick injury - recapping practices

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**Nagesh KR, Menezes RG, Shetty BS, Menon A**

**Circumscribed injuries caused by an explosion in firecracker factory**

*J Forensic Leg Med. 2010 Apr;17(3):169-71 Epub 2010 Jan 22*

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Firecracker display is used worldwide for celebrating religious festivities, New Year celebrations and various other occasions. Explosion during the manufacture of firecrackers can result in serious injuries. We, herein, report a case, where a person succumbed to injuries sustained in an explosion in a firecracker factory. Superficial to deep burns, traumatic amputation of right upper limb, and multiple abrasions and lacerations were present on various parts of the body with contusion of internal thoracic and abdominal organs. Also, multiple punctured circumscribed wounds with burnt floor and margins were present over the body.

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**Vinodkumar MN, Bhasi M.**

**Safety management practices and safety behaviour: assessing the mediating role of safety knowledge and motivation;**


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Safety management practices not only improve working conditions but also positively influence employees' attitudes and behaviours with regard to safety, thereby reducing accidents in workplace. This study measured employees' perceptions on six safety management practices and self-reported safety knowledge, safety motivation, safety compliance and safety participation by
conducting a survey using questionnaire among 1566 employees belonging to eight major accident hazard process industrial units in Kerala, a state in southern part of India. The reliability and unidimensionality of all the scales were found acceptable. Path analysis using AMOS-4 software showed that some of the safety management practices have direct and indirect relations with the safety performance components, namely, safety compliance and safety participation. Safety knowledge and safety motivation were found to be the key mediators in explaining these relationships. Safety training was identified as the most important safety management practice that predicts safety knowledge, safety motivation, safety compliance and safety participation. These findings provide valuable guidance for researchers and practitioners for identifying the mechanisms by which they can improve safety of workplace.

B Gupta BD, Singh OG, Mehta RA

**Death comes through eye: a rare case of electrocution**

Am J Forensic Med Pathol. 2009 Sep;30(3):301-2

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Injury and death from electric current although rare, are not uncommon. In majority of the fatalities, death usually results from accidental contact with a live wire, both in industrial and domestic circumstances. The entry wound is usually in the hand or foot, with the exit wound being in the opposite hand or foot touching the earth (or the ground). Rarely, due to a unique position of the body and circumstances, they may be seen on head, face, neck, mouth, lips, body trunk, etc. However, here we present a unique site of electrocution, the eye, which has probably never been reported before. This case was also accidental in nature.

14 Gupta S, Jani CB

**Oxygen cylinders: "life" or "death"?**


Forensic Medicine Department. P. S. Medical College, Karamsad - 388 325, (Gujarat), India

Oxygen is crucial to maintain and save human life. Other than medical purposes it is widely used for manufacture of mineral water, fabrication works and other industrial activities. If adequate precautionary measures are not adopted while handling, storage or transport of oxygen cylinder or container, accidental blast may claim human life and other damage as well. The case
involving three victims is presented to highlight various relevant aspects i.e. autopsy findings, cause/s of blast and recommended precautions are discussed in the light of oxygen cylinder blast case in an "oxygen filling factory", claiming three human lives.

Gupta S.

**Laboratory approach to the management of clinical emergencies: a diagnostic series**


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This article emphasizes on the laboratory investigations that may play a significant role in the prompt management of the patient. Hence, other conditions where laboratory investigations will not play a major role are not included in this article. An attempt has been made to highlight certain issues wherein we can prevent inadvertent ordering of tests to minimize the burden on the overworked emergency laboratory, without compromising patient care. The conditions that will be dealt here include: acute chest pain, acute abdominal pain, road traffic injuries, acute respiratory distress, high grade fever, vomiting, loss of consciousness, poisoning and laboratory accidents, and lastly occupational exposure to potential biological hazards.

Jayanth ST, Kirupakaran H, Brahmadathan KN, Gnanaraj L, Kang G.

**Needle stick injuries in a tertiary care hospital**


Hospital Infection Control Committee, Christian Medical College, Vellore, Tamil Nadu-632 004, India.

**Background:**
Accidental needle stick injuries (NSIs) are an occupational hazard for healthcare workers (HCWs). A recent increase in NSIs in a tertiary care hospital lead to a 1-year review of the pattern of injuries, with a view to determine risk factors for injury and potential interventions for prevention.

**Methods:**
We reviewed 1-year (July 2006-June 2007) of ongoing surveillance of NSIs.

**Results:**
The 296 HCWs reporting NSIs were 84 (28.4%) nurses, 27 (9.1%) nursing interns, 45 (21.6%) cleaning staff, 64 (21.6%) doctors, 47 (15.9%) medical interns and 24 (8.1%) technicians. Among the staff who had NSIs, 147 (49.7%)
had a work experience of less than 1 year (n = 230, 77.7%). In 73 (24.6%) of the NSIs, the patient source was unknown. Recapping of needles caused 25 (8.5%) and other improper disposal of the sharps resulted in 55 (18.6%) of the NSIs. Immediate post-exposure prophylaxis for HCWs who reported injuries was provided. Subsequent 6-month follow-up for human immunodeficiency virus showed zero seroconversion.

**Conclusion:**
Improved education, prevention and reporting strategies and emphasis on appropriate disposal are needed to increase occupational safety for HCWs.

**17** Rautji R, Behera C, Dogra TD
*An unusual fatal construction site injury in India: a case report*
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A 35-year-old male, employed at a construction site, accidentally injured himself when an iron rod, which he was handing up from the ground floor to a fellow worker standing on the first floor, fell backwards. It pierced his suprascapular fossa on the right side, damaging great vessels and the tricuspid valve, and entered the pericardial cavity after puncturing the posterior wall of the right ventricle. The iron rod was taken out by fellow workers at the site and the injured man was immediately taken to a nearby clinic where he was resuscitated and the wound was stitched. He was later transferred to a tertiary care hospital where he died about an hour after admission. Though many bizarre injuries have been reported at construction sites, a fatal injury of this nature deserves a mention in the forensic literature.

**18** Reddy GM, Negandhi H, Singh D, Singh AJ
*Extent and determinants of cost of road traffic injuries in an Indian city*
Indian J Med Sci. 2009 Dec;63(12):549-56
Department of Community Medicine, School of Public Health, PGIMER, India.

**Background:**
Studies aimed at estimating losses that are incurred as a result of road traffic injuries (RTIs), especially at the family level, are very limited.
Aims: To ascertain the direct and productivity costs of road traffic injuries and their determinants.

Settings and design:
This study was a cross-sectional survey of all the road traffic crashes recorded by traffic police during 2004 in Chandigarh, a modern planned city of north India.

Material and methods:
All road traffic crashes recorded by the traffic police during the year 1st January to 31st December 2004 were included in the study. The houses of all the victims were visited. The direct costs included the immediate medical costs (i.e., emergency and hospital care, follow-up care, medicines and appliances, doctor bills, etc.), and nonmedical costs (transportation, property damage cost, etc.). Statistical analysis: Work productivity and activity questionnaire (WPAI-SHP), the health and labor questionnaire (HLQ) and Human Capital Method were used for estimating the productivity costs. Percentage, mean, standard deviation of the outcome parameters were calculated. Results: Of the 121 crash victims listed, 95 agreed to participate in the study. The net direct costs incurred were Rs. 8,55,644 ($19,991). The vehicle repair costs constituted more than half of such cost. Surgery, which was conducted in 28 cases, constituted 14.5% of the direct costs. The total productivity cost incurred was Rs. 8,06,24,530 ($1,883,750). Costs incurred due to premature mortality constituted over 99% of these productivity losses suffered by society. Lost wages due to the crash constituted less than 1% [Rs. 1,40,230 ($3276)] of the total productivity loss. Conclusions: Road traffic injuries are a significant financial drag on the society. The productivity costs far outweigh the direct costs. Premature mortality, vehicle damage and medical costs constituted the major share of the cost of RTIs.

Thatte UM, Kulkarni-Munshi R, Kalekar SA
Review of policies for injuries to research participants in India
J Med Ethics. 2009 Feb;35(2):133-9
Department of Clinical Pharmacology, TN Medical College and BYL Nair Charitable Hospital, Mumbai Central, Mumbai, India.

Background:
As there is little Indian data about severity, frequency and types of research related injuries, costs involved and policies regarding compensation, this study was conducted to review the present Indian scenario.
**Methods:**
The study was carried out in three parts; a questionnaire-based survey, in-depth interviews, and a review of informed consent and insurance documents of projects submitted to three ethics committees.

**Results:**
47% of investigators were either unaware of, or had not understood, the legal requirements and depended on sponsors to manage these issues, whereas 74% of ethics committee members were aware of the requirements. Although 40% of investigators, 30% of ethics committee members and all sponsors had policies to manage compensation issues, these were mainly to provide immediate free medical care or reimbursement of expenses incurred for the acute management of an adverse event. Compensation for loss of time/wages, death, physical disability or long term incapacitation was not included. A review of informed consent and insurance documents showed that compensation issues were inadequately discussed, with only insurance certificates submitted to ethics committees.

**Conclusion:**
In India, there are no uniform policies and investigators are largely unaware of their responsibilities. Therefore, there is an urgent need to draft national guidelines regarding compensation for research injuries of research participants and highlight the responsibilities of each stakeholder. Potential research injuries should be categorised based on risk assessment, severity and seriousness of the injury. Further, it would be necessary to have arbitration committees to determine the extent of compensation. Training and awareness workshops for those involved in clinical research, including research participants, is also needed.

**Ambade VN, Godbole HV, Dixit PG, Kukde HG. Accidental ligature strangulation due to crop thrasher**
Department of Forensic Medicine, Vasantrao Naik Government Medical College, Yeotmal 445 001, Maharashtra, India. vipulambade@rediffmail.com

Forty five years male was accidentally strangled when his shawl was caught in a moving electrical crop thrasher used for separating the grains from dry crops kept after cutting in the field. He was immediately taken to the nearest hospital. He was unconscious. He died after six days. Accidental ligature strangulation in this fashion due to such electrical machine is very rare and not reported previously to the best of our knowledge.
Survival following accidental ligature strangulation is quite rare. The present case involves an adult male strangulated by a soft cotton cloth entangled in the rotor of a machine. Unilateral neck compression allowed survival of the victim. The victim escaped with minimal injuries which were limited to contusion of the neck and edema of the vocal cords and inter arytenoid region.

A case of mediastinal emphysema due to an isolated facial trauma, which contributed to the death of an adult male, is reported in this article. A thorough search in the literature reveals only 19 cases of mediastinal emphysema occurring secondary to facial injury, none of which was fatal.

Introduction:
Dupatta (scarf) is a part of the traditional dress for females in the Indian subcontinent. Working near machinery, riding a motorcycle or cyclerickshaw, can result in entanglement of dupatta in moving parts of machinery and subsequent cervical spine injury. It is seen most commonly in rural areas, with farmyard equipment.
A retrospective study was performed between January 2004 and January 2006, on all the patients presenting with cervical spine injury secondary to dupatta entanglement in machinery. They were assessed for mode, level of injury, neurological status, associated complications, radiological picture and clinical outcome.

**Results:**
There were 12 such cases of cervical spine injury. The most common cause of injury was a threshing machine. All cases except one had quadriplegia (ASIA grade A) with bladder and bowel involvement. There was loss of consciousness in nine patients. Three patients expired. There was no neurological recovery in any patient.

**Conclusion:**
Dupatta is a unique cause of cervical spine injury in females, especially in rural areas. Easy methods of prevention may be helpful in preventing such injuries.

24 Kunar BM, Bhattacherjee A, Chau N.
**Relationships of job hazards, lack of knowledge, alcohol use, health status and risk taking behavior to work injury of coal miners: a case-control study in India**
Department of Mining Engineering, Indian Institute of Technology, Kharagpur, India

Objective is to assess the relationships of job hazards, individual characteristics, and risk taking behavior to occupational injuries of coal miners. This case-control study compared 245 male underground coal miners with injury during the previous two-year period with 330 matched controls without injury during the previous five years. Data were collected via face-to-face interview and analyzed using the conditional logistic model. Handling material, poor environmental/working conditions, and geological/strata control-related hazards were the main risk factors: adjusted ORs 5.15 (95% CI 2.42-10.9), 2.40 (95% CI 1.29-4.47), and 2.25 (95% CI 1.24-4.07) respectively. Their roles were higher among the face-workers than among the non-face-workers. No formal education, alcohol consumption, disease, big-family, and risk-taking behavior were associated with injuries (2.36<=ORs<=10.35), and the findings were similar for both face and non-face workers. Prevention should focus on handling material, poor environmental condition, especially addressing workers with no formal education, alcohol consumption, disease, big family size, and risk-taking behavior.
Orbital emphysema following conjunctival tear in the absence of orbital wall fracture, caused by air under pressure is rare. Usually orbital emphysema is seen in facial trauma associated with damage to the adjacent paranasal sinuses or facial bones. To the best of our knowledge, there have been only eight reports of orbital emphysema following use of compressed air during industrial work. The air under pressure is pushed through the subconjunctival space into the subcutaneous and retrobulbar spaces. We present here a rare cause of orbital emphysema in a young man working with compressed air gun. Although the emphysema was severe, there were no orbital bone fracture and the visual recovery of the patient was complete without attendant complications.

Occupational injuries in mines are attributed to many factors. In this study, an attempt was made to identify the various factors related to work injuries in mines and to estimate their effects on work injuries to mine workers. An accident path model was developed to estimate the pattern and strength of relationships amongst the personal and sociotechnical variables in accident/injury occurrences. The input data for the model were the correlation matrix of 18 variables, which were collected from the case study mines. The case study results showed that there are sequential interactions amongst the sociotechnical and personal factors leading to accidents/injuries in mines. Amongst the latent endogenous constructs, job dissatisfaction and safe work behaviour show a significant positive and negative direct relationship with work injury, respectively. However, the construct safety environment has a significant negative indirect relationship with work injury. The safety environment is negatively affected by work hazards and positively affected by social support. The safety environment also shows a significant negative
relationship with job stress and job dissatisfaction. However, negative personality has no significant direct or indirect effect on work injury, but it has a significant negative relationship with safe work behaviour. The endogenous construct negative personality is positively influenced by job stress and negatively influenced by social support.

27 Saha A, Kumar S, Vasudevan DM.  
Factors of occupational injury: a survey in a chemical company  
Ind Health. 2008 Apr;46(2):152-7  
Occupational Medicine Division, National Institute of Occupational Health, Gujarat, India

Chemical industries being the seat of dangerous occurrences frequently resulting in injuries, an occupational injury surveillance study was initiated involving 307 permanent and 419 temporary workers in a chemical company to understand the contribution of different possible factors on injury causation. Risk calculation was undertaken in relation to every individual factor using univariate and multivariate analysis techniques. Workers of lower age were found to be more susceptible to accidents (as evidenced by negative correlation coefficient), though non-significantly. Lower job duration (experience) had a significant impact on injury causation (correlation coefficient -0.5115, p<0.05). Alcohol habit could not show any significant impact but smoking/chewing habit showed significant effect (OR, 7.29: 95% CI, 3.88-9.33) on accident occurrence. Nature of job had no significant impact but nature of employment was found to have considerable effect on the causation of injuries. Temporary nature of employment was at greater risk (OR, 2.51: 95% CI, 1.42-3.77) in comparison to permanent workers.

28 Abbasi T, Abbasi SA  
Dust explosions-cases, causes, consequences, and control  
J Hazard Mater. 2007 Feb 9;140(1-2):7-44.  
Center for Pollution Control and Energy Technology, Pondicherry University, Pondicherry 605014, India

Dust explosions pose the most serious and widespread of explosion hazards in the process industry alongside vapour cloud explosions (VCE) and boiling liquid expanding vapour explosions (BLEVE). Dust explosions almost always lead to serious financial losses in terms of damage to facilities and down time. They also often cause serious injuries to personnel, and fatalities. We present
the gist of the dust explosion state-of-the-art. Illustrative case studies and past accident analyses reflect the high frequency, geographic spread, and damage potential of dust explosions across the world. The sources and triggers of dust explosions, and the measures with which different factors associated with dust explosions can be quantified are reviewed alongside dust explosion mechanism. The rest of the review is focused on the ways available to prevent dust explosion, and on cushioning the impact of a dust explosion by venting when the accident does take place.

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Dentists and their assistants are at risk of physical injuries during dental operations. The most common injuries are musculoskeletal. The need to work in a fixed working position using continuous repetitive movements can predispose dentists to wrist ache, lower backache, and neckache. We encountered a rare case of scapholunate dislocation with ligamentous injury, an unusual complication of extraction of teeth.

Department of Mining Engineering, Indian Institute of Technology, Kharagpur, India

This study assessed the relationships of job tasks and living conditions with occupational injuries among coal miners. The sample included randomly selected 516 underground workers. They completed a standardized self-administered questionnaire. The data were analyzed via logistic regression method. The rate of injuries in the past two years was 29.8%. The job tasks with significant crude relative risks were: power hammer, vibrating hand tools, pneumatic tools, bent trunk, awkward work posture, heat, standing about and walking, job tasks for trunk and upper/lower limbs, pain caused by work, and
muscular tiredness. Logistic model shows a strong relationship between the number of job tasks (JT) and injuries (adjusted ORs vs. JT 0-1: 2.21, 95%CI 1.27-3.86 for JT 2-6 and 3.82, 2.14-6.82 for JT>or=7), and significant ORs>or=1.71 for face work, not-good-health-status, and psychotropic drug use. Musculoskeletal disorders and certain personality traits were also significant in univariate analysis. Therefore job tasks and living conditions strongly increase the injuries, and occupational physicians could help workers to find remedial measures.

31 Dega S, Gnaneswar SG, Rao PR, Ramani P, Krishna DM

Electrical burn injuries. Some unusual clinical situations and management
Burns. 2007 Aug;33(5):653-65
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A retrospective and prospective management of 665 patients of electrical burn injuries out of 10,000 burn cases admitted between 1996 and 2004 (9 years) was analyzed. The problems encountered and their solutions are presented. One hundred and fifty-five (155) of them had their limbs amputated, i.e. (24%). The pathophysiology of electrical injury is reviewed. Serial and multiple debridement of wounds were performed, preserving the nerves, tendons, joints and bones even if denatured to preserve the continuity as these could regenerate partially if covered with vascularised skin. Functional outcome of an electrical burn wound is inversely proportional to the time lapsed before start of reconstructive procedure/s. Infrastructural limitations like severe shortage of blood, and surgical materials due to a disparity between demand and supply added to the poor general condition of the patient unfavorably delayed the start of reconstruction and precipitated “an unusual clinical situation”. The aim of management has been to obtain a healthy wound, which could support an inset of a skin edge. Under these situations, a stable wound was obtained on the 12th day [average]. Split skin grafts and loco-regional flaps, using time-old principles of rotation, advancement, transposition served well in most of our cases. Through this paper, some unusual wounds in unusual clinical situations, which were managed with various methods of reconstruction, following the reconstructive ladder are presented.

32 Gangopadhyay S, Ghosh T, Das T, Ghoshal G, Das B.

Impact of injuries on work performance among the surgical blacksmiths of West Bengal
The manufacture of surgical instruments is one of the leading small-scale industrial sectors in West Bengal, India. The present study was undertaken to assess the rate, type and cause of injury incidents among surgical blacksmiths and whether these incidents affected the work performance of the blacksmiths. A cluster of 216 skilled and 225 unskilled blacksmiths (male), engaged in the manufacture of surgical instruments, was selected from Baruipur subdivision as study subjects. The study included: 1) completion of a questionnaire; 2) measurement of physical parameters; 3) incident records; 4) statistical analysis of the data. The present study revealed that the blacksmiths suffered very frequently from work-related injuries. The number of injuries that occurred during 2004 - 2005 for skilled and unskilled blacksmiths was 1413 and 1610 respectively. Unskilled blacksmiths were disproportionately affected. These injuries resulted in a high rate of lost workdays, i.e. 517 and 742 workdays for skilled and unskilled workers respectively. The study thus indicated that surgical blacksmiths are highly prone to injuries in their occupation, mostly affecting the fingers (23% and 23%) and back region (21.7% and 22%) in both groups, which consequently affected their health, productivity and work performance.

Mago V.

Retrograde posterior interosseous flap
Iowa Orthop J. 2007;27:58-60

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This paper describes and discusses some of the clinical applications of the posterior interosseous forearm flap in hand reconstruction. It is based on a series of 20 patients in whom a distally based posterior interosseous island flap was used for closure of defects on the dorsum of the hand. Flaps survived completely in 16 patients. Partial necrosis occurred in one flap. Total flap loss occurred in two patients (20%). The flaps adapted well to the recipient site and had excellent color and texture match. The donor site morbidity was minimal.
The Haddon matrix is a potential tool for recognizing hazards in any operating engineering system. This paper presents a case study of operational hazards at a large construction site. The fish bone structure helps to visualize and relate the chain of events, which led to the failure of the system. The two-tier Haddon matrix approach helps to analyze the problem and subsequently prescribes preventive steps. The cybernetic approach has been undertaken to establish the relationship among event variables and to identify the ones with most potential. Those event variables in this case study, based on the cybernetic concepts like control responsiveness and controllability salience, are (a) uncontrolled swing of sheet contributing to energy, (b) slippage of sheet from anchor, (c) restricted longitudinal and transverse swing or rotation about the suspension, (d) guilt or uncertainty of the crane driver, (e) safe working practices and environment.

Occupational injury is a major and often preventable health problem in a work environment. Every year around a million people are affected and thousands are killed in work related accidents. Fishing as a sport and occupation is enjoyed and practiced by people of all age groups. Fishing related hazards and injuries are common but unreported. A fatal case of amputation of a limb caused by fishing net is described.

Temporary ectopic testicular replantation, refabrication and orthotopic transfer
Bilateral traumatic castration if left untreated can result in permanent sexual, social and psychological maladjustments. We hereby report a novel procedure of temporary ectopic replantation of a traumatically avulsed testis on the forearm with refabrication and subsequent successful orthotopic microsurgical transfer to the perineum. The significance of this replantation is related to the refabrication of a long pedicle for subsequent reattachment to the perineum. This would not have been possible but for the ectopic replantation.

37 Saha A, Kumar S, Vasudevan DM

**Occupational injury surveillance: A study in a metal smelting industry**

*Indian J Occup Environ Med. 2007 Sep;11(3):103-7.*

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An investigation of occupational injury was undertaken in a metal smelting industry to examine the occurrence and nature of occupational accidents where analysis of occupational injury records was carried out. At the same time, all the workers were interviewed to collect data in relation to personal and occupational characteristics. With this information, the study aimed to examine the role of different factors in the causation of occupational accidents. High incidence of superficial injuries of limbs due mostly to stepping / striking against objects and overexertion / wrong movements of the workers and the frequent association of handling of small tools with work injuries, observed in this study indicated the role of human error in these accidents and highlighted the necessity of proper safety training of the workers. This study also highlighted the need of elevated safety status during summer months and in evening and night shifts (more so in the second half). Moreover, this study could categorize some high-risk groups e.g. young workers, less-experienced workers, obese workers, workers having smoking / chewing habits etc, who need special attention so far as workplace safety is concerned.

38 Balasubramanya R, Rani A, Madhusudan, Sangwan VS.

**Expansive mortar-induced ocular injury**

*Indian J Ophthalmol. 2006 Dec;54(4):269-70*

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We describe here a case of bilateral chemical injury (with an expansive mortar which is being used in recent times to cut the rocks). On examination limbal ischemia was more in the left eye (9 clock hours) than the right eye (2 clock hours). The case was managed by bilateral removal of foreign bodies, along with conjunctival resection and amniotic membrane transplantation in the left eye. At six-month follow-up, patient had best corrected visual acuity of 20/30 and 20/60 in the right and left eyes respectively. Since this being an occupational hazard, proper eye protection gear should be used by persons using this expansive mortar.

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Total scalp avulsions are devastating injuries and replantation is the best form of reconstruction. We present our experience of replantation of six totally avulsed scalps done between 1996 and 2004. All were technically successful, but one was lost in the post-operative period due to accidental shearing of the scalp during nursing care. A single team performed the surgery in all cases and the average operating time was 6 h. No vein grafts were used. Hair growth was satisfactory in all cases. None underwent formal nerve repair but there was adequate sensory recovery in all of them by 6-9 months. A small area of skin necrosis in the occipital area (three cases), telecanthus and epiphora (two cases) were the minor complications. The available Literature highlights the need for multiple teams to reduce the long operating time, the use of multiple vein grafts and the complexities involved. Since, they are rare injuries, gaining wide experience is difficult. In this article we offer recommendations in pre-op preparation, vessel identification, technique of anchoring the avulsed scalp prior to vessel anastomosis and post-op care to make this rare procedure quicker, easier and successful.

40 Ganveer GB, Tiwari RR. Injury pattern among non-fatal road traffic accident cases: a cross-sectional study in Central India
Research question:
What is the pattern of injuries among non-fatal cases of road traffic accidents?

Objective:
To study the pattern of injuries among non-fatal cases of road traffic accidents

Study design:
Cross-sectional study

Setting:
Nagpur, a city in central India

Participants:
423 non-fatal cases of road traffic accidents reporting for treatment to Indira Gandhi Medical College, Nagpur during 1999-2000

Study variables:
Demographic characteristics, accident characteristics

Statistical analysis:
Percentages, proportions, Chi-square test

Results:
Out of total 423 subjects, 363 (85.8%) were male while only 60 (14.2%) were female subjects. Majority of the victims (75%) were in the age group 18-37 years. Sideways collision was the most common type of accident seen in 269 (63.59%) cases. Two wheelers and LMV were the common vehicle being involved in accidents (69.97%) and these accidents were almost equally distributed in both half of the day. Fracture of the bones was the common injury afflicted to the victims followed by multiple injuries like blunt injury, abrasions and lacerations. Lower extremity was involved in 192 (45.39%) cases while multiple sites were affected in 114 (26.95%) cases.

Conclusions:
In the present study, the fractures were the commonest injury among the victims of non-fatal road traffic accidents.

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Reversible hearing loss associated with high-voltage electric shock
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Hearing loss associated with high-voltage electric shock is a rare entity and minimal information is available in the current literature about this condition. To our knowledge, this article represents the first case report in the literature of improvement in sensorineural hearing loss sustained due to a high-voltage electric shock. A case report of a patient, who incurred various otologic problems, including hearing loss and tinnitus, is presented. An improvement in hearing loss and tinnitus was observed in the subsequent follow up after one month. Audiological findings and possible pathophysiology of hearing loss are discussed. We recommend that further studies be done to investigate the incidence, severity and pathophysiology of hearing loss in such cases.


Background: Approximately 3 million health care workers (HCWs) experience percutaneous exposure to bloodborne viruses (BBVs) each year. This results in an estimated 16,000 hepatitis C, 66,000 hepatitis B, and 200 to 5000 human immunodeficiency virus (HIV) infections annually. More than 90% of these infections are occurring in low-income countries, and most are preventable. Several studies report the risks of occupational BBV infection for HCWs in high-income countries where a range of preventive interventions have been implemented. In contrast, the situation for HCWs in low-income countries is not well documented, and their health and safety remains a neglected issue.

Objective: To describe the extent of occupational exposure to blood and the risk of BBV infection among a group of HCWs in rural north India.

Methods: A cross-sectional survey of HCWs from 7 rural health settings gathered data pertaining to occupational exposure to blood and a range of other relevant variables (eg, demographic information, compliance with Universal Precautions, perception of risk, knowledge of BBVs). A mass action model was used to estimate the risk of occupational BBV infection for these HCWs over a 10-year period.
Results:
A total of 266 HCWs returned questionnaires (response rate, 87%). Sixty-three percent reported at least 1 percutaneous injury (PI) in the last year (mean no. = 2.3) and 73% over their working lifetime (mean no. = 4.2). Predictors of PI during the last year were hospital site, job category, perception of risk, and compliance with Universal Precautions.

Conclusion:
The high level of occupational exposure to blood found among this group of rural north Indian HCWs highlights the urgent need for interventions to enhance their occupational safety to prevent unnecessary nosocomial transmission of BBVs.

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Accidental exposure from blood/body fluid of patients is a risk to healthcare workers (HCWs). Percutaneous injury is the most common method of exposure to blood-borne pathogens. A policy was formulated at our institute, a tertiary care centre in central Mumbai, and we report a six-year (1998–2003) ongoing surveillance of needlestick injuries. Of the 380 HCWs who reported needlestick injuries, 45% were nurses, 33% were attendants, 11% were doctors and 11% were technicians. On source analysis, 23, 15 and 12 were positive for Hepatitis B surface antigen (HBsAg), human immunodeficiency virus (HIV) and hepatitis C virus (HCV), respectively. Immediate action following potential exposure included washing the wound with soap and water, encouraging bleeding and reporting the incident to the emergency room. Analysis of the source of injuries revealed that known sources accounted for 254 injuries, and unknown sources from garbage bags and Operating Theatre instruments accounted for 126 injuries. Most needlestick injuries occurred during intravenous line insertion (N=112), followed by blood collection (N=69), surgical blade injury (N=36) and recapping needles (N=36). Immediate postexposure prophylaxis (PEP) for HCWs who sustained injuries with hepatitis-B-virus-positive patients included booster hepatitis B immunization for those positive for antiHBs. A full course of immunization with hepatitis B immunoglobulin was given to those who were antiHBs negative. All staff who sustained injury with HIV were given immediate
antiretroviral therapy (AZT 600 mg/day) for six weeks. Subsequent six-month follow-up showed zero seroconversion.


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The role of various factors in coal mine-related injuries was investigated using a case-control design. The study setting was two neighbouring underground coal mines in India. Cases comprised mine workers (n = 150) who had sustained a prior mine-related injury from a population of 1000 underground workers. Controls were selected from those mineworkers with no history of a prior mine-related injury using frequency matching (n = 150) from the same source population. Data were collected from the cases and controls using a structured survey questionnaire. Based on the responses of the participants, each factor was grouped into three categories. High-low plots and Chi-square tests were conducted to explore the differences between the cases and controls. Bivariate logistic regression was run to estimate the crude odds of injuries, while multivariate logistic regression estimated the adjusted odds of injuries to the workers for the various variable categories. High-low plots and the Chi-square test clearly revealed that the cases and controls significantly differed in their responses for the variables studied. Accident-involved workers take more risks, are negatively affected, feel more production pressure, job stress, work hazards and are less job involved and are more dissatisfied with safety environment and social climate of the mines compared to the controls. The multivariate odds of injuries to high risk taking, negatively affected and job dissatisfied workers are 1.21, 9.34 and 2.00 times more compared to their lowest counterparts.

Acetylene is an inflammable gas commonly used for welding in small-scale industries. We present a case of a 34-year-old male welder who died following injuries sustained from explosion of an acetylene gas-welding cylinder. In this case report, we discuss the circumstances leading to the explosion of the welding cylinder, the autopsy findings, and a brief review of the literature on deaths resulting from blasts of acetylene cylinders.

One hundred and forty-five unselected autopsy cases of construction site accidents received from South Delhi were studied during the period from 1996-2002. Data for the study was gathered from autopsy reports and hospital records. The cases represented approximately 1.61% of all autopsy cases received from South Delhi at the All India Institute of Medical Sciences, New Delhi (India). Data was analysed with regard to the age and sex of the victim, the part of the body involved, the manner of accident, the cause of death and the pattern of injuries in different body regions. Death occurred at the scene of the fatal event in thirty-four cases; forty-three cases were dead on arrival at the hospital; sixty-eight cases died after being admitted to the hospital. Ethanol was detected in the blood of 16% of the cases.

Context:
Although a large number of contributing factors of occupational injury causation are explored meticulously to explain the phenomenon of higher occupational injury occurrence in some subjects, it has remained a matter of controversy.
AIMS:
In this study, an effort is made to explore whether job security has any contribution in explaining higher susceptibility of some workers.

Settings and design:
This was a retrospective occupational injury record study conducted in an industry of eastern India.

Materials and methods:
Along with the study of injury records of 5 years, an interview was also conducted involving 726 workers (including permanent and temporary workers both) of the factory.

Statistical analysis used:
Comparison was made between permanent and temporary workers by using the Mann-Whitney U-test and the chi-square test. A theoretical model of Poisson's distribution was used to compare between expected and real occurrence.

Results:
Although two worker groups were very similar in relation to age, level of education, habits, and nature of work, accident frequency and severity rates were found to be significantly higher in temporary workers.

Conclusions:
This study concluded that the higher accident risk of the temporary workers might have been due to the less effective experience as well as due to lack of job security inherent in such workers.

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Wheat thresher agricultural injuries: a by-product of mechanised farming
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Farm mechanization has resulted in extensive use of wheat threshers on Indian farms. It has also increased agricultural injuries. A prospective study was undertaken for analysis of wheat thresher agricultural injuries and their remedial measures. Fifty two patients presenting with thresher injuries during the wheat harvesting season of March to June, 2003 were studied. A study-specific 14-point proforma was prepared to gather all possible information from site of injury to hospital records. Injuries were mostly of the upper limb and amputations accounted for most of these. Poor light arrangements, unskilled
workers, drug / alcohol abuse, fatigue, poor designing and lack of orientation to work on these machines were the contributory factors to such injuries. The analysis emphasizes that the need of the hour is to decrease wheat thresher injuries through specific preventive approaches like improved designing, education, legislation, compensation and surveillance programmes.


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Background:
Musculoskeletal disabilities are a cause for concern in aircrew as they can critically affect return to flying duties. Analysis of the nature and cause of musculoskeletal disabilities can provide insight to assist in developing preventive and therapeutic intervention programs.

Methods:
The Institute of Aerospace Medicine (IAM) is responsible for centralized evaluation of military and civil aircrew with any musculoskeletal disability. We analyzed musculoskeletal disabilities among Indian Air Force aircrew who were evaluated at this Institute from 2001-2003.

Results:
A total of 232 aircrew were evaluated. The majority (53.4%, n=124) came from the fighter stream. A large proportion (30.2%, n=70) were in the age group 26 to 30 yr with an additional number (25.4%, n = 59) in the 31-35 age group. Musculoskeletal injuries affecting the spine constituted most (48.2%, n = 121) of the disabilities followed by upper limbs (28.2%, n = 71) and lower limbs (19.9%, n=50), respectively. Of the spinal disabilities, degenerative disease of the disk was the leading diagnosis (46 aircrew, 38.0%), followed by fracture of the spine (28.1%, n=35). Road traffic accidents accounted for almost a quarter of the injuries (23.3%, n=54).

Discussion:
These findings provide insight into the nature of musculoskeletal disabilities among military aircrew. Implications for preventive and therapeutic strategies are elaborated. Follow-up studies to understand the characteristics associated with each disability have been initiated.
The constitution of India, as a part of the fundamental rights, has laid down that the State shall direct its policy towards protection of childhood and youth against exploitation and shall not be employed to work in any factory or mine or engaged in any hazardous employment. India has the largest number of urban and rural child workers in the world. The Government of India acknowledges at least 17.5 million working children. Footwear industry is also one of the major export oriented industry employing a large number of children. The Footwear Industry is a significant segment of the Leather Industry in India. India ranks second among the footwear producing countries next to China. The industry is labour intensive and is concentrated in the small and cottage industry sectors. While leather shoes and uppers are concentrated in large-scale units, the sandals and Chappals are produced in the household and cottage sector. The major production centers India are Chennai, Ranipet, Ambur in Tamil Nadu, Mumbai in Maharashtra, Kanpur and Agra in Uttar Pradesh, Jalandhar in Punjab and Delhi. The processes in the footwear making include last making, pattern cutting, clicking, Sewing, Assembling and Finishing. Children between 10 and 15 years old are mainly employed in assembling shoes. Some 80 percent of the children work for contractors at home. Children work on soling (fixing upper portions of shoes to leather or rubber soles) with glue. Children in cramped poorly lit rooms suffer from continuous skin contact with industrial adhesives and breathing vapors from glues. The children working in the footwear industry are exposed to physical factors like poor illumination, noise and poor ventilation, and chemicals like leather dust, benzene that is used as a solvent in glues and p-tert butyl phenols, which is used in neoprene adhesives. Thus most children suffer from respiratory problems, lung diseases and skin infections through constant exposure to glue and fumes. They are also exposed to risk of nasal cancer, neurotoxicity and adverse physical factors. It is recommended to stop child labour and let the child be bread eater rather than bread earner.

**Keywords**: Child labor, Footwear industry, Occupational Cancer, Neurotoxicity

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**Dogra PN, Gautam G, Ansari MS.**

*Penile amputation and emasculation: hazards of modern agricultural machinery*

*Int Urol Nephrol. 2004;36(3):379-80*
We report a case of 20-year-old farmer with penile amputation and emasculation secondary to crushing injury inflicted by agricultural machinery. His entire penis, scrotum and both the testis had been avulsed after falling onto a rotating axel wheel of an electronically driven thrashing machine. After resuscitation the wound was thoroughly washed with saline, hemostasis achieved and a perineal urethrostomy was made from the remnant urethra.

Ghosh AK, Bhattacherjee A, Chau N

**Relationships of working conditions and individual characteristics to occupational injuries: a case-control study in coal miners**


This study assessed the relationship of age, poor perception of working condition, poor safety environment, poor management and supervision, risk-taking behavior, emotional instability, negative job involvement, job dissatisfaction, job stress, and poor safety performance of workers to occupational injuries. This case-control study was conducted on 202 male coal miners with at least one occupational injury during a five-year period and 202 male controls with no occupational injury, matched on the job. A standardized questionnaire administered by individual interviewers was used. Data were analysed by the logistic regression method. For all workers combined, the factors with significant adjusted odds ratios (ORs) found were: 30-45 and >45 yr age groups (OR vs. <30 yr age group: 1.80, 95% CI 1.02-3.17 and 2.59, 1.38-4.85 respectively), poor perception of working conditions (1.61, CI 1.00-3.18), emotional instability (2.33, 1.04-5.22), job stress (1.83, 1.00-3.46) and poor safety performance of workers (3.10, 1.45-6.63). No significant interaction was found between these risk factors and the job. It was concluded that older age, poor perception of work conditions, poor work environment, and human behavioral factors played significant roles in occupational injuries. This information would help in implementing preventive programs to improve working conditions and management quality and to help the workers to develop positive psychological traits, but workers with negative traits such as emotional instability and older workers should be employed in less demanding jobs.
In spite of stringent regulations and much attention towards reducing risks in the physical environment, the mining industry continues to be associated with high levels of accidents, injuries and illnesses. Only engineering solutions to accident prevention are inappropriate unless coupled with focused attention to the attitudes and behaviours of the mineworkers in coping with the inherent physical, technical and situational risks. The present study identified these various risk factors and analysed their influences on work injury in a causal framework. Data were collected from an underground coalmine of India. The pattern and strength of relationships of 16 causal factors with work injuries were assessed through structural equation modelling. The case study results showed that negatively personified individuals are of major concern for safety improvement in the mine studied. They not only fail to avoid work injuries, they are unable to extend safe work behaviours in their work. The variable safety environment is negatively affected by personality, whereas social support has a positive relationship with safety environment. The variable job hazards appeared to have a significant relationship with job involvement, which has a negative relationship with work injury. Elimination of negative behaviours must be focused and committed by the mine safety management. Long term planning through (i) identification of negative individuals, (ii) proper counselling of adverse effects of negative behaviours, and (iii) special training with psychological treatment is highly required. Identification may begin while recruiting new workers through interview. Proper allocation of jobs (right person for right job) may be a judicial solution to this end.

The Indian farming employs 225 million workforce to cover 140 million hectares of total cultivated land. In spite of rapid farm mechanization (e.g., 149 million
farm machinery), the vast resource-poor family farming has primary
dependence on traditional methods (e.g., 520 million hand tools and 37 million
animal-drawn implements are in operation). The work drudgery, the traumatic
accidents and injuries are the major concerns to examine options for
ergonomics intervention and betterment of work in crop production activities.
This review summarizes human energy expenditure in crop production
activities, to assess the job severity, tools and machinery, and formulate the
basis to reorganize work and work methods. While the farm mechanization is
more in the northern India, the accidents were more in the villages in southern
India. On average of the four regions, the tractor incidents (overturning, falling
from the tractor, etc.) were highest (27.7%), followed by thresher (14.6%),
sprayer/duster (12.2%), sugarcane crusher (8.1%) and chaff cutter (7.8%)
accidents. Most of the fatal accidents resulted from the powered machinery,
with the annual fatality rate estimated as 22 per 100,000 farmers. The hand
tools related injuries (8% of the total accidents) were non-fatal in nature. In
spite of the enactment of legislation, the shortcomings in production and
monitoring of the machinery in field use may be responsible for the high rate of
accidents (e.g., 42 thresher accidents/1,000 mechanical threshers/year in
southern India). Due to the lack of technical capability of the local artisans,
adhering to safety and design standards is impractical to the implements
fabricated in the rural areas. The analysis emphasizes that the effective safety
and health management may be possible through legislative enabling of the
local infra-structure, such as block development authority and primary health
services, to permeate occupational health and safe work practices in the
farming sector.

Raja Sabapathy S, Sebastin SJ, Venkatramani H, Balaji G.
Primary use of the index finger for reconstruction
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Seven cases of primary reconstruction of traumatic amputation of the thumb
using the index finger are reported. In six cases, the reconstruction was done
using an injured index finger, while in one case where the amputation of the
thumb was through the carpometacarpal joint, an intact index finger was
primarily pollicised. This reduces cost of treatment, hospitalisation period and
allows earlier rehabilitation without a period of a 'no thumb experience'. We
have followed all the patients for a minimum period of 2 years and all of them have excellent functional results. We believe that pollicisation of a normal index finger, if thumb amputation is through the carpometacarpal joint or an injured index finger at the time of initial management of a severely traumatised hand with thumb amputation is an excellent technique for thumb reconstruction.

56 Saha A, Ramnath T, Chaudhuri RN, Saiyed HN. 
An accident-risk assessment study of temporary piece rated workers
Ind Health. 2004 Apr;42(2):240-5
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An occupational injury surveillance study (record study of five years duration) was conducted involving the workers of a fertilizer producing industry in eastern India to assess whether the risk of occupational accidents in temporary piece rated workers was higher in comparison to the permanent time rated workers. At the same time, to collect the personal details of the workers who have worked in the industry in the study period, an interview was also conducted. Mean age of temporary piece rated workers and permanent time rated workers were (35.9 +/- 12.5) and (35.3 +/- 11.4) respectively. Distribution of other variables like nature of work, level of education, experience, habits were also very similar between the two worker groups. Accident incidence rate, accident frequency rate and accident severity rate were found to be significantly higher in temporary piece rated workers. This difference was more prominent in case of time-loss accidents than in no time-loss accidents. Relative risk has varied from 2.3 to 18.0 in case of time-loss accidents. In case of no time-loss accidents, it has varied from 1.1 to 2.6. When relative risk is considered after taking both types of accidents together, it has ranged from 1.2 to 3.5. This study concluded that the temporary piece rated workers are more vulnerable to occupational accidents.

57 Sen RK, Jain JK, Nagi ON
Traumatic bowing of the forearm bones in roller machine injuries
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Slow bending forces created by rollers of rotating machines and acting on forearm bones can result in traumatic bowing even in adults. Four patients having this peculiar injury pattern in industrial accidents have been reported in this paper. Three of these had concomitant fractures of ipsilateral humerus. There were problems in appropriate reduction of the deformity due to the presence of associated overlying soft tissue injury. The literature has also been reviewed for this injury and 13 reports defining the injury profile, problems in realigning forearm bones and their subsequent maintenance have been described. The eventual outcome of such machine injuries has not been good due to persistence of some degrees of bowing and associated restriction of forearm rotation.


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A study was conducted in a glass bottle manufacturing plant in Pondicherry, India, to assess the magnitude and identify the risk factors of work-related injuries between January and December 1998. Three hundred and seventy-seven injuries were reported among 341 permanent workers followed up for one year (incidence=1,105.5/1,000 workers/yr). A higher load of injuries was noted in the first half of the night shifts and the second half of the other three shifts. Injuries were higher in the second half of the week and during the first half of the year. Hands and wrists were the most common sites of injury (40.6%), whereas the eye, foot, ankles and other body parts had 30%, 14.6%, 10.6% and 4.2% of injuries respectively. The commonest type of injury was cuts and lacerations (50.1%); injuries to the eye (due to foreign bodies, chemicals and welding sparks) accounted for 30%, sprains 8% and burns 7.1% of the injuries. A cohort of 75 workers chosen from the 341 permanent workers were followed up for the one year for identification of risk factors. Significant risk factors were age (less than 30 yr) and experience (less than 2 yr). Technical factors responsible for injury were a hazardous worksite in 37 (38.5%) cases, inadequate protection with safety wear in 32 (33%) cases and proximity to machines in 14 (14.6%) cases. Human factors identified were non-use of protective wear in 43 (45%), overconfidence in 18 (18.7%) and timing error while working with machines in 11 (11.4%) episodes.
Bhattacherjee A, Chau N, Sierra CO, Legras B, Benamghar L, Michaely JP, Ghosh AK, Guillemin F, Ravaud JF, Mur JM; Lorhandicap Group

Relationships of job and some individual characteristics to occupational injuries in employed people: a community-based study

J Occup Health. 2003 Nov;45(6):382-91

Department of Mining Engineering, Indian Institute of Technology, Kharagpur, India

This study assessed the associations of job and some individual factors with occupational injuries among employed people from a general population in north-eastern France; 2,562 workers were randomly selected from the working population. A mailed auto-questionnaire was filled in by each subject. Statistical analysis was performed with loglinear models. The annual incidence rate of at least one occupational injury was 4.45%. Significant contributing factors for occupational injuries were job category (60.8%), sex (16.2%), regular psychotropic drug use (8.5%), age groups (7.5%), and presence of a disease (7.0%). The men had higher risk than the women (adjusted odds-ratio 1.99, 95% CI 1.43-2.78). Compared to executives, intellectual professionals and teachers, labourers had the highest risk (6.40, 3.55-11.52). They were followed by farmers, craftsmen and tradesmen (6.18, 2.86-13.08), technicians (3.14, 1.41-6.70), employees (2.94, 1.59-5.48) and other subjects (3.87, 1.90-7.88). The young (< or = 29 yr) showed an increased risk. Similar odds-ratios were observed for regular psychotropic drug use (1.54, 1.16-2.05) and the presence of a disease (1.50, 1.11-2.02). Univariate analysis showed that smoking habit, overweight and excess alcohol use were also associated with injuries. The loglinear model results showed that there were associations between some of these independent factors. It was concluded that job, sex, young age, smoking habit, excess alcohol use, overweight, psychotropic drug use, and disease influenced the occupational injuries. Preventive measures concerning work conditions, risk assessment and job knowledge should be conducted in overall active population, especially in men, young workers, smokers, alcohol users, overweight workers and in individuals with a disease or psychosomatic disorders.
Chagas Silva M, Gaunekar G, Patel V, Kukalekar DS, Fernandes J

The prevalence and correlates of hazardous drinking in industrial workers: a study from Goa, India

Alcohol. 2003 Jan-Feb;38(1):79-83

Aims:
This study aimed to describe the prevalence and associations of hazardous drinking in a male industrial worker population in India.

Methods:
A total of 984 subjects from a randomly selected sample of 1013 workers from four industries in Goa, India, were recruited. Interviews included the 10-item Alcohol Use Disorders Identification Test (AUDIT) as an indicator of hazardous drinking and the 12-item General Health Questionnaire (GHQ12) as a measure of common mental disorders (CMDs).

Results: The prevalence of hazardous drinking, defined as an AUDIT score of more than 8 was 21%. There was a significant association with CMD (OR 2, P = 0.003). Hazardous drinking was significantly associated with severe health problems, such as head injuries and hospitalization, whereas CMD was found to be a confounder in its association with adverse economic outcomes.

Conclusions:
Hazardous drinking is common among male industrial workers in Goa. Interventions in the workplace must target both drinking problems and CMDs, since they often co-exist and are associated with different types of adverse outcomes.

Rautji R, Rudra A, Dogra TD.

An unusual fatal injury due to tyre burst: a case report


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A 20 year-old male driver of a heavy duty crane, employed in an industry located in an industrial area on the outskirts of Delhi was fatally injured while repositioning an ill-fitted locking rim of a crane tyre (Fig. 1). The inner tube of the crane tyre had accidentally burst, dislodging the loose iron-locking rim,
which hit the individual with a great force resulting in multiple injuries. He died on his way to the hospital.

62 Roy PK, Bhatt A, Rajagopal C.  
Quantitative risk assessment for accidental release of titanium tetrachloride in a titanium sponge production plant  
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This paper outlines the quantitative risk assessment for storage and purification section of a titanium sponge production facility. Based on qualitative HAZAN technique, which involves a detailed FETI and HAZOP study of the entire plant, the storage and the purification section were found to be the most hazardous sections. Titanium tetrachloride (TiCl(4)) is the major reactant used in this plant. TiCl(4) is a toxic, corrosive water reactive chemical and on spillage from containment creates a liquid pool that can either boil or evaporate leading to the evolution of toxic hydrogen chloride (HCl). Fault tree analysis technique has been used to identify the basic events responsible for the top event occurrence and calculate their probabilities. Consequence analysis of the probable scenarios has been carried out and the risk has been estimated in terms of fatality and injuries. These results form the basic inputs for the risk management decisions.

63 Kumar A, Mohan D, Patel R, Varghese M.  
Development of grain threshers based on ergonomic design criteria  
adarsh_iari@rediffmail.com

Threshers are used extensively on Indian farms for threshing grains, but are involved in a significant proportion of limb crush injuries. International safety standards are somewhat difficult to enforce because manufacture of machines is done at widely dispersed local workshops. Locally made machines are used for crop production and post-harvesting operations, with a great deal of manual work. This technical note reports the results of a study to develop a cost effective, improved design for safe operation of threshers based on ergonomic principles.
A study was carried out in Madhya Pradesh (Central India) to collect data on injury-causing agricultural incidents during the period 1995-1999. The overall incidence rate was 1.25/1000 workers/year. About 9.2% of the incidents were fatal, and most of the fatal incidents were due to tractors and snakebites (42.9% each). About 77.6% of all incidents were due to farm machinery, 11.8% were due to hand tools, and the remaining 10.6% were due to other sources like snakes, wells, etc. Data on 1,911 incidents reported in 10 leading newspapers published during the five-year period (1995-1999) from different regions of the state were also collected and analyzed, which indicated that only major or roadside agricultural incidents were reported in newspapers. Based on the survey data, it was estimated that in the year 2000 there would have been about 17,480 agricultural incidents in Madhya Pradesh, causing death to about 2,050 workers and injuries to about 16,770 workers, including amputations of limbs, burns, cuts, etc. Total monetary loss due to agricultural injuries in the state of Madhya Pradesh has been estimated as US $27 million/year.

An autopsy was performed on a 22-year-old tractor driver who was found on a cliff, 20 feet down from the highway, trapped between the wheel of a tractor trolley and some stones in an inverted position, after sustaining a head injury. Post mortem lividity was present above the knee joints except where the left arm was firmly adducted on the chest and where the cloth folds were compressing on the chest and abdomen all round. Sub-mucosal ecchymoses and petechial hemorrhages were present in the pharyngeal walls, and on both surfaces of the epiglottis and larynx above the vestibular folds. Such hemorrhages were first noticed along with other findings of traumatic and postural asphyxia.
David SS, Goel K

Knowledge, attitude, and practice of sugarcane crushers towards hand injury prevention strategies in India
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suresh.david@cmcvellore.ac.in

Introduction:
Injuries of the hand have an enormous impact on hand function and on quality of life. Occupational injuries are a major cause of morbidity and mortality in India and their incidence has been steadily increasing. Sugarcane crushers produce juice using dangerous procedures.

Objective:
The objective of this study was to determine the knowledge, attitudes, and practices among sugarcane crushers in India and thus assist in the formulation of effective preventive strategies.

Setting:
A block (area) in the Vellore District, South India (population 100 000).

Subjects and methods:
All sugarcane crushers living in this area (n = 32) were included. A single observer, using a questionnaire, conducted personal on-site interviews.

Results:
Carelessness was involved in 63% of injuries. Sixteen per cent felt that machines with improved safety features are required; 40% supported the use of special gloves, although 19% considered them a hindrance. Eighty eight per cent did not consider the long duration of work as a risk factor and 38% were fatalistic (God's will); 50% thought the injuries were due to "bad luck".

Conclusion:
Sugarcane crushers do not perceive the need for safer equipment. To overcome fatalistic views, and persuade this group to take other safety measures, safety education will need to take into consideration their socioeconomic and educational status.

Gupta BD, Jani CB

Fatal air pressure injuries of the intestine: a case report
This is a case report of a worker in a big industrial company. He was injured by air, which forcefully entered into his body through his anus while he and his three co-workers were having fun with an air tube. He succumbed to his injuries. Details of the case are described. It is presented due to its rarity.

68  Nag PK, Nag A  
Shiftwork in the hot environment  
National Institute of Occupational Health (I.C.M.R), Ahmedabad, India

The study examined the risks of heat induced workplace accidents (textile industry, N = 4125) and the heat tolerability of the rotating day (morning and afternoon, N = 16) and permanent night shift workers (N = 13) in hot-dry and hot-humid environment (34 to 49 degrees C, 50-80% RH; 31 to 42 degrees C ET, Basic). Accident prevalence was significantly high in the summer months (May-June) when the ambient temperature ranged between 42 and 48 degrees C (hot-dry). The influence of hot climate in accident causation was evident from the shift-wise variations in the occurrence of accidents. The longitudinal study showed that the night workers were more vulnerable and less tolerant to heat, the tolerance time being less by about 15% (31 degrees C ET) to 40% (39 degrees C ET), compared to the rotating day workers. The relationship of the segmental and compartmental temperatures (segmental triggering response) played a critical role in heat dissipation/accumulation mechanism, and reflected in the heat tolerability of the day and night workers.

69  Sarma BP  
Epidemiology and man-days loss in burn injuries amongst workers in an oil industry  
Burns. 2001 Aug;27(5):475-80  
Indian Oil Corporation Ltd. (Assam Oil Division) Hospital, 786171, Assam, Digboi, India

This retrospective study, conducted at the Indian Oil Corporation Ltd. (Assam Oil Division) Hospital, Digboi, in a period of 5 yr amongst workers of IOC Ltd. (AOD) describes work-associated injuries. Out of 2320 cases of different types of injuries involving workers over this period, 820 (35.3%) occurred at the workplace. 1430 (61.6%) at home or other places and 70 (3.1%) occurred on way to the workplace. Burn injuries were found in 132 cases (5.8% of the total
injuries), but constituted 12.6% of the accidents at the workplace. The majority of the other injuries were soft tissue injuries, including sprains 1288 (55.5%) and hand injuries 688 (29.5%). Major burns (above 20% BSB) were found only in 5 cases. The most common sites of involvement in minor burns were the hands (45 cases), the legs (35 cases) and face (20 cases) with the remaining involving the chest and abdomen. Scald injury was observed in 66/132 (50%) cases, contact burns in 13/132 (10%) cases, flame burns in 33/132 (25%) cases, chemical burns in 11/132 (8.3%), and electrical burns in 9/132 (7%) cases. Mortality was 1.5%. Working days lost (man-days loss) in burn injuries was found to be higher in comparison to other injuries of similar severity. Causation of industrial burns is discussed and importance of prevention of burns in industries has been emphasised.

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Purpose:
Occupational ocular trauma is an important cause of acquired monocular blindness in a rapidly industrialising country like India. Knowledge of the epidemiology of occupational eye injuries is essential to formulate viable industrial safety measures.

Method:
We retrospectively reviewed all patients with occupational open globe injuries between 1994 and 1998. We documented the circumstances of the injuries, their clinical findings and the use of appropriate protective eyewear at the time of the injury. The visual acuity 6 months after the injury was the final outcome measure.

Results:
In this study period we examined 43 patients with open globe injuries sustained at the work place. Thirty-four (79.1%) patients were young males. The iron and steel industry accounted for 19 (44.2%) cases while 8 (18.6%) patients each were from the agricultural, mining and other small scale industrial sectors. At the time of the injury, 33 (76.7%) were not wearing the recommended protective eyewear and 6 (13.9%) were under the influence of alcohol. The injuries were mild in 6 (13.9%), moderate in 18 (41.9%) and severe in 19 (44.2%) patients. At the end of 6 months, 2 (4.7%) patients had a visual acuity of 6/12 or better, 4 (9.3%) had a visual acuity of 6/18 to 6/60 and
29 (67.4\%) had a vision of <6/60. Eight (18.6\%) patients were not available for follow up.

**Conclusions:**
Occupational open globe injuries are usually severe and are associated with a poor visual outcome. Mandatory use of protective eyewear and alcohol-free environment at the work place is likely to reduce the incidence of severe occupational open globe injuries.

71  Kasthuri AS, Nagpal BM, Handa A, Singh YD

*Medical problems in surgical patients*

*J Assoc Physicians India.* 2000 Jul;48(7):695-9

Department of Medicine, Armed Forces Medical College, Pune 411 040

**Objectives:**
There has been an increase in surgical cases due to physical violence, accidents and weapon related injuries. This study was undertaken to assess the medical problems in general surgical cases and due to various injuries.

**Methods:**
All general surgical cases and casualties arising out of weapon related, accidents and blunt injuries admitted to a zonal hospital over a period of one and half years were studied. Only cases who developed a medical illness due to surgical cause, anaesthetic or surgery were included. Evaluation and treatment was done alongwith the surgeon till discharge/death. Details were analysed to ascertain the type of surgical illness, medical complication and the outcome of treatment.

**Results:**
There were seven hundred sixty two (53.8\%) general surgery cases and six hundred fifty four (46.2\%) cases due to various injuries. After excluding cases with prior known medical illness, thirty-seven patients were studied. There were eight (1.05\%) patients out of seven hundred sixty two general surgery cases and twenty-nine (4.43\%) out of six hundred fifty four injury cases. Weapon related injury cases were the maximum. Their medical problems related to the organ injury, fat embolism and sepsis. Soft tissue injury was next common, they all developed renal failure. Vehicle accident victim(3) were few and developed fat embolism, aspiration. Two patients out of thirty-seven succumbed to post anaesthetic complications.

**Conclusion:**
The incidence of medical problem in injury related cases are more than in general surgery cases. The type of injury contributes to the medical problem.
Increase in mortality and morbidity is because of emergency nature of surgery. This problem needs special study.

72 Sabapathy SR, Mohan D, Bharathi RR

'Jumping' cross finger flaps: a useful technique for salvaging parts in mutilating hand injuries
Ganga Hospital, Swarnambika Layout, Coimbatore, Tamil Nadu, 641009, India

In multi-digital injuries, soft tissue from non-adjacent injured fingers, which would have otherwise been discarded, can be used to cover small defects in salvageable digits. This was found useful in the salvage of four digits and one thumb. Anticipation of the need for a flap cover, and the possible availability of tissue in non-adjacent digits, is of paramount importance during the planning process in these injuries. This technique of using 'jumping' cross finger flaps is a useful method, when dealing with multiple finger mutilations that need soft tissue cover.

73 Verma SK, Agarwal BB

Accidental hanging with delayed death in a lift
Department of Forensic Medicine and Toxicology, University College of Medical Sciences, Shahdara, Delhi, India

While hanging is a common method of committing suicide in India, accidental hanging is uncommon. However, it does occur when people are engaged in auto-erotic practices. An adult male who was helping passengers trapped in the lift of an outpatient department at a teaching hospital was accidentally hanged. He survived for 39 days. This case highlights a rare but serious hazard in the use of lifts.

74 Kumar Pa, Abraham CE

Two tier burn by ignited compressed acetylene gas and air mixture
aDepartment of Burns and Plastic Surgery, Kasturba Medical College, Manipal, Karnataka, India
bDepartment of E.N.T. Head and Neck Surgery, Kasturba Medical College, Manipal 576 119, Karnataka, India
A rare case is reported of combined surface burn and subcutaneous burn, due to ignited compressed acetylene gas and air mixture that a 21-yr-old male sustained at his work place.

**Keywords**: Two-tier burn, Acetylene gas, Subcutaneous burn, Tangential excision

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**Sunder S, Bharat R**

**Industrial burns in Jamshedpur, India: epidemiology, prevention and first aid**

Burns. 1998 Aug;24(5):444-7

Department of Burns and Plastic Surgery, Tata Main Hospital, Jamshedpur, Bihar, India

Industrial burn injuries result in significant morbidity, infrequent mortality and man-hour loss, leading to loss of productivity. With a view to study the epidemiology of industrial burns in Jamshedpur and first aid awareness, we analysed 815 patients (142 inpatients and 673 outpatients) with industrial burns seen by us during the period from January 1993 to December 1996. 69% of these injuries were caused by contact with hot objects, while the rest were caused by flame, electrical and chemical agents. Our audio-visual awareness promotion programme for burns safety and first aid awareness amongst our officers and employees at various levels, has been successful in reducing the incidence of burns. The campaign has also popularised the use of cool water as the best first aid measure.

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**Titiyal JS, Murthy GV**

**Industrial ocular morbidity in a north Indian town**

Indian J Public Health. 1998 Apr-Jun;42(2):29-33

Dr. R. P. Centre for Ophthalmic Sciences, A.I.I.M.S, New Delhi

A study on industrial ocular morbidity was carried out in 6 industrial establishments at Saharanpur. The mean age of the respondents was 35.3 years. 58.2% were regular floor staff. 10.6% professed suffering from an industrial ocular injury. 60% of these injuries were sustained by ocular metallic trauma. 51.9% complained of ocular symptoms at the time of the survey. The frequency of ocular complaints increased with age. The point prevalence of ocular morbidity was 746.03/1000 industrial workers. Refractive errors were the commonest ocular condition (56.7%) observed, followed by Trachoma (32.6%). The highest prevalence of morbidity was recorded among workers above 44 years. Clerical and managerial personnel had higher prevalence compared to other jobs. Only 3.6% of the floor workers were using protective devices while on the job.
Although numerous opponensplasties are described, the options are limited when the median and ulnar nerves and the flexor tendons are injured. We describe a new tendon transfer using the previously injured flexor carpi radialis combined with a fascia lata graft for opponensplasty in a patient who had a wrist injury resulting in division of all his flexor tendons, except flexor carpi ulnaris, and the median and ulnar nerves.

Analysis of the accident records of an aluminium smelting industry, covering about 2,100 employees, over a period of three years, showed a total of 465 accidents of male employees. Out of these, 5 were fatal, 40.86% were from contacts with extreme temperatures, causing burn injury to 42.58%. Hot materials were the agents causing 44.52% of the burn injuries. Molten aluminium constituted 43.96% amongst hot materials. Injury to lower limbs constituted 38.71% and that to upper limbs 36.99%. The accidents occurring to the employees, in the age group of 26-33 years, amounted to 61.72% of the total accidents. The average number of man-days lost per year was 11,153. Average frequency rate of accidents was 30.75 accidents per million man-hours worked. Severity rate of accidents was 2.196 per million man-hours worked. Incident rate per thousand employees was 73.81. Average number of days lost per accidents was 71.95 days and average duration of man-hours between accidents was 32,516. Mean age of the employees, who met with the accidents were 29.53 years. Share of accidents in the second half of each shift was always more than that in the first half, and this average was 66.66%.
Chemical accidents involving explosions, large fires and leakages of hazardous substances occurring during transport, storage and industrial production of chemicals constitute a real challenge to health, environmental and industrial safety professionals. The aim of this article is to discuss the main questions that this kind of accident provokes, in terms of public health, particularly in developing countries such as Brazil. The paper defines and characterises these accidents and the various health risk they involve excluding the leakages of hazardous substances during "normal" production in industry--through the combination of quantitative and qualitative information drawn from the international literature on the subject. From some examples of chemical accidents such as occurred in Bhopal (India), Vila Socó (Brazil), São Paulo (México) and data of the World Health Organization (WHO), the authors seek to show that these events present a worsening, in terms of immediate deaths and injuries, in developing countries. The statistics of chemical accidents which occurred during the last ten years (1984 to 1993) in the State of Rio de Janeiro are used taken as a frame reference for the purpose of bringing to light the great number of occurrences made with no registration of basic information regarding assessment or surveillance. The complexity of causes and consequences, together with the structural problems of developing countries, present public health professionals and institutions, with some important tasks especially those of health risk assessment and the formulation of strategies to prevent and control future major chemical accidents.

80 Malhotra P, Dhar S, Dogra S, Kaul S, Raina RK
Pattern of injuries in a hydro-electric project
Dul-Hasti Hydro-electric Project, Government Medical College, Jammu

A study of work-related injuries at a hydro-electric project site (May 1991-April 1992) was undertaken to determine the incidence and pattern of the injuries out of a total number of 119 injuries in the year. A significant proportion of these were orthopaedic in nature and the commonest site of injury was limbs (both upper and lower limbs) like auto-amputations and head injuries. A large proportion of these accidents (24.37%) resulted in permanent disability likely to interfere in the normal activities or locomotion of those injured.
This is a retrospective study of 348 patients with burn injuries admitted to a peripheral industrial hospital over a period of 10 years. The patients were from all walks of life. The study compared the incidence of burns occurring in various industries and those in other situations, assessed the morbidity and mortality profile of burn injuries treated in a hospital devoid of a modern burn care unit and presents ways of improving the treatment of burn injuries. Out of the 348 patients 42.5 per cent had major burns and 57.5 per cent had minor burns. Children mostly received minor burns, females between the ages of 20 and 40 years commonly received major burns. Flame burns due to kerosene stoves, open flames and fireworks were the commonest causative agent (60.3 per cent). Scalds comprised 28.7 per cent of the injuries, the remainder being due to chemicals, electricity and lighting. Eighty-five per cent of the burns occurred in households; 12 per cent were industrial burns and rest were due to road traffic accidents and lightning. Out of 42 industrial burns, only two cases were of major severity. Most of the industrial burns were scalds. The overall mortality was 18.3 per cent. The average hospital stay was 17.5 days. The treatment given to the patients is briefly discussed and the importance of the introduction of modern methods of burn management in our hospital is also emphasized.

The authors discuss radioisotope angiography and blood pool imaging for assessing radiation-induced injuries to the hands for assessing radiation-induced injuries to the hands and the deterioration or improvement in status during follow-up. Two industrial radiographers in two separate accidents were exposed to 22 Ci to 25 Ci of a Co-60 for 2 to 3 minutes each in February 1985. Subsequently, besides routine clinical
examinations and other tests, they underwent a series of amputations and
grafts in the digits of the hands. A first-pass study with Tc-99m sodium
pertechnetate followed by delayed RBC labeled blood pool imaging was
performed in September 1988 in both patients. Both had a reduced flow of
trace to the more affected hand and the affected digits. A repeat study
performed in March 1989 revealed improvement in perfusion to the more
affected hand in the first patient and no change in the second. Delayed blood
pool imaging did not reveal any change. The improvement in flow also
coincided with the reduction of pain in the affected digits of the first patient. The
authors conclude that isotope angiography followed by delayed blood pool
imaging is a simple, noninvasive procedure to assess radiation-induced
damage to extremities and to evaluate deterioration or improvement during
follow-up.

83  Sathiyasekaran BW
    Accident trauma--a descriptive hospital study
Institute of Community Medicine, Madras Medical College, India

The study was conducted at the casualty department of Government General
Hospital, Madras, South India. Accident trauma patients, 1906, have attended
the above department during a continuous period of one month round the
clock and accounted for 15.3% of the total attendance of patients to the
casualty department. Of those brought to hospital following accident trauma
1.8% were dead, 35.1% were due to road traffic accidents, 21.7% to household
accidents and 20.9% to occupational accidents. Of the accident traumas 46.9%
occurred in the age group 21-40 years. Males accounted for 80% of the
patients. Injuries involving lower extremities accounted for 35.4% of the total
injuries; head injuries accounted for 29.5%. Of the injuries 5.8% were life
threatening, 7.4% severely disabling, 35.9% disabling and the rest were trivial
injuries.

84  Sharma A, Tyagi G, Sahai A, Baijal SS
    Traumatic aneurysm of superficial temporal artery-
    CT demonstration
Department of Neurosurgery, G.B. Pant Hospital, New Delhi, India

A case of traumatic pseudo-aneurysm of the superficial temporal artery
documented on Computed tomography (CT) and angiography is described in a
55-years-old female, who was treated by surgical excision. Computed
tomographic appearance of this lesion is illustrated. This represents, to our knowledge, the first CT demonstration of traumatic aneurysm of superficial temporal artery within a large subgaleal haematoma.

85 Agrawal OP
Profile of burn injury in steel industry
Department of Surgery, Bokaro General Hospital, Bokaro Steel City

Among the industrial workers of Bokaro Steel Plant 270 cases of burn injury were studied to streamline the cases from the site of accident, to find out the different causes of burn accident and to evaluate the result of specific management. After first-aid and resuscitating at the casualty department they were treated in intensive burn unit. The most vulnerable age for burn injury were the patients of 21-30 years. Maximum number of cases were seen due to electrical flash (78 cases or 28.9%) and slag burn (70 cases or 25.9%). Flame burn (39 cases or 14.4%), electrical contact (30 cases or 11.1%), gaseous burn (20 cases or 7.4%), scald (18 cases or 6.7%) and chemical burn (15 cases or 5.6%) were accounting for the rest. Adequate safety education to young employees, prompt transport to hospital, nursing in isolated area and early excision of eschar reduced the mortality and morbidity of burn injury.

86 Mathur N, Sharma KK, Tiwari VK
Orthopaedic industrial injuries
Department of Orthopaedics, ESI Hospital, Jaipur

A study of 600 consecutive cases of industrial injuries, who came from power using mechanised industries at Jaipur was undertaken to determine the incidence, pattern and causes of industrial injuries. The study revealed that there were fewer injuries in the 18 to 25 years age group than in those over the age of 36. Most of the injuries involved the upper limbs (66.2%), of which nearly 41% resulted from entrapment of hands in machines and were serious. This reflected the lack of adequate safety measures where it is most required.

87 Biyani A, Sharma JC, Mathur NC
Plantar panmetatarsophalangeal dislocation--a hyperflexion injury
Department of Orthopedics, M.G. Hospital, Jodhpur, India
A rare panmetatarsophalangeal dislocation of the foot in a young male is described. Hyperflexion was instrumental in causing this injury. The dislocation was in the plantar direction.

88 Mathur N, Sharma KK
Medico-economic implications of industrial hand injuries in India
Department of Orthopaedics, E.S.I. Hospital, Jaipur, India

625 five consecutive cases of industrial hand injuries attending the Employee's State Insurance Hospital, Jaipur, have been studied from 1983 to October 1986. The incidence of injuries was 36 per 10,000 workers per year. 47% were due to entrapment of the hand in active machines, 25% occurred during lifting and transportation of heavy objects and 12% while handling tools. The injuries resulted in residual deficit in 55% of cases and were serious enough to require absence from work of more than four weeks in 48% of cases. On an average 35 days were lost per injured worker. The average economic loss per injured worker was Rs. 6900 (approximately pounds 275) for workers in the wage-range of Rs. 5400 to 19,200 (pounds 216 to pounds 768) per annum.

89 Walls C
Accident consultations in one month in a semirural town
N Z Med J. 1988 Jun 8;101(847 Pt 1):373-4
General Practitioner, Pukekohe

General practice statistics for the month of July 1986 were analysed from a semirural town. There were 498 accident consultations and Maoris tended to be underrepresented. Thirty six percent of accidents were at work, 30% in the home and 12.6% in sports. Twenty three percent of the accidents involved no time off work and 32% had up to a week off. Thirty percent made a claim for earnings related compensation to ACC. Eight patients had prolonged periods off work.

90 Jain BS, Soni SR
Ocular injuries: an analytical study in a teaching general hospital
B S Jain Deptt of Ophthalmology, MLB Medical College, Jhansi India
A total of 319 cases of ocular injuries were examined in a period of 3 years by us. Out of these only 108 cases needed hospitalization. The total incidence among patients attending the ophthalmic O.P.D. was 1.43%. The patients had many different modes of injuries and the ocular tissue involved differed in many ways but notably injuries among stone crushers were in abundance (157 cases) in this region. The injuries lead to partial blindness in 52.3% and total blindness in 11.6% of cases.

Sight is the most cared for function of the human. Although, nature has provided a protective bony wall and lids to cover the eye to protect it from injury, still it is exposed to all types of trauma. In most of the cases of ocular injuries, it is the anterior segment of the eye, including conjunctiva cornea, iris, lens, and the angle of the anterior chamber, which bear the brunt of direct as well as indirect force of the injuries. However, ciliary body, choroid, retina, and vitreous may also be involved.

91 Mohan D
Injuries and the 'poor' worker
Ergonomics.1987 Feb;30(2):373-7

It is commonly assumed that occupational injuries are less of a problem in developing countries because there is less industrialization. Spot studies reveal, however, that injuries are a serious problem among miners, agricultural workers, and industrial workers in most countries. Each nation differs greatly in its level of industrialization, laws, working conditions, and range of products. Those with lower per capita incomes and lower levels of industrialization are likely to have more decentralized production which is less likely to be controlled effectively. Workers in developing countries are more likely to be injured; injuries are more likely to be disabling; and rehabilitation services more likely to be unavailable. Workers' transiency makes it more difficult for them to appreciate hazards which operate over long periods. Finally, workers' social status and level of organization in many cases greatly reduces their power to promote change. In this paper, an attempt is made to understand which experiences of the rich industrialized nations are valid for other nations and what new research needs to be done.

Keywords: Agricultural (grain thresher) injuries, Automatic protection devices, Developing countries, Occupational hazards
92 Veturi SM, Lakshmi BK, Ganguli AK, Chakrabarti AK
The impact and feasibility of international/national standards in the prevention of musculoskeletal injuries in developing countries
Ergonomics. 1987 Feb;30(2):405-10

This paper considers various facets of a preventive scheme for musculoskeletal injuries and examines the role of standards in the terminology, investigation, reporting, compilation and computation in such schemes.

93 Weill H
Disaster at Bhopal: the accident, early findings and respiratory health outlook in those injured
Bull Eur Physiopathol Respir. 1987 Nov-Dec;23(6):587-90
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In December, 1984, in Bhopal, India, a massive leak of methyl isocyanate (MIC) resulted from operational and equipment malfunctions in a pesticide plant. Many thousands of residents of the city, most in proximity to the plant, suffered sublethal and lethal respiratory injuries, the expected consequences of high-level exposure to this type of potent irritant chemical vapour. Animal toxicologic information was limited prior to the accident, but has since confirmed that the lung is the major target of these lethal injuries, invariably with pulmonary oedema. Early concerns regarding acute cyanide intoxication were not supported by subsequent scientific inquiry. Superficial corneal erosions did not result in permanent eye injury. The primary medical (and, presumably, legal) issue which is unresolved, and perhaps unresolvable, is the incidence and determinants of long-term respiratory injury in the survivors. Available evidence, which is limited, suggests that chronic damage, when present, is, or resembles, fibrosing bronchiolitis obliterans, the expected consequence when permanent injury results from acute, high-level irritant gas exposure. Definition of the follow-up population is uncertain, and exposure information is lacking. Dose-response relationships are not likely to emerge from follow-up studies.

94 Lorin HG, Kulling PE
The Bhopal tragedy--what has Swedish disaster medicine planning learned from it?
On December 3, 1984, a leak of methylisocyanate (MIC) from a chemical plant in Bhopal, India, affected 150,000 to 200,000 people. More than 10,000 people were severely injured and approximately 2,500 died. In this article a survey of symptoms, treatment, and rescue work is given. On the basis of this, we discuss ways to help reduce the effects of a major release of an irritant gas. People living in the vicinity of potential health hazards need information on how to behave in case of accidents. Rescue workers and medical personnel must be trained to operate under “toxic conditions.” There must be planning for treatment of thousands of patients at the same time, a circumstance that will often require temporary “satellite hospitals” to be opened. As symptoms and injuries are of the same kind, even if the magnitude and the effect may differ, treatment can, in many ways, be standardized. Therefore members of the health care team, irrespective of their daily different specialty fields, can work with the most urgent missions.

95 Bhattacharya V, Sinha JK, Tripathi RM
Management of scalp injuries
J Trauma. 1982 Aug;22(8):698-702

Scalp avulsions of various origin are frequently seen, owing to rapid industrialization and the increased incidence of road-traffic accidents. This article deals with 20 such cases seen and treated by the authors in the last 5 years. The victims were predominantly young females. The anatomic and pathophysiologic aspects of avulsion injury are considered in detail, and various modalities of treatment are discussed. With intact pericranium, split-skin grafting remains the treatment of choice. In the presence of bare bone, local flap is preferred, if feasible. If not, then the outer table of the skull is chiseled out or multiple drilling is done through it to accelerate the formation of granulation tissue. Subsequently, this is covered by split-skin grafting. Of course, the grafts do not grow hair and the patients need to wear a wig for total psychological and functional rehabilitation. Prevention remains still the best remedy.

96 Gupta RC, Bhasin SK, Khanka BS
Drive-belt or patta injuries
Injury. 1982 May;13(6):495-9

With increasing electrification and mechanization in rural areas, industrial drive-belt or patta injuries have posed a serious problem. Most of these severe injuries come to hospital. Eighty-eight cases admitted to the SRN Hospital
which is attached to MLN Medical College, Allahabad, over 3 years from 1977 to 1979 have been reviewed. This type of injury constituted 3.22 per cent of the total rural orthopaedic accidents (36.27 per cent of total accidents) and involved, exclusively, growing children and young people of working age. It was directly responsible for 9.09 per cent of deaths. This serious and disabling accident usually resulted from neglect or carelessness of workers and lack of adequate safety measures.
Abstracts not found

1. Sharma DC.
   Delhi radiation leak exposes lax safety procedures

   Needle stick injuries in health care providers
   Department of Oral and Maxillofacial Surgery, DAV Dental College and
   Hospital, Yamunanagar

   Injuries and injury care among child labourers in
   gem polishing industries in Jaipur, India
   J Occup Health. 2004 May;46(3):213-9
   Occupational Medicine Division, National Institute of Occupational Health,
   Gujarat, India

4. Tiwari RR, Rajmohan HR, Dave SK, Saiyed HN.
   Care of burns: a knowledge, attitude and practice study among match industry workers
   National Institute of Occupational Health, Indian Council of Medical Research, Ahmedabad

5. Singh RS, Dhaliwal RS, Singh H, Batra I
   Successful management of combined penetrating injury of innominate artery and trachea
   Department of Cardiovascular and Thoracic Surgery, Postgraduate Institute of Medical Education and Research, Chandigarh, India

6. Babhulkar SS, Pande KC, Babhulkar S
   Bowing injury of forearm in an adult
   Injury. 1995 May;26(4):277-8
   Indira Gandhi Medical College, Nagpur, India
7. Mathur N
   Does training reduce the incidence of industrial hand injuries?

8. Rennie J.
   Trojan horse. Did a protective peptide exacerbate Bhopal injuries?
   Sci Am. 1992 Mar;266(3):27-8

9. Chugh SN, Mehta LK, Malhotra KC
   Disseminated intravascular coagulation

10. Rath S, Bhan S
    Unusual open injury of multiple metacarpophalangeal joints
    Injury. 1988 Sep;19(5):339-41
    Department of Orthopaedics, All-India Institute of Medical Sciences,
    New Delhi

11. Narain L
    Perforating injuries in coal mining area

    Accidental injuries among technical personnel in railways at Allahabad

13. Khan MY
    Fatal thoracic squeeze

14. Sambasivan M
    Survey of the problems of head injuries in India
    Neurol India. 1977 Jun;25(2):519
15. Divatia AS
   Ocular problems in cotton industry
   J All India Ophthalmol Soc. 1968 Dec;16(4):192-5

16. Goel I, Khanuja
    "Ocular injuries in industry"; a survey of six factories
    J All India Ophthalmol Soc. 1968 Dec;16(4):183-5

17. Gupta TN
    Compensation in industrial ocular injuries
    J All India Ophthalmol Soc. 1968 Dec;16(4):243-4

18. Laxminarayan
    Ocular injuries in coal mines
    J All India Ophthalmol Soc. 1968 Dec;16(4):186-91

19. Raman K
    Industrial eye accident prevention in textile mills
    J All India Ophthalmol Soc. 1968 Dec;16(4):196-7

20. Kher NN
    Incidence and management of perforating injuries of the eye
    J Indian Med Assoc. 1964 May 16;42:469-74
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