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Safety Condition in Rural Engineering Workshop in Bangladesh

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ABSTRACT
Safety is the condition being protected against any hazardous situation and any other type of failure, error and accidents. As a developing country our technology is growing day by day. But the man who works to develop this technology and works in different industries, factories and rural engineering workshops is deprived of their required safety. The safety issues provided for the workers are not properly maintained in Bangladesh. Almost no safety is provided for the workers in rural engineering workshop in Bangladesh and for that they are affected by physical, social, spiritual, financial, political, emotional, occupational, educational or other types or consequences of failure, damage, error, accidents, harm or any other event which could be considered non-desirable. Many accidents have already been taken place due to not providing enough safety to the workers. Therefore, safety must be provided minimizing accident hazards and risks. The workshops safety situation in Bangladesh is very severe by international standard. An overview of the prevailing accident problem characteristics and some working safety priorities that should be addressed with due urgency are briefly discussed in the paper. In this paper an attempt has been made to highlight the workers safety issues in rural engineering workshops in Bangladesh.

Keywords: Safety issues, Rural engineering workshop, Occupational Safety.

1. Introduction

A workshop is a part and parcel of any engineering section. There is no doubt that rural engineering workshops play an important role in our economic and social welfare. But safety issue is a crucial question here. Thousands of accidents and cases of illness are reported every year in rural engineering workshops. Many of these accidents are caused by ignorance, horseplay or abuse of machinery and equipment. The owners and workers both are responsible for these accidents. They take the safety issues very lightly and sometimes neglect it willingly. On the other hand child labour is a threatening issue. Illegal conditions of the environment of workplace is so murky and offensive. Otherwise the workplace is too small for an operation. In there man, machine and material stay almost in contact. Many engineering processes are potentially hazardous and these include activities such as casting, cutting, soldering, welding, etc. In addition, some processes involved the use of hazardous materials and chemicals. Furthermore, even the most basic and straightforward activities can potentially be dangerous if carried out using inappropriate tools, materials, and methods. In all cases, the correct tools and protective equipment should be used and proper training should be provided. In addition, safety warnings and notices should be prominently placed in the workplace, access to areas where hazardous processes take place should be restricted and carefully controlled so that only appropriately trained personnel can be present. In addition, the storage of hazardous materials (chemicals, radioactive substances, etc.) requires special consideration and effective access control. Successful health and safety management in small engineering workshops is about identifying the most frequent and serious risks and adopting the right precautions, taking account of time, money and resources. The information was collected in this study related to trading situation, employment and labor problems and related especially to occupational safety, health and working environment, safety measure at work, guidelines in promoting the development of safety standards at work in rural engineering workshops in Bangladesh. Various measuring methods such as reportable work injuries, hospital treated work injuries, and survey based estimates of work injuries may give different estimates of the number of work injuries.

The cases of work injuries included in this study are thus the less severe injuries, in the sense that they only include injuries causing temporary absence from work. This study aimed to provide an overview of the situation of occupational health and safety management in rural engineering workshops to gain information related to the employment situation, welfare facilities, health facilities, , accident statistics, hazardous working environments, control of hazards, occupational health and safety management, safety training and safety activities provided to workers. It can be used for the ground work for evaluating the occupational health and safety of rural engineering workshops in Bangladesh, especially the rural engineering workshops with high potential for business.

2. Method

2.1. Questionnaire development

A questionnaire was developed comprising check-box questions and open-ended questions. The questionnaire was divided into four sections that covered:

- Information about the workshop.
- Enquiry the accidents and workers condition data.
- Condition of workshops and workers.
- Occupational health and safety regulations.

The adjustment of the questionnaire was made following the comments.

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2.2 Types of workshop.
The targeted workshops were small sized rural engineering workshop in Bangladesh. Which were

- Automobile service center.
- Welding shop.
- Lathe shop.
- Air cooler & refrigerator service center.
- Wood shop.
- Painting workshop.
- Fiber & glass workshop.
- Electronic device service center.
- Saw mill (cutting and processing wood).

2.3 Procedures
A cross-sectional non-experimental design was used for this study. From January 2014 to May 2014, we prepared the survey in the two districts (Jessore, Khulna) in Bangladesh. We tried to contact to the owner of different rural engineering workshop and the victim of different types of accident. Based on the type of workshops and the questionnaire that we did the survey. Finally, 80 small size rural engineering workshops were investigated for obtaining the questionnaire .All most 85% of these workshops were road side workshops.
The survey was designed to capture the common injury that occurred in rural engineering workshops as identified by safety science based on online database. Then, the survey was designed to identify the common nature of injuries, parts of body affected by injuries, causes of injuries. The survey was furnished to gather information from five major sections consisting of 35 items: (a) causes of injury (table 1); (b) nature of injuries (table 2); (c) occupational injury socio-demographic category (table 5); (d) occupational injuries in work related category (table 6); and (e) working conditions. We asked to report any injuries or experience of accident while working for the current operation.

2.4. Data analysis
Data from the questionnaire were hinted and analysis. Percentage were used.

3. Results

3.1. Accident statistics
There are many accidents and cases of injuries reported every year in the small engineering workshops. Almost two-third of all such accidents arise from the movement of people, goods and vehicles around the workshops and out of it. Of these "movement" accidents are about half involve lifting and moving goods and other half involving slips, trips and falls and hitting stationary or moving plant and equipment . "Non-movement" accidents mostly arise from the use of machinery, these account for 10 to 15% of all accidents. Electrical accidents are common and they frequently have the potential for more serious injuries. The most common occupational diseases are dermatitis, deafness, asthma and vibration white finger, and back, hand, arm, shoulder and neck problems. In any particular workshop risks which are relevant should be assessed. Those likely to be of most concern includes movement of people, goods and vehicles around the workshop, particularly manual handling, machinery safeguarding, hazardous substances, particularly metalworking fluids, degreasing solvents and dust or fume from welding, brazing, soldering, coating and painting, noise and vibration. Besides these reasons there are many other causes for accidents such as poor lighting, electrical hazards, fire hazards, poor exhaust ventilations, human carelessness etc. Unguarded and badly maintained plant and equipment are obvious causes to injuries. However most of the common causes of accidents are falls on slippery floors, poorly maintained stairways scaffoldings and obstructed passageways in overcrowded workplace.
The costs of accidents and ill health to small engineering workshops may be high. Many employees are 'key' workers whose loss through injury or ill health severely disrupts production and lowers profitability.
The overall condition and different cause for accidents in rural engineering workshops were investigated.
The accident statistics of workshops were classified by number of injured workers by different causes is shown in Table 1.

Table 1: Injuries to rural engineering workshop by accident.

Total number of injured person(investigated)	26
1.Handling and Carrying	7 (27%)
2.Falling objects	5 (19%)
3.Slipping and tripping	2(8%)
4.Machinary	10 (38%)
5.Falls from height	2 (8%)
6.Workplace transport	0 (0%)

The accident statistics of workshops were classified by nature of injury is shown in Table 2.

Table 2: Nature of injury for 26 interviewed injured wrokers.

Nture of injury	Number (%)
1. Amputation, laceration	3 (11.53%)
2.Contusion	2 (7.69%)
3.Dislocation, facture	5 (19.23%)
4. Hernia, rapture	2 (7.69%)
5.Sprain/strain,joint inflamination	9 (34.61%)
6.Scratch, abrasion	1 (3.84%)
7.Brun,multiple, miscellaneous	4 (15.38%)

The accident statistics of workshops were classified by number of injured workers in different workshop is shown inTable 3.The accident statistics of survey classified by absences of workers is shown in Table 4.

Table 3: Numbers of injuried workers in different types of rural engineering workshop by accident.

Types of workshop	Numbers of workshop	Injured workers (%)
1.Automobile service center	12	3 (11.53%)
2. welding shop	14	5 (19.23%)
3.Lathe shop	12	6 (23.07%)
4.Air conditioner & refrigeration service center	4	1 (3.84%)
5.Wood shop	10	2 (7.69%)
6.Painting shop	6	0 (0%)
7.Fiber & glass workshop	5	2 (7.69%)
8.Electronic devices service center	10	4 (15.38%)
9.Saw Mill	7	3 (11.53%)

Table 4: Accident statistics classified by absecence of workers in the workshop.

Accident case	Number (%)
1.≤1 day lost case	6 (23.07%)
2.> 1 day lost case	5 (19.23%)
3.Disability case	4 (15.38%)
4. fatal case	4 (15.38%)
5. Scikness case	7 (26.92%)

3.2. Conditions of workers & Workshops

In Bangladesh the occupational safety of rural engineering workers is not well organized. The owners are employing male workers with below 30 years of ages at the rate of 65% and the upper being 35% while the percentage of female workers is negligible. The most remarkable fact is that the percentage of child (age below than 15 years) workers in rural engineering workshop are minimum 30%. The owner of those workshop prefer them to take the opportunity of their poverty and also their wages are cheap. They are also deprived of their basic education. Their average working hour was 8.0 h/day (31%) and 48 h/week. Regarding a number of holiday/week, maximum workers had one day, two days holiday was rear. Most of the day workers had little time to lunch or breakfast. They were working from morning to till night most of the days. Most engineering workshop arranged several welfare facilities for workers namely. There was not arranged clean drinking water, suitable eating places separated from operation area, clean and good sanitation of toilet facilities, washing basins and proper resting areas inside the workshop. It is very important that the workshops provide necessary welfare facilities for workers. Occupational health and safety management was considered essential to prevent accidents and diseases in the workshops. Out of 80 rural engineering workshops studied, the workers were exposed to work by hazardous chemicals, excessive noise, working at dangerous elevation, in hot place, in confined space, low fresh air circulation, inadequate lighting quality, with excess vibration etc.

The workers are not trained enough to the proper use of tools and machines in the engineering workshops which may cause injury to the operators. Percentage of unskilled workers and illiterate worker is high. Different types of rural engineering workshops were observed and different case of accidents were investigated. Injured and non-injured people are divided into two categories firstly socio-demographic and secondly work related category. And these categories are divided into some sub-categories. So that table 4 and table 5 is related to factors of occupational injuries in different types of workshop in socio-demographic category and work related category.

Table 5: Data for factors of occupational injuries in socio-demographic category.

factors		Injured workers (total 26)	Non-injured workers (total 248)
age	< 30 years	17(65%)	108(44%)
	≥ 30 years	9(35%)	140(56%)
Material status	Unmarried	15(58%)	156(62%)
	Married	11(42%)	92(38%)
Educational level	Illiterate/basic education	20(77%)	176(71%)
	College/technical	6(23%)	72(29%)

Table 6: Data for factors of occupational injuries in work related category.

factors		Injured workers (total 26)	Non-injured workers (total 248)
Job category	Unskilled	18(69%)	104(41%)
	Skilled	8(31%)	144(59%)
Duration of work(years)	<10	16(62%)	139(57%)
	≥10	10(38%)	109(43%)
Working hours/week	>48	8(31%)	177(72%)
	≤48	18(69%)	71(28%)
Workplace supervision	No	17(65%)	150(60%)
	Yes	9(35%)	98(40%)
Machinery & maintenance	Poor	15(58%)	172(69%)
	Good	11(42%)	76(31%)
Health and safety	No	21(81%)	188(76%)
	Yes	5(19%)	60(24%)

Reviewing these two tables that the perception about the rural engineering workshop is found and which is very woeful. Some pictures are given below which shows the hazardous situation of workshops.

1 A

1 B

1 C

Fig.1 different imperfect condition in rural engineering workshop.

In figure 4 A is shown that a worker is doing gas welding without safety. His dress is lungi (one kind of Bengali dress) which is long loose. That kind of dress is too much dangerous for any kind of machining operations. In figure 4B it is viewed that a child is working in workshop. He was working there during two years.
In figure 4C it is noticed that a victim of workshop accident. He lost his one finger because of blasting the air trunk of truck.

4. Discussion

In engineering workshops accidents are unfortunately too common. They vary in degree from trivial to, in exceptional circumstances and facilities. The health and safety of people at work is covered by a variety of acts of parliament, each act containing a book of laws and regulations which govern the way in which work may be done in the workplace and the processes, operations and equipment employed to do the work. This case-control study of risk factors for injuries in rural engineering workshops recognized a number of work environment features that were connected with injury occurrence. The risk factors confirmed in multivariable regression models were high physical workload, machine-paced work or inability to take a break when tired, lack of training, absence of a lockout program, being new on the job, and being male. Overtime is considered important for workers in rural engineering workshops because they wanted to have more income. If the owners do not provide overtime work, they might move to other places causing a high turn-over rate due to low take home pay. It can be seen that workers in workshops have to work very hard, for approximately 11 h/day on average, if they do overtime jobs. The results showed that most of the enterprises did not have a suitable eating place for workers; thus workers had to bring some food for lunch or had to find a place to eat outside. The number of workshops which had a fire extinguishing training, fire drills and fire evacuation training were too low. We carried out environmental monitoring for dust, heat, noise and lighting for those workshops and found most of them complied with the law only in some parameters. Those workshops therefore still need to improve their working conditions.
Improvement of safety condition of rural engineering workshop is a multi-disciplinary task and does not occur by itself. One fundamental step should be taken by Bangladesh government and which is created an organization dedicated to initiating and coordinating safety activities for rural engineering workshop. These organizations will investigate the safety condition and give them the licenses. To ensure occupational safety and to develop the safety issues some policy should be taken which are given below.

- National Policy:
  1. Safety management should be encouraged.
  2. National occupational safety and health policy.

- Government Organizations:
  1. Establish autonomous occupational safety institute.
  2. Establish national occupational safety and health council.
- Employers Organizations:
  1. Training, awareness and motivation of employer regarding workplace safety and health.
- Labour Union:
  1. Encourage more bipartite approach.
  2. Expand union activities to all occupational sectors.
- Legislation:
  1. Update the laws and reduce inconsistencies.
  2. Increase effectiveness of the law focusing on rural engineering workshop.
  3. Encourage employment of occupational health service specialists, safety inspectors in every local zone.
  4. Introduce safety audit.
- Training organization:
  1. Develop and strengthen institutional capacity to provide education and training related to occupational safety and health.
- National Statistics:
  1. Develop active data collection system.
  2. Establish occupational diseases surveillance.
  3. Establish national and regional accident and occupational diseases database.

In Bangladesh most of the workers are illiterate. So it is very much important to give them at least primary knowledge about their work and safety measurements to be performed in their workshop.

Suitable clothing is a very important factor in an engineering workshop. Overall and protective clothing should be sufficiently loose in order to allow easy body movement but not so loose that they interfere with engineering task and activities. Maintenance and equipment must be regularly serviced and maintained by appropriately trained and experienced personnel. These not only reduce the chances of a major breakdown leading to loss of production, it lessens to chance of a major accident caused by a plant failure. Equally important is attention to such details as regularly checking the stocking and locating of First Aid Cabinets and regularly checking both the condition and location of fire extinguishers. All those check must be logged.

But before all of these recommendations the first work is to grow up the vigilance of the owners, the workers and the government. If we can ascertain the occupational safety of the workers and the safety condition of the workshop then it will help to progress our country, to improve our social value and to achieve a good international reputation.

5. Conclusion

The study shows that the importance of accident prevention is not only limited to the immediate consequences, but also that it can have a significant effect on the long term consequences in the form of early retirement for men that have had an accident at work. This paper consists of safety condition of rural engineering workshop in Bangladesh and occupational safety of workers. It was found that many rural engineering workshop are prone to accidents and casualties. Here occupational safety refers mainly to needs the workers. But the owners have no concern about their safety and their workshop environment. On the other hand they want to enjoy benefits with increased production. The occupational safety in Bangladesh is still in the developmental stage. The field of rural engineering has the potential to make the significant contributions to achieve an ideal occupational safety system by maintaining safety issues and the law. As large number of people are working in rural engineering workshop and they serve us to meet our daily needs so they should provide with sufficient safety measures. Laws should be implemented and followed strictly. If we want to improve our economy the condition of the workers must be improved and they should be facilitated by their basic needs otherwise we will lose our potentiality and our economy will be hammered. So it is very important as a developing country to pay heed to the concerns about rural engineering workshops. Thus we can improving life style of people, social values, and economical condition.

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