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Effectiveness of Health Safety Training Programme on Knowledge and Practice Regarding Prevention of Occupational Hazards among Construction Workers

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Abstract

Construction work is inherently hazardous, often involving activities that expose workers to falls, electrical injuries, slips, dust, vibration, noise, burns, and other physical, chemical, and biological risks. In India, the unorganized nature of the construction sector, poor educational status of labourers, and lack of structured training amplify the dangers faced on site. Despite legal frameworks and safety guidelines, compliance is often poor. Most workers are unaware techniques of hazard prevention and do not practice proper safety measures, resulting in frequent injuries and long-term health issues. The need for effective, structured training becomes critical. This study was undertaken to assess the impact of a specifically designed health safety training programme on the knowledge and safety practices of construction workers in Bangalore. Quantitative Approach and One group pretest and posttest design was adopted. Health safety training programme was developed and delivered by the investigator through lecture using PPT and AV aids. Structured interview schedule was conducted through Knowledge Questionnaire and Observational Checklist to collect the data from 60 constructional workers. The results revealed that the knowledge scores improved to adequate level (68.3%) and high level of practice (60%) after the Health Safety Training Programme. The findings were statistically significant. The knowledge and practices were significantly associated with age, marital status, experience, marital status, type of family and history of occupational injuries.

Keywords: Health Safety, Training Programme, Knowledge and Practice, Occupational Hazards, Construction Workers, Workplace Safety

Introduction

Occupational hazards are risks related to types of work. Physical safety hazards, chemical hazards, biological hazards, physical hazards, and ergonomic risk factors are the five categories of occupational hazards as defined by the Occupational Safety and Health Administration (OSHA) [1]. The term construction worker defined as a person who performs a variety of general construction tasks during all phases of a construction project. Construction workers are specialized for works like tearing down buildings, removing hazardous materials, building highways and roads, digging tunnels and mine shafts, laying concrete or road [2].

The construction industry in India is rapidly growing and employs a large number of workers, many of whom work in the informal sector using cheap and unsafe technology due to financial constraints. These workers often lack basic benefits and work in sites that are poorly regulated and unsupervised, leading to unsafe conditions. Despite its important role in infrastructure development, the sector faces challenges such as job insecurity and work-related stress for its employees. It is fact that a great number of employers belongs to grey market in labour- prolonged hours of work - the working conditions is average and involve danger. Their remuneration is poor, because of that it difficult to run their family. They usually work in excessive noise levels and dangerous movements of apparatus. Employers in the construction business are at risk because the work is temporary, employer-employee connections are weak and fugitive, insecure unprotected [3].

India passed the occupational safety and health law reforms in 2020. Factories Act,1948, deals with labour welfare and safety. Ministry of labour and Employment's Directorate General Factory Advice Service and Labour Institutes collects Occupational

Safety and Health statistics from state chief inspectors of factories and directors of industrial safety [4]. In 2020, according to the Bureau of Labor Statistics, the number of nonfatal falls, slips, and trips was greater for construction workers comparing to other industries, harmful substances or environments caused 9% of all workplace fatality; almost 31% of all construction accidents came from falls, slips, or trips. In 2021, according to the Bureau of Labor Statistics, 143 accidents were due to caught in between. In 2021, according to Occupational Safety Health Administration, 5400 accidents caused due to fall. About 300 deaths using cranes were reported to the Census of Fatal Occupational Injuries between 2011 and 2017, or 42 deaths annually on average. Between 2011 and 2017, almost 600 accidents were forklift-related. Struck-by, worker being hit by construction equipment or a car, fires, demolishing unknown construction materials are also the great reason for accidents [5].

The authors recommend fostering a proactive safety climate through leadership commitment, regular safety audits, and open channels for worker feedback. Integrating such organizational interventions within the health safety training programme can reinforce knowledge, ensure sustained practice of safe behaviours, and ultimately strengthen the safety infrastructure in construction projects [6] Studies have highlighted the urgent need for focused interventions to improve both awareness and compliance with PPE usage in the Indian construction sector.

In many developing regions, including India, construction workers often lack formal education, adequate safety awareness, and access to structured training programs. Despite the availability of safety guidelines and regulations, poor implementation, lack of supervision, and inadequate use of personal protective equipment (PPE) continue to contribute to a high incidence of workplace accidents. Studies have shown that insufficient knowledge and unsafe practices are major contributing factors to occupational hazards in construction settings.

Health and safety training programmes play a crucial role in improving workers' knowledge, shaping positive attitudes, and promoting safe practices at the workplace. Such interventions can significantly reduce the risk of accidents and enhance overall occupational health outcomes. However, there is a limited number of context-specific, evidence-based studies assessing the effectiveness of structured training programmes among construction workers, particularly in selected local settings.

Therefore, this study was essential to assess the existing knowledge and practices regarding the prevention of occupational hazards among construction workers and to evaluate the effectiveness of a health safety training programme. The study was certain in identifying knowledge gaps, improving safety practices, and providing evidence for policymakers, employers, and healthcare professionals to design and implement effective occupational health interventions, ultimately contributing to safer construction environments [7, 8, 9].

Objectives

1. To assess the pre-test knowledge and practice regarding prevention of occupational hazards among construction workers.
2. To assess effectiveness of health safety training programme on knowledge and practice regarding prevention of occupational hazards among construction workers.
3. To correlate between the knowledge and practice regarding prevention of occupational hazards among construction workers.
4. To associate the levels of knowledge and practice of pretest regarding prevention of occupational hazards among construction workers with their selected demographic variables.

An extensive **review of literature** was done on aspects of knowledge and practice regarding prevention of occupational hazards, health safety training programmme and on occupational hazards among construction workers.

Materials and Methods

Quantitative research approach using One group Pretest Post-test design was utilized to conduct the study. The study was conducted on construction sites in Bangalore. The sample was drawn from the population of construction workers in selected construction sites and fulfilling the inclusion criteria using non-probability Purposive Sampling method. 60 active construction workers working at construction sites selected for the study.

Data Collection Tools

Structured Questionnaire was used to assess the knowledge regarding prevention of occupational hazards. Observational Checklist was used to assess the practice of safety measures by the construction workers. The content validity was obtained from the experts in the field of public health and occupational health. Reliability was established using Brown prophecy formula.

Health Safety Training Programme

The Health Safety Training Programme is a structured educational intervention carefully developed by the investigator. It was designed to enhance awareness among construction workers about common occupational health hazards in their work environment and to equip them with essential safety practices for preventing such risks. The programme was systematically organized into modules and delivered through interactive lectures, utilizing a variety of audio-visual aids to improve participant engagement and learning outcomes.

Data Collection

After obtaining informed consent, a pre-test was conducted using a structured questionnaire and observational checklist to assess the participants' baseline knowledge and practices regarding occupational hazards. This was followed by the implementation of the Health Safety Training Programme.

The training and data collection were carried out in small groups to facilitate better interaction and ease of management. A post-test was then administered after 7 days, using the same tools, to evaluate the effectiveness of the intervention.

The study strictly adhered to ethical principles to ensure the protection of human subjects. Before the commencement of data collection, formal approval from the relevant authorities of the selected construction companies was obtained. Informed consent was secured from all participants after a clear explanation of the study's purpose, procedures, and their rights. A strict assurance of confidentiality was provided to all subjects, ensuring that

their personal information and responses remain private and were used solely for research purposes. Throughout the entire duration of the study and data collection, no ethical issues are encountered.

Results and Discussion

Distribution of Respondents Based on Personal Characteristics:

A total of 60 construction workers participated in the study. The findings show that the majority of respondents, 26 (43.3%), were in the age group of 31–45 years, indicating that most participants were in their prime working age. Most of the respondents were male, accounting for 52 (86.7%), reflecting the male dominance in the construction sector. In terms of marital status, the majority of workers were married, 40 (66.7%). Regarding educational status, a considerable proportion of respondents had no formal education, 14 (23.3%), highlighting the low educational background among many construction workers. With respect to the nature of work, the majority were general laborers, 25 (41.7%). In terms of work experience, most respondents, 22 (36.7%), had 11–20 years of experience in construction work. Concerning monthly income, the majority of the respondents, 28 (46.7%), earned between Rs. 12,001 and Rs. 21,000 per month.

Distribution of Respondents Based on Selected Characteristics:

The majority of respondents, 36 (60%), belonged to the Muslim religion. Most participants were from joint families (22; 36.7%). With regard to the number of children, the largest group of respondents, 20 (33.4%), had three or more children.

In terms of migration background, half of the respondents (30; 50%) were local residents, constituting the majority group.

Majority Findings of Selected Characteristics: The majority of respondents, 39 (65%), did not report any comorbidities. Among those with comorbid conditions, hypertension (8; 13.3%) was the most commonly reported. More than half of the respondents, 31 (51.7%), had experienced occupational injuries, with cut injuries to the hand (14; 23.3%) being the most frequent type. (Fig 1). A significant proportion of respondents, 24 (40%), reported having no source of information regarding occupational hazards. Additionally, the vast majority, 54 (90%), had not received any formal training on occupational health and safety. Among those exposed to hazards: 30% reported experiencing falls from height, 20% reported electrical shocks, 15% had respiratory issues due to dust or airborne particles. The remaining respondents experienced incidents such as back injuries, being struck by objects, or contact with chemicals. About the Use of Safety Equipment (PPE): Alarmingly, only 21.7% of the participants reported regular use of personal protective equipment (PPE), such as helmets, gloves, or boots. The remaining 78.3% stated that they either rarely or never used PPE at work. This low compliance rate could be due to lack of availability, awareness, or motivation.

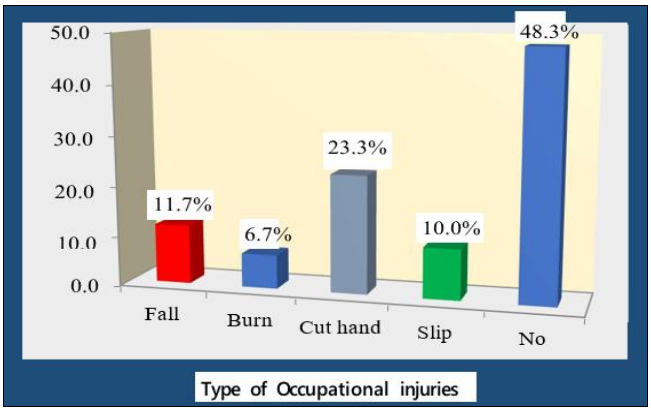

Fig 1: Classification of Respondents by Type of occupational injuries

Effectiveness of Health safety Programme in terms of Pretest and Post test scores:

Out of 60 respondents, in the pre-test knowledge level, 44 (73.3%) were inadequate, 16 (26.7%) were moderate, and 0 (0.0%) were adequate. In the post-test knowledge level, 0 (0.0%) were inadequate, 19 (31.7%) were moderate, and 41 (68.3%) were adequate. (Fig 2)

Out of 60 respondents, in the pre-test practice level, 40 (66.7%) demonstrated a low practice level, 20 (33.3%) showed a moderate practice level, and 0 (0.0%) exhibited a high practice level. In the post-test practice level, 0 (0.0%) had a low practice level, 24 (40.0%) achieved a moderate practice level, and 36 (60.0%) demonstrated a high practice level. (Fig 3)

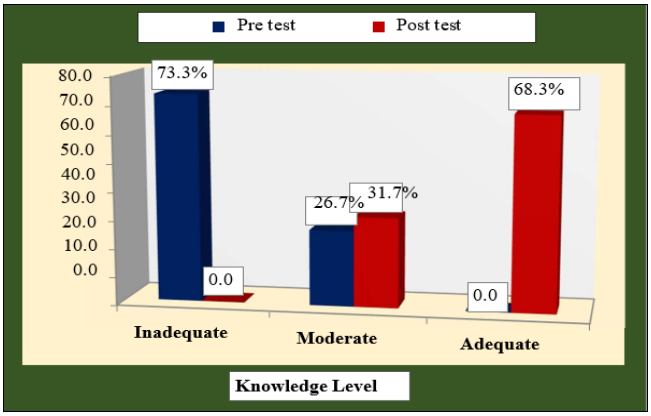

Fig 2: Classification of Respondents on Pretest and Post test Knowledge level on Prevention of Occupational hazard

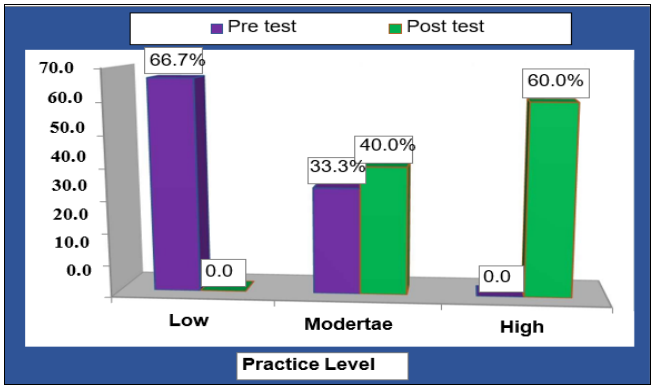

Fig 3: Classification of Respondents on Pretest and Post test Practice level on Prevention of Occupational hazards

Correlation between knowledge and Practice on prevention of Occupational Hazards

The pre-test point (37.6%, 45.7%) shows moderate practice despite lower knowledge. The post-test point (80.6%, 80.7%) shows both knowledge and practice increased substantially. This indicates improvement in both variables after the intervention. The correlation values (r = +0.21 pre-test, r = +0.47 post-test) suggested a Weak positive relationship before training and Moderate positive relationship after training, meaning better knowledge is more strongly associated with better practice post-intervention.

Association of Knowledge and Practice with demographic variables

Significant associations were observed between selected variables and knowledge scores. Age group showed a significant association ($\chi^2 = 7.39$, $p < 0.05$), with younger workers (21–30 years) demonstrating better knowledge. Marital status was also significantly associated ($\chi^2 = 10.23$, $p < 0.05$), with unmarried workers scoring higher. A significant relationship was found with work experience ($\chi^2 = 7.21$, $p < 0.05$), indicating that workers with less experience had better knowledge levels. Religion ($\chi^2 = 7.01$, $p < 0.05$) showed that Hindu respondents had higher knowledge scores. Additionally, respondents from nuclear families ($\chi^2 = 6.36$, $p < 0.05$) and those without a history of occupational injuries ($\chi^2 = 3.94$, $p < 0.05$) demonstrated better knowledge.

Regarding practice, significant associations were identified with age group ($\chi^2 = 8.70$, $p < 0.05$), where workers aged 31–45 years exhibited better safety practices. Work experience was also significantly associated ($\chi^2 = 6.10$, $p < 0.05$), with those having 11–20 years of experience demonstrating improved practices. Higher practice scores were observed among respondents from extended families ($\chi^2 = 6.46$, $p < 0.05$), those without comorbidities ($\chi^2 = 5.28$, $p < 0.05$), and workers with a history of occupational injuries ($\chi^2 = 4.04$, $p < 0.05$)

Implications

The study highlighted the urgent need for health and safety practitioners, including occupational health nurses, to proactively implement and enforce mandatory and regular health and safety training programs for all construction workers. This is crucial regardless of their prior experience or formal educational background, as a significant gap in their knowledge and practice was identified. It is critical to ensure the provision of adequate Personal Protective Equipment (PPE) to all workers. Beyond provision, consistent use of PPE must be actively promoted and monitored through continuous education, regular supervision, and practical demonstrations by health and safety personnel to effectively improve the practical application of safety measures on construction sites. These efforts are directly in line with the core principles of occupational health nursing practice, which focuses on protecting and promoting the health and safety of workers.

Conclusion

The findings highlight a clear need for health and safety education in the construction sector. The health safety training programme significantly enhanced the knowledge and safety practices of construction workers. The strong correlation between improved knowledge and better practice confirms that awareness directly influences behaviour. The demographic associations also emphasized the importance of tailoring safety interventions to specific worker profiles e.g., those with no formal education or prior training. Therefore, such interventions can serve as an effective strategy in reducing the incidence of occupational hazards. The study concluded that implementing regular, need-based safety training can play a vital role in safeguarding the health and well-being of construction workers.

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Conflict of Interest

No any conflict of interest.

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