

CASE STUDY ON HEALTH AND SAFETY KNOWLEDGE AND COMPLIANCE ON CONSTRUCTION SITE

Lab Kumar singh¹, Mukesh Pandey², Sohit Agarwal³

¹PG scholar, Civil Engineering Department, ITM University, Gwalior, M.P, India

²Professor, Head of Civil Engineering Department, ITM University Gwalior, M.P, India

³Assistant Professor Civil Engineering Department, ITM University Gwalior, M.P, India

Abstract -Considerable attention has been targeted on health and safety knowledge its compliance on construction site in Gwalior city, India. It is generally poor in India. The main purpose of the research is find out level of health and safety knowledge, compliance on site and how much impact of both on project performance on construction site. Information was administered from construction sites by questionnaires survey and personal interview. The result was highlight on building construction technical person and building construction labour health and safety knowledge, compliance and project performance. The thesis identifies Technical person health and safety knowledge is high, health and safety compliance is moderate and project performance is high. And construction labour health and safety knowledge is moderate, health and safety compliance is low and project performance is moderate. This study concludes that only technical person and only construction labour health and safety knowledge and compliance cannot improve project performance, it is possible that both technical person and construction labour should have health and safety knowledge and compliance, and strictly follow the health and safety program can improve project performance.

Key Words: Construction 1, health and safety 2, knowledge3, compliance 4, project performance 5, construction labour 6, technical person7, correlation coefficient8

1.INTRODUCTION

Health and safety is clearly connected with or related to all branches of industry; it is most important for the construction industry. In recent time, India is the one of the most developing country. It has always been a critical issue as it is carefully thought about/believed as among the most dangerous areas when it comes to occupational sudden unplanned bad events/crashes. Construction sector is linked with the dangers/risks related to the site activities. The labors and workers come from different areas and background. These workers are exposed to risks, occupational sicknesses and health dangers/risks which cause illness and injuries. This leads to loss of time and legal difficulties. Therefore, it is awfully significant for any construction site to have certain health and safety knowledge for site activities and to create awareness among the workers. Health and safety two words are usually used

together to show concern for the physical and mental well-being of the individual at the place of work. Health and safety knowledge and compliance is most important for workers, it is also positive effect in project performance. There are two management system in construction industry ILO and OSH. Most of the work executed by human being which has led to increased quantity of injuries and death on construction areas. Although national statistics show that little decreased injuries in the construction area, but then it is still very high as compared to the developed countries' standards. So, in construction place there is adequate health and safety knowledge and compliance with health and safety rules among construction workers will translate to project performance. The major purpose of this research is to show the level of health and safety knowledge, level of health and safety on construction sites and impact of health and safety knowledge and compliance on project performance, to identify construction worker positive safety attitude and behaviors and to review literature on health and safety issue of building construction worker so as to get a deeper understanding of their health and safety related issues in the construction industry.

This paper is consolidated into five classes for clarity. The introduction tells about the study as the purpose and purpose of the study. Literature reviews provided the results of the prevailing studies, while taking a specific reference to construction health and safety knowledge, compliance, rules and management system. The methods applied in the study is presented in the method section, while the results of the study are provided and discussed in the next section. Finally, the finding section includes the general results and the success of the study, including recommendations.

2. LITERATURE REVIEW

Literature screening construction health and safety broadly falls into 4 categories.

- Construction health and safety knowledge.
- Construction health and safety compliance.
- Construction health and safety rule and regulation.
- Construction health and safety management system

2.1 Construction health and safety knowledge

Satish Kumar and V.K. Bansal outline Construction industry is the second biggest industry of the country when agriculture. The men within the Indian construction industry includes of fifty fifth percent unskilled labour, twenty seventh percent skilled labour, and rest are technical and employees. Regarding sixteen percent of the nation's working population depends on constructional works for its livelihood. Construction within the developing countries like India is a lot of effortful than that of the developed countries, involving two decimals five to ten times a lot of workers per activity. The labour within the construction industry is most vulnerable as a result of employment is generally temporary in nature. Employer-employee relationship is incredibly weak and most of the time passing job security, health and welfare facilities connected with uncertain work environment due to the lack of inherent risks to life and limb. Generally, workers are unskilled that migrate in teams with or while not their families, throughout the country in search of employment. Communication drawbacks among these workers owing to variations in their language, religion, and culture reduce safety on the work places.

2.2 Construction health and safety compliance.

Workplace health and safety risks and deals with all aspects of occupational health is a strong target first time. Occupational health and safety in the construction industry in India's performance is exceptionally poor. Occupational health and safety standards in developing countries is even worse. OHS in the Indian construction industry has never been the most important significance. Through the construction industry in India is booming enough, there's one thing to start the new start / OHS regulations and rules in place by the government in an attempt to use reasonable efforts are not. There are more than two, but not a lot of makes an attempt to begin something new taken by the Government of India, however they're still in their initial stages and need to be enforced.

The employers are disquieted regarding the completion of project rather than focusing on improving OHS of their workers. The industry has larger rank of tiny and medium size firms and extremely few numbers of larger firms. Tiny firms lack helpful things/valuable provides to adapt correct OHS procedures. The workers don't appear to be given with correct training and information regarding occupational health and safety dangers/risks. Lack of knowing regarding one thing on OHS, sub-contracting system, use of ancient strategies in construction, lack of proper personal protecting equipment, low wages and labour-driven industries are number of the vital factors that have their hit/effect on occupational health and safety in Indian construction. The results are conducted by survey questionnaire form and a telephone interview.

2.3 Construction health and safety rule and regulation

Karan Singh defines construction health and safety in India is still in its early years because health and safety laws are not strictly enforced. Contractors from the beginning of any job ignore basic safety rules and regulations, however, improvement in working conditions and specific rules for the government Minimum Wages Act, Contract Labour (Regulation & Abolition) Act, 1970, and the Workmen's Compensation Act of 1923 (amended in 1962), has implemented such laws only a small amount of the scope and procedures are put into practice. National Building Code of India, 2005 for a building construction that provides guidelines for controlling the activities; As well as across the country, such as project managers, engineers and engineers in charge of the site for buildings and civil works construction safety practices handbooks SP70- BIS (BIS) of the Code. However, worker safety in the construction industry often builders, contractors, and engineers most are pushed to the bottom of the priority list, while many are unaware of any general practices and regulations. In developing countries, safety regulations generally do not exist, even if it is present, the regulatory authorities are unable to implement the rules effectively. Therefore, the construction professional in their work and to create a solid end to a desired standard setting is dependent on the security rules. It certainly accidents that directly or indirectly reduce project costs and ultimately can reduce the delay. Efforts in India and health awareness among workers and employers about the importance of security-related issues should be to raise the level.

2.4 construction health and safety management system

Long time ago, health and safety management systems are using paper notepads and slide rules, and after some time 'Construction Management Software "in the industry made its debut early in the first use of the safety management system were from. Depending on the time of the safety rules, they were "one size fits all." construction companies were working due to the law checked by the Government inspectors.

Fast forward to a time when managers began using calculators. The next generation of security management systems, there was a fundamental change. Instead of protecting the government's prescription, companies to assess their own health and safety requirements had to. They showed that they were taking all reasonable steps and respect their employees (subcontractors, suppliers, customers, members of the public) to keep others safe during weekdays SMS had to set up some types. Those calculators started morphing into the PC, many construction companies throughout for at least three reasons for an effective safety management system was:

- Moral obligation
- Regulations
- Cost-effectiveness

An SMS is a method rather than a product. The implementation of an SMS may be paper-based or software-based, for instance, the implementation must be documented and auditable, meaning that a safety inspector (among others) can check it. Three Safety Management Systems for Constructions are as follows:

- [1] HS(G)
- [2] ILO-OSH
- [3] OSHA

HS(G) known as Guidelines from the British Health and Safety Executive, ILO-OSH known as The International Labor Office “Guidelines on Occupational Safety and Health Management systems”, and OSHA known as The US Occupational Safety and Health Administration guidelines. In India, International Labour Organization (ILO) and the Occupational Safety and Health (OSH) has been working. Large construction industry provides separate safety measures while small construction industry doesn’t provide safety measures as its under local contractor.

3. METHODOLOGY

This study is quantitative approach. In doing this survey, collected data from respondents using questionnaire and personal interview. The design of the questionnaire was followed by a literature review on building construction worker’s health and safety knowledge and compliance on site. The use of survey became necessary as a result of the number of construction workers existing at the various construction sites. For the data collection visit nine random sites on the Gwalior city and take on one site takes ten to twelve respondents where eighty percent labour and twenty percent technical person. In technical person, there are site engineer, mistry, supervisor and project manager and in labour, there are construction labours. The field survey was collect empirical data for analysis upon which finding thirteen statements on level of building construction worker health and safety knowledge, twelve statements on the level of health and safety compliance of construction worker and eight statements on the impact of health and safety knowledge and compliance on project performance. Opinion of worker used five point Likert scale. The responses to the questions were 1 is very low, 2 is low, 3 is Moderate, 4 is high and 5 is Very high. The raw data was collected from construction sites and processed into from suitable for analysis. The raw data was analyzed from statistical tools software and by manually. Average of respondent rating was calculated by mean. It is mathematically represented as:

$$\bar{X} = \frac{X_1 + X_2 + X_3 + \dots + X_n}{n}$$

Where,

‘ \bar{X} ’ indicates the mean of individuals;

X_1, X_2, X_3, X_n indicates the values of the respondents rating;

the values of the respondents rating;

‘n’ indicates the number of observations.

Pearson’s Product-moment Correlation Coefficient(r) was refers the relationship between the variables under consideration because these variables have quantities values and can be expressed, converted and assessed in ratio form. For this reason, the correlation coefficient (r) provides a suitable index for assessing the relationship between the two factors under consideration. It can be calculated using the formula

$$r = \frac{N \sum XY - \sum X \cdot \sum Y}{\sqrt{N \sum X^2 - (\sum X)^2} \cdot \sqrt{N \sum Y^2 - (\sum Y)^2}}$$

where,

‘r’ indicates correlation coefficient

‘X’ indicates independent variable

‘Y’ indicates dependent variable

‘N’ indicates number of pair of respondent age

The t calculated value is compared with its critical value for n-2 degree of freedom to determine whether r is significant or not. The degree of freedom (df) (n - 2) is used at 5% significant level. The mean values of both variables are used to get their correlation. When Pearson’s Product-moment Correlation Coefficients (r) between the two variables were computed and their correlation coefficient test obtained at (n - 2) degree of freedom and 5% ($\alpha = 0.05$) significant level, the results obtained are presented in section. Decision H0 is accept if t calculated less than t critical at df (n -2) and at 5% (0.05) significance level otherwise reject H0.

4. RESULT AND DISCUSSIONS

Level of health and safety knowledge, compliance and project performance of technical person.

Table 1

No. of respondent	Knowledge	Compliance	Performance
18	3.630	3.217	3.780

Table 1 showed the level of health and safety knowledge, compliance and impact of health and safety knowledge and compliance on project performance of construction technical person. Respondent age is classifying Inclusive Form. The average mean score 3.630 showed that there was high level of health and safety knowledge, among the technical person in Gwalior city. The average mean score 3.217 showed that there was moderate level of health and safety compliance on site in Gwalior city, and the average mean score 3.780 showed that there was high Impact of health and safety knowledge and compliance on project performance on Gwalior city.

Health and safety knowledge and compliance

Table 2

Correlation coefficient(r)	Nature of Association	T-test value	T _{critical}	R ²	p-value	Decision
0.065	Very week positive correlation	0.072	4.3026	0.01	0.928	Accept H ₀

Table 2 showed that the correlation analysis between health and safety knowledge and compliance on site. 0.065 showed a very week positive correlation between the level of health and safety knowledge and compliance with health and safety issue. Though there was certain degree of health and safety knowledge among the technical person, the relationship with complying with health and safety issues on site was very weak. The value of the coefficient of determination (R²) indicated that the variation in the data collected through survey and the actual data is 0.01(1%) which is considered as negligible. When the significance of the relationship was tested, the result showed that T_{calculated} 0.072 was less than T_{critical} 4.3026 at 5% significance level α = 0.05 and (n-2) degree of freedom. Hence, since T_{critical} 4.3026 was more than T_{calculated} 0.072, H₀ was accept. This was verified by the score of the p-value 0.928 which was bigger than 0.05. This signification the unimportance of the relationship. thus, there was no strong strength relationship between Technical person health and safety knowledge and compliance.

Health and safety knowledge and project performance

Table 3

Correlation coefficient(r)	Nature of Association	T-test value	T _{critical}	R ²	p-value	Decision
0.569	moderate positive correlation	0.979	4.3026	0.32	0.431	Accept H ₀

Table 3 showed that the correlation analysis between health and safety knowledge and project performance. This result 0.569 showed a moderate positive correlation between the level of health and safety knowledge and project performance. This suggested that good understanding knowledge about the safety issue in construction could activate some behavioral changes which in turn could lead to better safety performance on site. The value of the coefficient of determination (R²) indicated that the variation in the data collected through survey and the actual data is 0.32(32%) which is achieved relationship. When the significance of the relationship was tested, the result showed that T_{calculated} 0.979 was less than T_{critical} 4.3026 at 5% significance level α = 0.05 and (n-2) degree of freedom. Hence, since T_{critical} 4.3026 was more than T_{calculated} 0.979, H₀ was accept. This was verified by the score of the p-value 0.431 which was bigger than 0.05. This signification the unimportance of the relationship. It therefore implied that there was no strong strength relationship between Technical person health and safety knowledge and compliance.

Health and safety compliance and project performance

Table 4

Correlation coefficient(r)	Nature of Association	T-test value	T _{critical}	R ²	p-value	Decision
0.710	Strong positive correlation	1.428	4.306	0.50	0.290	Accept H ₀

Table 4 show that the relationship between the health and safety compliance and project performance has a strong positive correlation r = 0.710. this implied that compliance with health and safety rules on construction site could improve project performance at least to some extent. The value of the coefficient of determination (R²) indicated that the variation in the data collected through survey and the actual data is 0.50(50%) which is considered relationship. However, when tested for sign T_{calculated} 1.428 was less than T_{critical} 4.3026 Hence, since T_{critical} 2.447 was more than T_{calculated} 1.428, H₀ was not rejected therefore, there was no significant relationship between the health and safety compliance and project performance. This was verified by the score of the p-value 0.290 which was bigger than 0.05 and therefore, rendered the not strong relationship.

Level of health and safety knowledge, compliance, and performance of construction labour.

Table 5

No. of respondent	Knowledge	Compliance	Performance
80	2.826	2.435	2.801

Table 5 showed that the level of health and safety knowledge, compliance and impact of health and safety knowledge and compliance on project performance of construction labour. Where knowledge represents the level of health and safety knowledge of construction workers, compliance represent the level of health and safety compliance of construction labour, and performance represent impact of health and safety knowledge and compliance on project performance.

Average mean score 2.826 showed that moderate level of health and safety knowledge of construction worker in Gwalior city, Average mean score 2.435 showed that low level of health and safety compliance on construction site in Gwalior city, and Average mean score 2.801 showed that the moderate impact of health and safety knowledge and compliance on project performance.

Health and safety knowledge and compliance

Table 6

Correlation coefficient(r)	Nature of Association	T-test value	T _{critical}	R ²	p-value	Decision
-0.977	Very Strong Negative correlation	-6.552	4.3026	0.96	0.023	Accept H ₀

Table 6 showed that the correlation analysis between health and safety knowledge and compliance on site. -0.977 showed a very strong negative correlation between the level of health and safety knowledge and compliance with health and safety issue. The value of the coefficient of determination (R²) indicated that the variation in the data collected through survey and the actual data is 0.96(96%) which is considered as relationship. When the significance of the relationship was tested, the result showed that T_{calculated} -6.552 was less than T_{critical} 4.3026 at 5% significance level α = 0.05 and (n-2) degree of freedom. Hence, since T_{critical} 4.3026 was more than T_{calculated} -6.552, H₀ was accept. This was substantiated by the score of the p-value 0.023 which was less than 0.05. This signification the importance of the relationship. Thus, there was strong strength

relationship between construction worker health and safety knowledge and compliance.

Health and safety knowledge and project performance

Table 7

Correlation coefficient(r)	Nature of Association	T-test value	T _{critical}	R ²	p-value	Decision
-0.867	Very strong negative correlation	-2.465	4.3026	0.75	0.133	Accept H ₀

Table 7 showed that the correlation between health and safety knowledge and project performance. This result -0.867 showed that the very strong negative correlation between the level of health and safety knowledge and project performance. This suggested that bad understanding knowledge about the safety issue in construction could activate some behavioral changes which in turn could lead to better safety performance on site. The value of the coefficient of determination (R²) indicated that the variation in the data collected through survey and the actual data is 0.75(75%) which is considered as relationship. When the significance of the relationship was tested, the result showed that T_{calculated} -2.465 was less than T_{critical} 4.3026 where 5% significance level α = 0.05 and (n-2) degree of freedom. Hence, since T_{critical} 4.3026 was more than T_{calculated} -2.465, H₀ was accept. This was verified by the score of the p-value 0.133 which was bigger than 0.05. This signification the unimportance of the relationship. It therefore implied that there was no strength or no significant relationship between Technical person health and safety knowledge and compliance.

Health and safety compliance and project performance

Table 8

Correlation coefficient(r)	Nature of Association	T-test value	T _{critical}	R ²	p-value	Decision
0.912	Very Strong positive correlation	3.147	4.3026	0.83	0.088	Accept H ₀

Table 8 show that the relationship between the health and safety compliance and project performance has a very strong positive correlation r = 0.912. this implied that compliance with health and safety rules on construction site could improve project performance at least to some extent. The value of the coefficient of determination (R²) indicated that the variation in the data collected through survey and the actual data is 0.83(83%) which is considered as relationship. However, when tested for sign T_{calculated} 3.147 was less than T_{critical} 4.3026 Hence, since T_{critical} 4.3026 was more than T_{calculated} 3.147, H₀ was not rejected therefore, there was no significant relationship between the health and

safety compliance and project performance. This was verified by the score of the p-value 0.088 which was bigger than 0.05 and therefore, rendered the strength of relationship is weak.

5. CONCLUSION

This study has found that the level of health and safety knowledge among the technical persons was high. It also found that the level of health and safety compliance among the technical persons was moderate. The result further revealed that effect of health and safety knowledge and compliance of construction on the project performance was moderate. It went further to establish a relationship between health and safety knowledge and compliance of technical person is very weak positive correlation. The relationship strength was weak. In the health and safety knowledge and impact of health and safety knowledge and compliance on project performance was moderate positive correlation and the relationship was found not strong. In the health and safety compliance and impact of health and safety knowledge and compliance on project performance was strong positive correlation and there is weak strength relationship each other.

Construction worker was moderate level of knowledge of the health and safety, and the health and safety of workers also found to reduce the level of compliance and health and safety knowledge and performance of the project had the effect of compliance was moderate. It went further health and safety knowledge and health and safety compliance to establish a connection between the very strong negative correlation was found each other's strengths and strengthen their relationship. Project performance and health and safety knowledge was very strong negative correlation relationship. between compliance and project performance its relationship strength was very strong negative correlation. And health and safety compliance and project performance very strong positive relationship was found with respect to each other strength.

This study further declared that only technical person and only construction labour health and safety knowledge and compliance cannot improve project performance, it is possible that both technical person and construction labour should have knowledge and compliance and both strictly follow the health and safety rule and regulations then progress project performance.

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