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Factors Influencing Occupational Health Issues Of Contract Workers In Construction Industry In Tamilnadu

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Abstract

Construction industry is one of the biggest industries in India and it has provided employment opportunities to more than 50 million people in the country. Workers working in the construction industry are handling many types of raw materials and they are living in the polluted working environment. Hence there are many factors that affect the health of contract workers in the construction industry. The study attempted to analyse the factors influenced the health of contract workers in the construction industry in the state of Tamilnadu with the sample size of 385 contract workers working in various construction companies in the districts of Cuddalore, Vellore, Thoothukudi, Erode and tiruchirappalli. The study evidenced that majority of the respondents (52.7%) were below 40 years of age. Majority of the respondents (63.9%) had a work experience of more than 10 years in construction industry, majority of the respondents (58.4%) were labours and majority of the contract workers in construction industry were working more than the normal working hours (8 hours). Material and equipment used in the construction industry was found to be the most severe factor that influenced on the contract workers' health and 'lack of safety measures' was found to be the least severe factor. Age, nature of work and working hours of the contract workers had significant relationship with the factor of 'work related factors'. Awareness level, age and nature of work had significant relationship with the factor of 'material and equipment'. Awareness level, experience in construction work and nature of work had significant relationship with the factor of 'work environment. Awareness level, age and experience of contract workers had significant relationship with the factor of 'lack of safety measures' and nature of work and working hours had significant relationship with psychological factors.

Keywords: Construction, contract, occupational health, awareness, environment.

Introduction

Construction industry is one of the fastest growing industries in India and also it is the evergreen industry in the country, since it is a developing country, the government and also private sector are developing infrastructure in the country. Hence this industry is providing a considerable employment opportunity to people both directly and indirectly. This industry requires a vast number of unskilled and semi-skilled workers rather than a skilled work force. Construction industry uses many types of raw materials for construction such as, cement, sand, brick, rod, chemicals etc., majority of them are made by chemicals and they make gradual impact on human health who are spending long period of time in the work sites. Workers who are working in the construction sites cannot avoid inhaling the air which is polluted with construction materials and construction work. Indian construction industry has provided a total of 59.53 million employment opportunities to people in the year 2019-20 (Chand R & Singh J 2022). Unlike other industries, in the construction industry there are many factors to cause occupational health defects of workers in the industry. The probability of being affected by occupational deceases is very high in this industry. Apart from the occupational deceases, the probability of accidents is also high in the construction industry. In most countries, there are high number occupational accidents in construction industry (Torner M & Pousette A, 2009). Many factors are affecting the occupational health of workers in the construction industry. Unlike other industry, in construction industry, a considerable portion of the workers are recruited under contract basis. Hence there are many contract workers in construction industry and generally they are paid low wages compared to permanent workers. The awareness level of contract employees in construction industry regarding these occupational health issues and factors affecting the occupational health is very low, since most of them are either not educated or low educated. Casual nature of employment, lack of labour welfare activities, uncertain working hours, unsafe working conditions, injuries, wage exploitation and differentiation, noise, working at high places, and bad habits affected the workers and reduce their labour efficiency in construction sector (Ponnaian K & Iyappan T (2016). Idoga P.E. (2018) stated that training, construction workers health/safety knowledge as well as safety planning and safety assessment had significant influence on the health and safety of construction workers. Smoking and alcohol consumption is affecting construction workers rapidly than other sector workers, strong statistical association was found between morbidity and the presence of smoking, alcohol consumption, and use of other forms of tobacco, type/nature of work,

marital status and type of diet they consumed (Mohankumar P, Gopalakrishnan S & Muthulakshmi M (2018). The state of Tamilnadu is one of the biggest and fast-growing states in India. Construction industry in the state is progressing at very high rate and providing employment to people. The research paper has aimed to study the factors affecting occupational health of contract workers of construction industry in the state of Tamilnadu.

Literature Review

Ponnaian K & Iyappan T (2016) analysed the problems of workers in construction industry in Kanniyakumari district of Tamilnadu state. The study concluded that the problems such as casual nature of employment, absence of social security, lack of labour welfare activities, uncertain working hours, unsafe working conditions, occupational diseases, injuries, wage exploitation and differentiation, noise, working at high places, non-availability of raw materials, mobility of labour, lack of co-operation and satisfaction and bad habits affected the workers and reduce their labour efficiency in construction sector. **Abas NH et al (2020)** presented review of the factors affecting safety performance of construction project, focused on project level. The study concluded that there were several identified factors that could affect the safety performance of construction project in project level. There were many advantages by implementing these safety factors, such as reduce the number of accident on the construction project, increase productivity, project complete on time, and decrease compensation cost and increase morals among employees. **Jung M, Lim S & Chi S (2020)** investigated how the work environment and psychological state influence construction workers' perceptions and safety behaviors. The study found that construction workers' safety compliance and participation behavior were related to their safety knowledge and motivation, and depression and trait anxiety were found to lower safety motivation, knowledge, and, eventually, safety behavior. Job demands, lack of job control, lack of reward, and lack of organizational justice negatively impacted safety behavior. In contrast, job support did not show a significant relationship with safety behavior.
Abaya P.M., Diang'a, A.S. & Gwaya A (2021) investigated the factors affecting occupational safety and health compliance of the construction sites in Kiambu County, Kenya. The study concluded that stakeholder engagement and use of technology affected the OSH compliance on the construction sites. The study also revealed that use of appropriate technology and engaging the stakeholders in the right manner on the construction sites greatly attributes to OSH compliance on the construction sites. **Rani H.A et al (2022)** explored the factors affecting workplace well-being in building construction projects. The study determined 14 critical factors were determined namely, including salary package, working hours, project progress, planning of the project, workers' welfare, relationship between top management and employees, timeline of salary payment, working environment, employee work monitoring, communication between workers, insurance for construction worker, general safety and health monitoring, collaboration between top management and employee, and project leadership. **Azees AS (2022)** assessed the prevalence and factors associated with lung function abnormalities among rice mill workers in Sokoto state, Northwest Nigeria. The study found that about a third of 119 (30.2%) of the respondents had abnormalities on spirometry, and there was a statistically significant reduction in the mean FVC (3.63 ± 0.39) and FEV1 (3.01 ± 0.36). Being at least 30 years of age (aOR=3.3), working more than 8 hours a day (aOR=2.4), and having at least a symptom of respiratory morbidity (aOR=10.1) were the factors found to be significantly associated with lung function abnormalities. The study concluded that the prevalence of lung function abnormality among rice mill workers in Sokoto state was relatively high and age, number of hours worked per day and having at least a symptom of respiratory morbidity were the factors associated with lung function abnormalities.
Kartikeyan PN et al (2022) studied a series of reviews of previous literature were described in relation to the elements of reliability, integrity, and availability. This study examined the methods used to investigate the levels of each element as well as the results of performing the analysis. The study showed that the chosen reviews had positive and negative changes towards the level of machinery safety and a more substantial approach was needed to further strengthen the issue. The proposed model combined the effort of employees and various management organizations as a team. The model was validated using Bias-Variance trade-off method that analyses the proposed model in a 27MW power plant with a selection of employees and management. **Solmaz M and Solmaz T (2023)** examined the root cause analysis process of occupational accidents that occurred in a state hospital and to examine how it was applied in the health facility. The study found that of those who had occupational accidents, 67.94% were women, 45% were nurses, 25 were cleaning staff and 3% were physicians. Fifty percent of the accidents occurred in inpatient services, 15% in emergency services, and 15% in intensive care units. Causes of accidents; needle-stick injuries (71.8%) are the most common occupational accidents. These injuries are followed by slipping and falling (14.7%).

Objectives

The current research work has the following objectives.

- To study the socio-economic background of the contract workers in Construction industry in Tamilnadu.

- To study the factors affecting the occupational health defects of the contract workers in Construction industry in Tamilnadu and
- To study the relationship between socio-economic factors and factors affecting the occupational health defects of the contract workers in Construction industry in Tamilnadu.

Methodology

The study has been undertaken to analyse the factors affecting the occupational health defects of the contract workers in Construction industry in Tamilnadu. For this purpose, the researcher selected five districts from the state of Tamilnadu namely Cuddalore district from North, Erode district East, Vellore district from East, Thoothukudi district from South and Tiruchirapalli district from central Tamilnadu. The sample size of the study is 385 contract workers of construction industry from the study area. The sample respondents are selected using convenient sampling method. A well-structured interview schedule was prepared and served to collect primary data from the sample respondents. The researchers applied appropriate statistical tools to analyse the data such as, Cronbach's Alpha test to test the reliability of the interview schedule, Factor analysis for reducing factors identified and correlation analysis to know the relationship between socio-economic factors and factors influencing occupational health defects of contract workers in construction industry in the study area.

Results and Discussion

Unlike other industries, employees working in the construction industry are being affected by occupational diseases much. The possibility of being affected by the health of contract construction workers is higher than employees in other industries. Hence the researchers of the study are intended to analyse the factors affecting the health of contract employees in construction industry in the state of Tamilnadu. For this purpose their socio-economic factors are studied and the results are presented in table 1.

Table 1: Socio-Economic Background of the Contract Workers

Sl. No.	Classification	Freq.	%
Age			
1	Upto 30 Years	102	26.5
2	31 to 40 Years	101	26.2
3	41 to 50 Years	81	21.1
4	Above 60 Years	101	26.2
	Total	385	100
Experience			
1	Upto 5 Years	62	16.1
2	5 to 10 Years	77	20.0
3	11 to 15 Years	103	26.8
4	16 to 20 Years	74	19.2
5	Above 20 Years	69	17.9
	Total	385	100.0
Nature of Work			
1	Labour	225	58.4
2	Supervisor	27	7.0
3	Foreman	32	8.3
4	Engineer	35	9.1
5	Storekeeper	26	6.8
6	Others	40	10.4
	Total	385	100.0
Working Hours			
1	Less than 8 hours	125	32.5
2	8 to 10 hours	129	33.5
3	Above 10 hours	131	34.0
	Total	385	100.0

Source: Primary Data

It could be known that majority of the respondents (52.7%) in the study area who were working in construction industry were below 40 years of age. Little more than one fourth of the total respondents were more than 60 years of age. Majority of the respondents (63.9%) had a work experience of more than 10 years in construction industry. It was also noticed that majority of the respondents in the study area (58.4%) were labours. It was also noticed that majority of the contract workers in construction industry in the study area were working more than the normal working hours, i.e., they were working more than 8 hours per day, of which 34% were working more than 10 hours a day.

Factor Analysis – Factors Affecting Occupational Health Issues

The researcher identified 20 various factors which are probably affecting occupational health of the contract employees in construction industry in the state of Tamilnadu. With the view of reducing these number of factors, the researcher applied factor analysis. This portion of the thesis presents the results of the factor analysis on factors affecting occupational health of the contract employees of construction industry in the study area. The results of the communalities of the statements before and after the factor extraction are presented in the following Table. The initial communality i.e., before extraction is assumed to be 1. However, after factor extraction the communality depend upon the amount of variance available for the analysis of the selected variable. Individually, 100 percent variance is available for analyzing the statements/variables. However, after factors are extracted, the same variance is lost in the process. Hence, it is required to analyze the remaining variance available for the analysis. The individual variances are presented in the following communalities. It is the proportion of variance explained by the variables after extraction by factor analysis.

Table 2: Communalities of Variables of Factors Affecting Occupational Health Issues

Sl. No.	Factors	Initial	Extraction
1	Long working hours	1.000	0.602
2	Continuous work without rest	1.000	0.555
3	Lack of leave / holiday availed	1.000	0.622
4	Dust from materials (cement / sand etc.)	1.000	0.673
5	Usage of chemicals in construction	1.000	0.732
6	Noise in work place	1.000	0.541
7	Falling objects	1.000	0.641
8	Lack of safety instruments provided	1.000	0.583
9	Happenings to work in heights	1.000	0.506
10	Electricity risks	1.000	0.662
11	Hazardous machineries usage	1.000	0.598
12	Welding fumes	1.000	0.572
13	Chances of collapse in construction	1.000	0.612
14	Availability of unhealthy foods	1.000	0.675
15	Lack of knowledge in operating machineries.	1.000	0.688
16	Pressure from superiors	1.000	0.651
17	Stress by thinking about fear of loosing job.	1.000	0.542
18	Handling heavy materials manually.	1.000	0.584
19	Handling sharpen instruments.	1.000	0.674
20	Working frequent night shift during a project	1.000	0.644

Table 2 depicts that the individual variances of the variables were high, which were a statistically significant range. The results indicate that the calculated values of extracted communalities of all the variables are greater than 0.5. The extracted communalities show the goodness of fit of the factor analysis. Higher the value of extracted communalities of the variables, the better it is. Hence, for factor analysis, all the variables can be taken. The factor analysis applies the process of Principle Component Analysis (PCA) with the view of identifying and estimating the eigenvalues of principle components. After calculating the Eigen values of the components, they are arranged in descending order with respect to calculated Eigen values. According to Kaiser‘s criterion, the factors having Eigen value more than 1 are retained for the study. This leads to the reduction of factors as shown in the Table below. Factor analysis is a statistical tool used to describe the variability among observed and correlated variables in terms of a potentially lower number of unabsorbed factors. It is mainly used to reduce the number of variables taken by the researcher. On the basis of inter correlation between the variables and several the factors are grouped one. The researcher identified 20 factors affecting occupational health of contract employees of construction industry of the state of Tamilnadu. In order to reduce and group the inter correlated variables into one, factor analysis was applied and the results of Eigen values, percentage of variance, cumulative percentage for initial Eigen values and rotation sums of squared loadings are presented in the following table.

Table 3: Total Variance Explained: Factors Affecting Occupational Health Issues

Component	Initial Eigen values			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative per cent	Total	%Variance	Cumulative per cent
1	1.474	12.272	12.272	1.474	12.272	12.272
2	1.327	11.635	23.907	1.327	11.635	23.907
3	1.320	10.601	34.508	1.320	10.601	34.508
4	1.236	10.479	44.987	1.236	10.479	44.987
5	1.192	9.259	54.246	1.192	9.259	54.246
6	0.990	7.072	61.318			
7	0.950	6.085	67.403			
8	0.941	5.132	72.535			
9	0.938	4.203	76.738			
10	0.908	3.230	79.968			
11	0.896	2.719	82.687			
12	0.861	2.505	85.192			
13	0.849	2.381	87.573			
14	0.831	2.307	89.880			
15	0.822	2.247	92.127			
16	0.791	2.153	94.280			
17	0.752	1.856	96.136			
18	0.673	1.462	97.598			
19	0.659	1.367	98.965			
20	0.607	1.035	100.000			

Extraction Method: Principal Component Analysis.
Source: Primary Data

Table 3 shows the results of factor analysis in terms of Eigen values at initial stage and after the process of rotation method for the factors affecting occupational health of contract employees in construction industry in the study area. The results indicated that all the 20 factors were reduced into 5 factors by factor analysis by following rotation method, i.e. which are having Eigen value of more than 1. All the 5 factors explained 54.246 per cent of variance of the included statements. It is assumed that the explained variance is sufficient and the extracted variables can be used for further analysis. For the purpose of modifying the extracted components representing the selected statements (20 statements or variables), orthogonal rotation (Varimax) is applied. The Rotated Component Matrix (RCM) shows the factor loading of each variable to the extracted factors. The factor loadings can be defined as the correlation between the factors and the variables. It is assumed that every variable considered for the study must have significant factor loading to only one factor and insignificant factor loadings to all other extracted factors. Its results along with correlation under rotated matrix are presented in Table ////.

Table 4: Factors Affecting Occupational Health Issues of Contract Workers in Construction Industry (Rotated Component Matrix[a])

Sl. No.	Factors	Component					Factor Name
		1	2	3	4	5	
1	Long working hours	0.846					Work Related Factors
2	Continuous work without rest	0.832					
3	Lack of leave / holiday availed	0.789					
4	Working frequent night shift during a project	0.754					
5	Dust from materials (cement / sand etc.)		0.883				Material & Equipment
6	Usage of chemicals in construction		0.845				
7	Falling objects		0.816				
8	Electricity risks		0.764				
9	Hazardous machineries usage		0.732				

Sl. No.	Factors	Component					Factor Name
		1	2	3	4	5	
10	Noise in work place			0.842			Work Environment
11	Happenings to work in heights			0.811			
12	Welding fumes			0.763			
13	Chances of collapse in construction			0.721			
14	Lack of safety instruments provided				0.869		Lack of Safety Measures
15	Availability of unhealthy foods				0.841		
16	Lack of knowledge in operating machineries.				0.832		
17	Handling heavy materials manually.				0.784		
18	Handling sharpen instruments.				0.742		
19	Pressure from superiors					0.754	Psychological Factors
20	Stress by thinking about fear of loosing job.					0.716	

Table 4 shows that the results of factor analysis for the factors affecting on occupational health of contract workers in construction industry in the study area. 20 factors were reduced into five factors by using factor analysis. The factors Long working hours, Continuous work without rest, Lack of leave / holiday availed and Working frequent night shift during a project were highly correlated with factor 1, hence they were grouped into one and they were labeled as "Work Related Factors". The factors Dust from materials (cement / sand etc.), Usage of chemicals in construction, Falling objects, Electricity risks and Hazardous machineries usage were highly correlated with factor 2, hence they were grouped into one and they were labeled as "Material and Equipment". The factors, Noise in work place, Happenings to work in heights, Welding fumes and Chances of collapse in construction were highly correlated with factor 3, hence they were grouped into one and labeled as "Work Environment". The factors Lack of safety instruments provided, Availability of unhealthy foods during working hours, Lack of knowledge in operating machineries, Handling heavy materials manually and Handling sharpen instruments were highly correlated with factor 4, hence they were grouped into one and named as "Lack of Safety Measures". The factors Pressure from superiors and Stress by thinking about fear of loosing job were correlated with factor five, hence they were grouped into one and it was labeled as "Psychological Factors".

According to the results of Factor Analysis, the total number of factors (20) are reduced into five and the following results are given for the five factors which are influencing the occupational health defects on contract construction employees in the study area. The following table presents mean, standard deviation, coefficient of variation and the factors are ranked according to mean values.

Table 5: Factors Influencing Occupational Health Issues of Contract Construction Workers

Sl. No.	Factors	$\bar{x}$	σ	CV	Mean Rank
1.	Work Related Factors	2.94	0.65	22.06	3
2.	Material and Equipment	3.03	0.61	20.05	1
3.	Work Environment	2.88	0.73	25.21	4
4.	Lack of Safety Measures	2.78	0.62	21.37	5
5.	Psychological Factors	3.02	1.05	34.67	2

Source: Primary Data

It could be known from the results that material and equipment is the most severe factor influencing the health of contract workers in construction industry in Tamilnadu, since its calculated mean value was highest (3.03) among the factors, followed by psychological factors are also severe factor for causing occupational health issues of contract workers in construction industry. It was observed that lack of safety measures was the least affecting factor on the health of contract construction employees in the study area, since the construction companies in the study area have implemented sufficient safety measures for workers. Following to the factor, the factor of work environment was also the least affecting factor on the health of contract construction workers in the study area. The results of standard deviation and coefficient of variation indicated that there was low level of variation in the opinion of the respondents from the mean value. The deviation was little higher for psychological factors.

It was also aimed by the study that to know whether there is any significant relationship between socio-economic and factors affecting the health of contract workers in construction industry in the study area, correlation analysis was applied. For this purpose the following null hypothesis was framed. These results are presented in table 6.
Ho: There is no significant relationship between socio-economic factors and factors influencing the health of contract construction workers.

Table 6: Relationship between Socio-Economic Factors and Factors Influencing Health of Contract Workers

		Awareness	Age	Experience	Nature of Work	Working Hours
Work Related Factors	Pearson Correlation	0.006	**0.575***	0.021	**0.449***	**0.557***
	Sig. (2-tailed)	0.914	0.021	0.481	0.021	0.014
	N	385	385	385	385	385
Material and Equipment	Pearson Correlation	**0.542***	**0.342***	0.334	**0.667***	0.136
	Sig. (2-tailed)	0.014	0.042	0.243	0.041	0.337
	N	385	385	385	385	385
Work Environment	Pearson Correlation	**0.425***	0.213	**0.598***	**0.428***	0.095
	Sig. (2-tailed)	0.030	0.346	0.002	0.037	0.076
	N	385	385	385	385	385
Lack of Safety Measures	Pearson Correlation	**-0.389***	**0.421***	**0.623***	0.223	0.155
	Sig. (2-tailed)	0.033	0.013	0.003	0.086	0.342
	N	385	385	385	385	385
Psychological Factors	Pearson Correlation	-0.061	0.118	0.154	**0.591***	**0.476***
	Sig. (2-tailed)	0.234	0.322	0.421	0.004	0.005
	N	385	385	385	385	385

Source: Primary Data

* Correlation is significant at the 0.05 level (2-tailed).

It could be understood from the results of the above that awareness level of the contract workers had significant relationship with the factors of material and equipment, work environment and lack of safety measures on the health of the contract workers in the study area, since their calculated correlation coefficients are significant at 5% level, hence the null hypothesis was rejected. The calculated values of correlation coefficient between age of the contract workers and work related factors, material and equipment and lack of safety measures are 0.575, 0.342 and 0.421 respectively, they are significant at 5% level, hence the null hypothesis was rejected and therefore there was significant relationship between age of the contract workers and the factors of work related factors, material and equipment and lack of safety measures on contract workers health. Work experience of contract workers in construction industry had significant relationship with the factors of work environment and lack of safety measures on the health of the contract workers in the study area, since their calculated correlation coefficients are significant at 5% level, hence the null hypothesis was rejected. The calculated values of correlation coefficient between nature of work of the contract workers and the factors of work related factors, material and equipment, work environment and psychological factors are 0.449, 0.667, 0.428 and 0.591 respectively, they are significant at 5% level, hence the null hypothesis was rejected and therefore there was significant relationship between nature of work of the contract workers and the factors of work related factors, material and equipment, work environment and psychological factors. The calculated values of correlation coefficient between working hours of the contract workers and the factors of work related factors and psychological factors are 0.557 and 0.476 respectively, they are significant at 5% level, hence the null hypothesis was rejected and therefore there was significant relationship between working hours of the contract workers and the factors of work related factors and psychological factors.

Conclusion

Construction industry is one of the biggest industries in India and it has provided employment opportunities to more than 50 million people in the country. Workers working in the construction industry are handling many types of raw materials and they are living in the polluted working environment. Hence there are many factors that affect the health of contract workers in the construction industry. The study attempted to analyse the factors influenced the health of contract workers in the construction industry in the state of Tamilnadu. While the study was undertaken with the sample size of 385 contract workers, it was evident that majority of the respondents (52.7%) were below 40 years of age. Majority of the respondents (63.9%) had a work experience of more than 10 years in construction industry, majority of the respondents (58.4%) were labours and majority of the contract workers in construction industry were working more than the normal working hours (8 hours). Material and equipment used in the construction industry was found to be the most severe factor that influenced on the contract workers' health and 'lack of safety measures' was found to be the least severe factor. Age, nature of work

and working hours of the contract workers had significant relationship with the factor of 'work related factors'. Awareness level, age and nature of work had significant relationship with the factor of 'material and equipment'. Awareness level, experience in construction work and nature of work had significant relationship with the factor of 'work environment. Awareness level, age and experience of contract workers had significant relationship with the factor of 'lack of safety measures' and nature of work and working hours had significant relationship with psychological factors.

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