

Original Article

Occupational health problems of construction workers in India

Abstract

Context: Construction industry is one of the stable growing industries of the world and in India it is the largest economic activity after agriculture. Construction workers are at a greater risk of developing certain health disorders and sickness than workers in many other industries. Very little research has been done on the occupational health, hazards and psychosocial problems of these workers especially in Asian countries like India. **Aims:** The aim of this study is to understand the occupational health problems of construction workers — building and civil, to compare the morbidities among these two categories of workers. **Settings and Design:** The cross-sectional study was conducted at Kozhikode district of Kerala, India. **Materials and Methods:** Construction projects were selected by simple random method and all workers ($N = 410$) were enrolled as study subjects. Data was collected by the team consisting of investigators, doctors and social worker using a pre tested validated structured proforma. **Results:** Data was collected from 387 (94.4%) workers. Most of them belonged to the young age group (26.8 years). The prevalence of past morbidity like tuberculosis (1%), malaria (13.7%) and jaundice (10.6%), typhoid (3.4%) were higher than the general population in both groups without any statistically significant differences between them. Prevalence of injury was higher among civil work group (17.2% and 6.6%). Current fever, respiratory infections, eye disease were higher among Group I, skin and musculo-skeletal problems were similar. **Conclusions:** Measures are needed to improve the work environment of construction workers by ensuring availability of protective gears, sanitation facilities at the sites along with an accessible, accountable occupational health services.

Key words: Building and construction workers, occupational health, skin problems, water borne disease, work related injury

Thayyil Jayakrishnan,
Bina Thomas,
Bhaskar Rao, Biju George

Department of Community
Medicine, Government Medical
College, Calicut, Kerala, India

Address for the Correspondence:

Dr. Thayyil Jayakrishnan,
Department of Community
Medicine, Government Medical
College, Calicut, Kerala, India.
E-mail: drjayakrishnant@
yahoo.com

Access this article online

Website: www.ijmedph.org

DOI: 10.4103/2230-8598.123415

Quick response code:



INTRODUCTION

Construction industry is one of the stable growing industries of the world and construction labor form 7.5% of the world labor force.^[1,2] In India, it is the largest economic activity after agriculture and since it is a labor-intensive industry consist 44% of all urban unorganized workers.^[1-3] This work force comprises 55% of unskilled labor, 27% skilled labor and rest the technical and support staff.^[2] The two broad categories of construction works are building and civil engineering.^[2] Building applies to works involving structures such as houses, offices, shops, factories and schools. Civil engineering applies to all the other built structures in our environments, including roads, tunnels, canals, dams, railways and docks.^[1,2] Construction workers in both categories are at a greater risk of developing certain health disorders and sickness than workers in many other industries.^[4] They are exposed to multiple physical, chemical and biological agents, which make them vulnerable to various health problems that include - injuries, respiratory problems, dermatitis, musculo-skeletal disorders and gastro-intestinal diseases.^[2,5] The work is hard physical labor, often under difficult conditions like adverse weather conditions and the nature of work, hours of work, low pay, poor living conditions with lack of basic amenities and separation from family, lack of job security and lack of access to occupational health services make the situation worse.^[1,5,6] Due to ergonomic issues they are also vulnerable to degenerative disorders.^[1] Apart from this, in most of construction projects the workers employed are unorganized in nature and often not guided by the legislations made for the health and welfare of the workers and hence are not eligible for free or subsidized care.^[1,7]

In India they are mostly migrants from remote villages, often are less educated and not cautious about different preventive measures.^[3] Most of them are inter-state migrants and has poor language skills that prevent them from understanding the safety precautions given and to voice their problems.^[7] Their health and safety are also neglected and accident and occupational disease statistics are not accurately available.^[2] In the era of globalization construction is a fast growing industry and very little research has been done on the occupational health, hazards and psychosocial problems of these workers especially in Asian countries like India.^[3] In this context to understand the health problems of construction workers and to compare the morbidities among the two categories (building and civil workers) and advocate public health policy measures, this study was conducted.

MATERIALS AND METHODS

The cross-sectional study was conducted at Kozhikode district of Kerala, India during the year 2010 as part of the project “health of migrant employees” (HOME) by Department of Community medicine, Government Medical College Calicut, in collaboration with the Department of Labor Kerala state. Based on an earlier reported prevalence of morbidity of 47.8% and with a precision of 5% and 95% confidence level the required minimum sample size in each group was 180.^[1] The sampling unit was construction projects and the study population was all the unskilled and semi-skilled workers at the construction projects. The current construction projects in the district were listed ($n = 24$) from district labor department and 8 projects (3 construction + 5 civil) were selected by simple random method to get enough sample size. All the unskilled, semi-skilled workers in the selected projects were enrolled as study subjects and included total 410 subjects (n) with 200 in building (Group I) and 210 in civil works (Group II). The skilled, technical and support staffs were excluded. The job categories included manual labors, earth workers, landscaping, digging, paving, masonry, cement workers, cement mixing, concrete pumping, concreting (unskilled) and scaffolding, cutter, jack span cleaning, carpentering, painting, plumbing, pipeline fitting, rod bending, steel fixing, welding, bar making, Lift/crane operating (Semiskilled).

Managers of the selected projects were contacted and screening camps were conducted on fixed days from 9 am to 2 pm at the project sites without affecting the work. In case there is more than one work site under one project the workers were transported to the main camp sites. Since the workers camp sites were near the project sites and free medicines were distributed, maximum participation was ensured and those with sickness absenteeism also attended the screening thus enabling us to elicit maximum morbidity.

At the selected sites, all workers whose names were included in the nominal roll were included in the study. The workers attended the screening camp as per their nominal roll in batches accompanied by the supervisors. Data were collected by the team consisting of investigators, doctors and social worker using a pre-tested validated

structured pro forma. At each site five stations were arranged and personal data, past medical history, anthropometric data was collected directly and medical and laboratory examinations were performed. The personal particulars included age, sex, education, marital status, state of origin and personal habits/addictions. Since most of the workers were interstate migrants from north Indian states persons knowing Hindi or translators were posted in each station. The height and weight was measured by a validated instrument using standard procedures. To eliminate the confounding effect of seasonal variation the study was conducted within a month period and to avoid inter-personal errors all the data were collected by same persons.

The details of self-reported occupational history, past medical history, occupational accidents and tuberculosis (TB), vector borne diseases like malaria, dengue and leptospirosis, water borne disease typhoid, jaundice and sexually transmitted diseases (STDs) were collected. History of hospitalization, injury during last 1 year was collected. During medical examination, they were asked about their present health problems and physical examination was done and recorded. Hearing impairment was assessed by standard methods using a tuning fork by expert physicians. Those with fever blood smear examination were done to rule out malaria.

The following operational definitions were used for the study. An “unskilled worker” is one who possesses no special training and whose work involves the performance of the simple duties that require the exercise of little or no independent judgment or previous experience, although a familiarity with the occupational environment is necessary.^[6] A semi “skilled worker:” One who has got some knowledge and skills of the particular trade or to do respective work and simple job with the help of simple tools or machines and not undergone any formal training course. A person using any tobacco product on a daily basis for more than 1 year was labeled as “tobacco user.”^[6] Alcohol users were considered as those who had consumed alcohol at least once per month.^[6]

The study protocol was approved by institutional ethics committee, permission was obtained from district labor department and project owners. Data collection was done after getting informed consent from the participants. Written informed consents were obtained from those able to read and write and for illiterate, it was read out in the presence of a signed witness in local vernacular. Those requiring medications were given free drugs and referrals were given.

Analysis

All the collected data was coded and entered in Excel data sheet and Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) 16.0 program (SPSS Inc., Chicago, IL, USA) for Windows 7. The data analysis was performed for building and civil workers separately and comparison was done. Mean and standard deviations were derived for numerical data. Prevalence is reported in percentages. Odds ratio was calculated at 95% confidence of intervals. Significance level was defined as $P < 0.05$.

RESULTS

Out of the total 410 workers, we could get informed consent and collect data from 387 (94.4%) workers. Among the remaining, we could not collect data from 23. 13 persons were not willing to give their consent and 10 were absent not due to reasons other than any sickness. Among Group I - 183 (91.5%) building workers and among Group II-204 (97.1%) civil workers participated in the study. All were males. Mean age was 27.3(9.1) and 27.9(9.2) years and are comparable. Anthropometrically the height and weight of both groups was comparable [Table 1]. Majority in both groups were unmarried. Similarly, the literacy status was also comparable. The mean period of experience in the present job which corresponds to exposure is comparable in both groups [Table 1].

All the workers (100%) were interstate migrants. Most of them were from Northern India - 85% and 51% respectively in Groups I and II.

There were no significant difference in the prevalence of tobacco use (57.4% and 62.4%, $P = 0.28$). Alcohol use was higher among Group II. (8.7% and 24%. $P = 0.001$),

The prevalence of past morbidity like TB, malaria, jaundice, typhoid were higher than general population in both groups without any statistically significant differences between them [Table 2].

The prevalence of hospitalization was similar in both groups, prevalence of injury was higher among civil work group ($P 0.001$) [Table 2]. Though the district was endemic for dengue no cases were reported. Only 1 case of STD was reported in a civil worker. Current fever, respiratory infections, eye disease were higher among group I, skin and musculo-skeletal problems were similar in both groups [Table 2].

DISCUSSION

All were interstate migrant workers. Due to high literacy status and job aspirations of the people the state is experiencing scarcity of indigenous construction workers and most of the workers in construction industry are migrants.^[7] Gender and age, experience and anthropometric measurements in both groups were comparable. Hence, we expected biological and ergonomic confounders for health outcomes to be minimal in the study. Important determinants of health behavior like literacy status and marital status in both groups were also comparable [Table 1].

Since one-fourth of the workers were illiterate a lack of awareness about healthy choices and prevalence of addictions were expected to be high. Among the workers 60.2% were current users of tobacco, which was slightly higher than early reported study of 50.48% and national prevalence of 57% though not much different in two groups.^[6,8] Most of them were using smokeless tobacco products.

Table 1: Characteristics of study subjects

Variable	Total N=387 value (SD/%)	Building workers Group I (n=183) value (SD/%)	Civil workers group II (n=204) value (SD/%)	P value
Age (years)	26.8 (8.7)	27.3 (9.1)	27.9 (9.2)	0.520*
Height (cm)	162.4 (11.2)	162.9 (6.1)	162.1 (6.8)	0.994*
Weight (kg)	54.7 (13.8)	54.2 (6.6)	55.4 (6.1)	0.318*
Service years	1.8 (1.6)	1.9 (1.9)	1.7 (1.1)	0.240*
Illiterate	99 (25.5)	40 (21.9)	59 (28.9)	0.112*
Un married	234 (60.5)	115 (62.8)	119 (58.3)	0.365*

*Non-significant, $P \geq 0.5$, SD=Standard deviation

Table 2: Comparison of prevalence of health related behaviors/events

Behavior/morbidity	Total number (%)	Building workers group I number (%)	Civil workers group II number (%)	Odds ratio 95% CI	P value
Tobacco use current	233 (60.2)	105 (57.4)	128 (62.4)	0.80 (0.52-1.23)	0.281
Alcohol use current	65 (18.8)	16 (8.7)	49 (24.0)	0.30 (0.16-0.51)*	0.001*
Malaria past	53 (13.7)	21 (11.5)	32 (15.7)	1.06 (0.57-1.97)	0.844
TB past	4 (1.0)	1 (0.5)	3 (1.5)	0.37 (0.04-3.54)	0.370
Jaundice past	41 (10.6)	20 (10.9)	21 (10.3)	1.07 (0.53-2.14)	0.839
Typhoid past	13 (3.4)	4 (2.2)	9 (4.4)	0.48 (0.12-1.76)	0.225
Hospitalization <1 year	29 (7.5)	14 (7.7)	15 (7.4)	1.04 (0.46-2.36)	0.912
Fever current	20 (5.2)	13 (7.1)	7 (3.4)	3.24 (1.18-9.18)*	0.009*
Resp: diseases current	53 (14.7)	39 (21.3)	14 (6.9)	3.68 (1.85-7.41)*	0.001*
Skin diseases current	63 (16.1)	26 (13.7)	37 (18.1)	0.75 (0.42-1.34)	0.295
Eye disease current	18 (4.7)	16 (8.7)	2 (1.0)	9.68 (2.09-61.82)*	0.003*
Joint pain current	4 (1.1)	1 (0.5)	3 (1.5)	0.37 (0.01-4.0)	0.693
Injury <1 year current	47 (12.1)	12 (6.6)	35 (17.2)	0.34 (0.16-0.71)*	0.001*
	9 (2.3)	6 (3.3)	3 (1.5)	2.04 (0.45-10.44)	0.308

*Significant $P \leq 0.05$, Building workers (Group I) have got, *high exposure risk, †Low exposure risk, CI=Confidence intervals, TB=Tuberculosis

The current alcohol use was higher (18.8%) than previous studies (14.6%) but less than national estimate of 21%.^[8] The absence of recreational facilities, the nature of work, hours of work, low pay, poor housing and separation from family, lack of job security and lack of access to occupational health services cause anxiety in these workers.^[2,5] The alcohol users were three fold high among Group II (8.7% vs. 24%. $P = 0.001$) correspondingly they are more illiterate.

The construction workers are exposed to multiple risks at working and living places, they are exposed to physical, chemical, biological, ergonomic hazards and environmental and psycho social risks.^[2,6] In most places the workers were residing in make shift camps inside the project sites that expose them to health risks even after working hours. Due to poor environmental conditions at work sites chances of diseases from poor sanitation and unsafe drinking water were high.^[2,5,6] The sites create breeding grounds for various vectors and unprotected laborers act as potential baits.^[6] In addition, immigrants from disease endemic areas with different immune status, settling at highly vector receptive and unprotected project sites, introduce new strains multi drug resistant [MDR] TB, *P. Falciparum*) and chances of getting new infections (e.g.: Filariasis, Kala-Azar) become high.^[6]

Hospitalization is a nonfatal health out-come that is considered to be relatively free from errors associated with reporting illness can be used as proxy indicator of severe morbidity. Hospitalization rate in both groups during last 1 year recall period was collected categorically, which was comparable (7.7% vs. 7.4%). Though the reported current fever cases among construction workers were less than an earlier study (23.1%)^[6] more current fever cases were reported from Group I compared to II (7.1% vs. 3.4%, $P = 0.009$). Most of them were due to viral fever or respiratory infections may be due to overcrowding at the work site camps. Malaria smear examination was done in all fever cases ($n = 20$) with slide positive rate of 5%. Compared with civil workers more cases of malaria and TB were reported from building workers, which were not statistically significant ($P > 0.05$). The only newly detected malaria case was from this Group I, which was due to *Plasmodium vivax* [Table 2]. Since in this part of the state malaria is non-endemic, the case may be either imported or introduced. TB prevalence was similarly reported among them from other studies as 1.4%.^[5]

Jaundice cases were comparable in both groups [Table 2]. The state reported out breaks of jaundice due to hepatitis A during last few years and the workers may contract diseases due to poor sanitary conditions at work/camp sites. Typhoid cases were reported more frequently (2.2% and 4.4%) from civil workers and may be due to their exposure in outdoor unhygienic conditions where chances of fecal oral transmission are high.

Since the construction workers are working in air polluted dusty environment in different climatic conditions they are prone to allergic and respiratory problems.^[3,5,6] In our study, around 14.7% had current respiratory complaints with more among building workers (21.3% vs. 6.9%. $P = 0.009$) which may be due to increased indoor pollution, exposure to dust, paint and allergens than outdoor

civil works, super added by use of tobacco. The previous reported respiratory morbidity was 12.6% and 4.46% in other studies.^[5,6] The higher prevalence may be due to higher exposure to dust during the working hours and post-working hours as the accommodation is within the project site. The workers have increased risk of developing pneumoconiosis like silicosis. Most of the complaints were cough and breathing difficulties similar to earlier reports, which may be exaggerated by lack of personal protective measures such as, using mask, work practices like wet grinding and overcrowding.^[3]

Scarcity of water, limited availability of cleaning facilities and climatic conditions hasten the development of dermatitis in construction workers.^[3,9] A review of literature identified health risks associated with use of cement. It has constituents such as chromate, cobalt that produce irritant contact dermatitis and lime which is corrosive.^[1,6,9,10,11] In our study, 16.1% had skin problems which was higher among civil workers (13.7% vs. 18.1%. $P = 0.29$), which may be attributed to direct contact with soil and cement. In previous studies, it varied between 4.7% and 47.85%.^[1,6] Consistent with previous reports, the lesions were commonly present on the upper extremity.^[1] This may be attributed to the poor hygiene practices like hand washing and nonuse of gloves, overcrowding, which was reported earlier.^[3] The main skin problems were fungal infection, pyoderma and scabies, which was also similarly reported earlier.^[1,3]

Eye problems were reported among 4.7%, with more among building workers (8.7% vs. 1%. $P = 0.003$), which was reported as 0.5% and 4.07% earlier.^[6,5] The problems are mainly due to allergy to irritants thermal injury and infections. Cement can cause ophthalmic problems due to direct contact. 12 (6.6%) building workers had sty (Hordeolum), which is a matter of interest. Due to long-term exposure to noise pollution at the working sites, constructions workers are at risk of noise induced hearing lose. One in each group had hearing problem, which was acquired, progressive and may be attributed to the noise exposure to current job.

Construction workers have got an attributable risk of 50% for musculo-skeletal injuries, higher than all other workers.^[3,12] Postural changes like bending forward or standing and weight bearing may cause backache, low back pain and neck pain and so on.^[3] In our study, the reported prevalence of musculo-skeletal problems was 1.1% with not much difference in the two groups. In previous studies, it was reported variably as 4%, 60.7% and 40% affecting neck to foot.^[6,5,13] These symptoms have high positive correlation with age of person. Lower prevalence from the present study may be due to the younger age of the workers, use of good ergonomics and application of more mechanization in job. It may also be due to healthy worker effect; which happens when those with musculo-skeletal problems may be leave job earlier.

Occupational safety hazards in construction work occur due poorly designed ladders, unsuitable or poorly maintained lifting appliances, improper material handling, improper walking surfaces high platforms, improperly shored trenches, badly maintained tools and inadequate illuminations.^[3] Construction work accidents

contribute to 16.4% of fatal global occupational accidents.^[2] Relative risk of accidents in Indian construction industry were 8 compared to other manufacturing sector and fatal accident frequency rate was 15.8 incidents/1000 employees/year.^[3,5] An operational study on accidents in construction industry reported that problems arising from workers were 70%, workplace issues 49%, shortcomings with equipment 56% and deficiencies with risk management (84%).^[14] In our study, around 12.1% had sustained work related accident/injury during last 1 year. Poor language skills prevent them from understanding the safety precautions given and to follow the instructions given by supervisors. Civil workers had high risk of injury (6.6% vs. 17.2%. $P = 0.001$) and most of them were mechanical injury, which may be due to high rate of manual works using sharp tools and falls. Injury constitute wounds (7.2%), contusion (1.8%), burns (0.5%) and fracture of bones(0.8%). Currently, 2.3% had signs or symptoms of injury with no significant difference in two groups. The prevalence of injuries in previous studies were 7.9%, 7.56% and 25.42%,^[6,5,15] the reduction may be attributed to increased mechanization and good work practices. The risk of accidents increase with extremes of temperature, age, male gender, personal habits like use of alcohol, personality traits of risk-taking behavior and physical and mental state of the worker.^[16] Corresponding to accidents, our study revealed that alcoholism was higher among civil workers ($P = 0.001$). They were also less literate, which make them less aware of accident risks and precautions to be taken. Owing to their working in heights on moving cranes, unstable walking surfaces and probably poor illumination, the frequency of accidents were higher among building workers. More of mechanized work and on-site periodic safety induction training and practice may reduce the accidents.^[15]

The prevalence of water and vector borne diseases, respiratory, dermatological and eye problems, injury and high risk behaviors were reported to be high among unskilled and semiskilled construction workers. Since our study was a cross-sectional study temporality, causation of the health outcomes were not proved and the actual incidence could not be recorded. Those workers with severe morbidity may leave the job and due to the “healthy worker effect” the results may be an under reporting.^[17] Measures are needed to improve the work environment of construction workers by ensuring availability of protective gears, good living conditions and sanitation facilities at the sites along with an accessible, accountable occupational health services. A system of health recording and routine surveillance among workers should be implemented. Local medical schools and occupational health institutes should be encouraged to study the health of construction workers in comparison with appropriate baseline control populations due to the significant deficiency of epidemiological data in this fast growing sector.

ACKNOWLEDGMENTS

We express our sincere thanks to the following persons/: Department for conducting this project “HOME” study; Department of Labor, Kozhikode

District Government of Kerala; Owners of the Construction projects; Workers participated in the study - for the cooperation; Mr. Berkumon felix - Health Educator, Department of Community Medicine, Government Medical College, Calicut - for data collection; Dr. Vidhya Rajendran — Junior Resident, Department of Community Medicine, Government Medical College, Calicut — for data entry.

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How to cite this article: Jayakrishnan T, Thomas B, Rao B, George B. Occupational health problems of construction workers in India. *Int J Med Public Health* 2013;3:225-9.

Source of Support: Department of Labour, Government of Kerala, India. **Conflict of Interest:** None declared.