Section: Pulmonary Medicine

Original Research Article

PULMONARY FUNCTION OF UNORGANISED BUILDING CONSTRUCTION WORKERS IN NEDUMANGAD THALUK OF THIRUVANANTHAPURAM DISTRICT, KERALA

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ABSTRACT

Background: The building construction sector is one of the main job providing sector in India which mainly relies on unorganised labour. Thiruvananthapuram district in the state of Kerala is also no different from that. The dust generated at the work sites impairs their health. The health of the workers and the productivity in job is also closely related. *Aim:* To assess the pulmonary function test of unorganised building construction workers in Nedumangad thaluk of Thiruvananthapuram district.

Materials and Methods: A descriptive study was conducted by interviewing the building construction workers. The collected data was filled in a questionnaire at the construction sites. They were asked to come to a nearby Medical college within one month where their pulmonary function test was conducted and recorded.

Results: Out of 79 workers who did PFT, 60 persons had normal PFT while 19 had abnormal PFT. Among that 14 had obstructive pattern, 2 had restrictive and 3 had mixed type. Positive association was found between abnormal PFT results with non-usage of protective mechanism and smoking.

Conclusion: Smoking and non-usage of protective mechanism can cause abnormal lung function in construction workers.

Keywords: Building construction workers, unorganised sector, pulmonary function test.

INTRODUCTION

According to WHO exposures to hazardous conditions in the living and working environment are among the risk factors of chronic disease mortality.[1] The building construction workers in the unorganised sector consists of labourers who live in the villages and semi urban areas. Most of them are not utilised by the major builders or contractors in the towns. They form personal co-operative groups locally and gain employment opportunity. Most of the time they are brought together by a senior mason or a small-time contractor who organise the workforce. The building construction workforce can be divided into skilled and unskilled. The skilled labourers are masons and have higher status in this hierarchy. The skilled labourers include the ones doing tasks such as masonry and flooring. Plumbing, carpentry, painting, roof work and electrical work are also specialised work which are done by skilled workers. Most of the labourers here are 'unskilled' and help in masonry work. For unskilled jobs most often they utilise migrant workers from northern eastern states of India. Building construction workers are constantly exposed to dust from the construction site in which proper preventive measures are not taken most of the time. Dusty tasks such as abrasive work and polishing, emptying bags of cement, cutting wood and masonry expose workers to risk. Construction workers are exposed to multiple risks at working and living places. They are exposed to

physical, chemical, biological, ergonomic hazards and environmental and psychosocial risks.[2]

Aims

To assess the pulmonary function test of unorganised building construction workers in Nedumangad thaluk of Thiruvananthapuram district.

MATERIALS AND METHODS

The descriptive study was conducted from February 2024 to April 2024. The highest construction activity goes on during the non-monsoon months in Kerala(3). Since the workers were from the unorganised sector, their numbers could not be ascertained. From the thaluk headquarters, major roads going to the outskirts in all four directions were located from the map. Road diversions from the major roads to main inhabitations were also noted. Village roads were also included to avoid selection bias. While travelling through those roads, building construction sites on both sides were marked along the path. All the construction workers who were present in the site at the time of visit were included in the study. After getting an informed written consent, they were interviewed with the help of trained research assistants. The collected data was filled in a questionnaire at the construction site itself. After applying inclusion and exclusion criteria, 326 study participants were enrolled for the study. They were asked to come to the hospital of SUT Academy of medical Sciences within one month for physical examination and for the pulmonary function test free of cost. Out of 326 workers enrolled, the available study population who visited the hospital for the PFT were 79.

Inclusion Criteria

1. Those who have worked continuously in building construction sector for more than 1 year were included in the study.

Exclusion Criteria

1. Those who did not did not give written consent and those below 18 years and above 70 years were excluded from the study. Those who were previously diagnosed with chronic diseases like COPD and Pulmonary Tuberculosis were also excluded,

Spirometry

Pulmonary function test is an important diagnostic modality for both unexplained respiratory symptoms and monitoring progress of patients with known respiratory pathology. Lung function tests was performed using vitalograph spirometer. A prior briefing on lung function test was given to all participants in advance and procedure was demonstrated. Age, height and weight was collected. Patient was asked to take a deep inspiration and a forceful expiration for 6 seconds and again a deep inspiration. Parameters such as forced vital capacity (FVC), forced expiratory volume in one sec (FEV1) and the percentage of FEV1 to FVC (FEV1/FVC) were all assessed using spirometer. Spirometry was performed while the workers were in a seated position. They were asked to repeat the test three times after adequate rest to obtain the best measurement as recommended by the ATS. The parameters were recorded in an MS Excel sheet along with identification and socio-economic data.

RESULTS

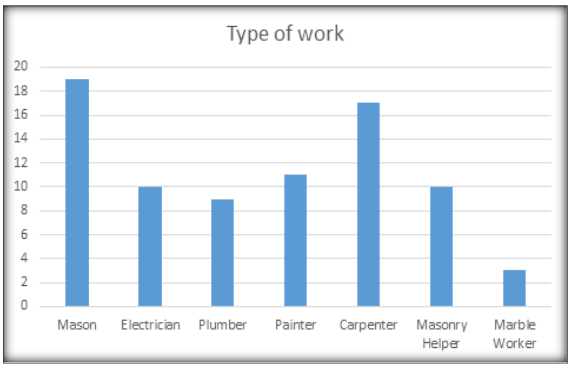

Figure 1

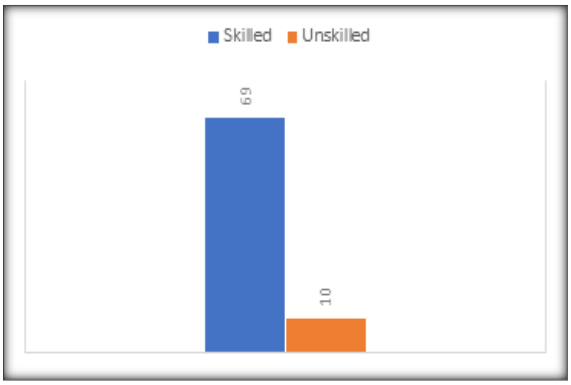

Figure 2

The construction workers included masons, carpenters, painters, marble workers and electricians. Among them 83.7% were skilled workers and rest were unskilled, mainly helpers.

58% of them were non-smokers, 19% were smokers. 22 % were ex-smokers who has stopped smoking in the past 2 years or more.

Table 1: Demographic data of the participants

SMOKING HISTORY	Frequency	%
Ex Smoker	18	22.8
Non Smoker	46	58.2
Smoker	15	19

All the study participants who did PFT knew about the health problems which can occur in construction workers. All of them knew about protective equipment. But only 24.1% i.e 19 persons used some sort of protective mechanism. For most of them, it was a piece of cloth wrapped round their head mostly covering the nostrils.

Table 3: Usage of protective equipment and pulmonary function test.

Use of protection equipment	PFT	
	normal	Abnormal
No	41(68.3)	19(100)
Yes	19(31.7)	0(0)

Out of 79 workers who did PFT, 60 persons had normal PFT while 19 had abnormal PFT. Among that 14 had obstructive pattern, 2 had restrictive and 3 had mixed type.

Table 4

PFT Results	Frequency	%
Obstructive	14	17.7
Restrictive	2	2.5
Mixed	3	3.8
Normal	60	76

Table 5

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
FVC	79	42	112	82.94	14.531
FEV1	79	37	111	82.71	16.944
FEV1/FVC	79	66	121	97.71	12.685

Table 6

FACTORS	CATEGORY	NORMALPF	ABNORMALPF	P-VALUE
TYPE OF WORK	CARPENTER	9(52.9)	8(47.1)	0.032
	PAINTER	8(72.7)	3(27.3)	
	ELECTRICIAN	10(100)	0	
	MASON	13(68.4)	6(31.6)	
	PLUMBER	9(100)	0	
	MASON HELPER	9(90)	1(10)	
	MARBLE WORKER	2(66.7)	1(33.3)	
SMOKING HISTORY	SMOKERS	4(26.7)	11(73.3)	0.001
	NON SMOKERS	42(91.3)	4(8.7)	
	EX SMOKERS	14(77.8)	4(22.2)	
USE PROTECTED EQUIPMENT	YES	19(100)	0	0.002
	NO	41(68.3)	19(31.7)	
DURATION IN YEARS	<5 YEARS	12(92.3)	1(7.7)	0.028
	10-Jun	12(92.3)	1(7.7)	
	15-Nov	8(100)	0	
	16-20	8(61.5)	5(38.5)	
	>20 YEARS	20(62.5)	12(37.5)	

Table 7

PULMONARY FUNCTION	SMOKERS	NON SMOKERS	EX SMOKERS	F VALUE	SIG	
FVC	67.20(15.24)	86.93(10.33)	85.83(14.99)	14.73	.000	
FEV1	60.67(16.93)	88.61(9.3)	86(17.79)	25.93	.000	
FEV1/FVC	85(14.35)	101.15(9.08)	99.50(12.69)	12.07	.000	

Table 8

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
FVC	Between Groups	4600.979	2	2300.49	14.732	0
	Within Groups	11867.7	76	156.154		
	Total	16468.68	78			
FEV1	Between Groups	9084.014	2	4542.007	25.934	0
	Within Groups	13310.29	76	175.135		
	Total	22394.3	78			
FEV1/FVC	Between Groups	3025.869	2	1512.935	12.072	0
	Within Groups	9524.435	76	125.322		
	Total	12550.3	78			

Table 9

Detailed DIAGNOSIS					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NORMAL	60	71.4	75.9	75.9
	OBSTRUCTION	14	16.7	17.7	93.7
	RESTRICTION	2	2.4	2.5	96.2
	MIXED	3	3.6	3.8	100
	Total	79	94	100	

ANOVA (Analysis of variance) is a statistical test used to compare the means of three or more groups to determine if there are significant differences between them. The F value represents the ratio of variance between the groups to variance within the groups. A higher F value suggests a greater difference between the groups.

The F value for FVC (14.73), FEV1(25.93) and FEV1/FVC (12.07) indicate significant differences among the three groups.Here the p values are all .000,meaning p <0.05 which indicates statistically significant differences in FVC,FEV1 and FEV1/FVC between the groups.

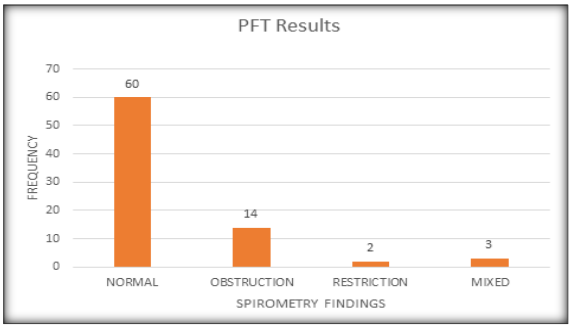

Figure 3

Non-smokers and ex-smokers had normal PFT when compared to smokers. This association was found to be statistically positive.

Those who used protective mechanism had better lung function when compared to those who did not. This was also found to have statistically associated.

DISCUSSIONS

Across the globe skilled, semiskilled and unskilled workers in different type of industries like construction, agriculture, coal etc are exposed to environment that increases the risk of inhaling particulate materials that adversely affect the respiratory system.[4] There have been several studies on work related respiratory diseases among construction workers. Occupational and environmental exposure to hazardous particulate matter led to respiratory health problems. Continuous exposure to dusty environment leads to inflammatory changes in small airways as well as in lung parenchyma leading to development of obstructive type of lung disease.

Zelke et al found that FVC and FEV1 were significantly reduced among the cement production workers but not among the controls.[5] The reduction in lung function was probably associated with high cement dust exposure. Smoking is considered the most important predisposing factor in development of emphysema; but environmental exposures also play an important role. It is important to control the smoking status of the workers as suggested by a number of previous studies by Tantisuwat and Thaveeratitham.[6]

Ulvestad et al conducted a study to find out association between dust exposure and airway inflammation in workers and found lower airway inflammation even though they worked for only 1 year.[7] Harmful dust particles can cause various acute and chronic respiratory diseases. So there is an urgent need to improve dust control measures and health awareness towards dust prevention measures. If the condition continued, the gradual deterioration of the lung function of the subjects leads to chronic disorders and other complications. Studies have shown that smokers had decreased lung function test when compared to non smokers. Our study also supported these findings. One possible reason could be inflammation which is common and a constant pathological finding in smokers.

Studies conducted by Monica Lucattelli et al. have reported that airway flow limitation occurs due to bronchial constriction caused by mediators of inflammation either directly or by increasing smooth muscle tone indirectly.[8] All these changes promote wall thickening leading to airway narrowing and flow limitation. In addition to that, inflammation causes destruction of the alveolar walls attached to the airway contributing to further airflow limitation by deforming and narrowing the airway lumen which had reduced the pulmonary function. However additional studies are needed to better characterize the extent and etiology of respiratory impairment among construction workers.

CONCLUSION

Construction workers are vulnerable for pulmonary disorders, but in our study only 24% of the workers who underwent pulmonary function test had abnormal lung function. Even though awareness of health hazards was there the practice of using protective equipment was less.

Recommendations: Behavioural Change Communication to be imparted on construction workers for the widespread usage of protective mechanism to protect them from respiratory problems.

Limitations of the study: only 24% of enrolled study participants appeared for institutional PFT.

Source of funding: Nil
Conflicts of interest: Nil

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