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RESEARCH ARTICLE

Assessment of work place and lung function test among the brick industry workers in Wardha District.

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Abstract

Occupational Health problems among the workers in various industries in India are on the rise which shows a lot needs to be done in order to protect the health of workers. Present article wishes to draw attention to such workers who work in extreme environment that is the Brick workers. This study began with the objective to first assess the work place of the brick industry workers and to evaluate lung function test among the brick industry workers. A semi-structured interview schedule was prepared comprising of socio-demographic profile, clinical examination and pulmonary function test. 38% workers were found to have pallor. 68% workers had normal BMI while 32% were underweight. 93% workers were Afebrile and 7% were found febrile. As the duration of work increases the abnormality in pulmonary function test was observed to increase. More than 2/3rd workers had normal BMI and 1/3rd were found underweight. Only a few reportedly had fever, more than 1/3rd had findings of pallor.

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Introduction:-

In India, occupational health problems are gaining momentum. Assessment of occupational health problems is one of the common fields of study of ergonomics ⁽¹⁾. Adverse environmental and physical conditions affect the health status of brick field workers who perform various types of activities, e.g. they have to walk on a hot surface (top of the furnace) while monitoring and regulating the fire. Physiological responses to such activities mainly involve the musculoskeletal and cardiovascular systems. Since the environment is unfriendly, it hinders excess heat elimination by the circulatory system, making the heart work harder to transport energy to the muscles for a successful completion of the job. An increase in age concurrently deteriorates the functional capacity ⁽²⁾. Fired clay bricks being one of the most important building materials, India is the second largest producer of bricks, accounting for over 10% of the global production. It is estimated that India has more than 100,000 brick kilns producing about 250 billion bricks annually, employing about 15 million workers and consuming about 35 million tonnes of coal annually ⁽³⁾.

Brick kiln are small businesses distributed along the poorest sides of the cities. Bricks are fabricated using clay, water, silt, and fuel. On one side these business provide food, education and housing to thousands of families. On the other side its operation generates pollutants to the environment. There is evidence that brick kilns emit a considerable amount of pollutants. These pollutants are created due to the incomplete combustion process and the different types of fuel used in the kiln. The typical brick kiln is built open to the atmosphere; therefore consume large amounts of fuels. Fuel used varies according to what is available for brick makers and includes wood, recycled

motor oil, coal, fuel oil, diesel, tires, trash and plastics among others. The inefficient combustion of these furnaces favors the emission of solid particles and greenhouse gases, among which are the oxides of nitrogen, sulfur, and carbon. Heavy metals can remain in its original form during incineration or may react to form new compounds such as metal oxides, chlorides or fluorides. The most common form of transport of the metals released in these and other processes is by air. The metals can thus travel thousands of miles to be deposited in the soil affecting people's health⁽⁴⁾. The present study was conducted with the intention to find out the hygienic practices and respiratory diseases among the brick industry workers.

Objectives:-

1. To assess the work place of the brick industry workers
2. To evaluate lung function test among the brick industry workers

Materials & Methods:-

Study population and research design:-

A cross sectional study was carried out at Brick Industries situated in selected areas in Wardha district. The subjects for this study consist of workers from these Brick industry. It includes personal details through history taking and clinical examination. All the workers from this industry will be subjected to pulmonary function test.

Sampling technique and size:-

Simple random sampling was chosen for the study purpose. Literature review indicated that respiratory morbidity amongst the Brick Industry was found to be 32% and among the general population it is found to be 10%. Based on the above observation with an- α level of 0.05 and β of 0.05 (power = 90%). Statcalc. Menu of EPI Info software was used for sample size calculation, which was calculated as 83. Considering the dropout rate and non-response rate of 10%, additional 10% was added to the calculated sample size which became 91 and hence 100 study subjects were decided for the study purpose.

Data collection:-

The necessary approval was obtained from Ethics Committee, JNMC Sawangi, DMIMS (DU), Wardha to conduct study. A semi-structured interview schedule was prepared comprising of socio-demographic profile, clinical examination and health appraisal including routine. After explaining the procedure in verbal and written, the informed consent was obtained and data kept confidential. After fulfillment of the inclusion criteria, workers were interviewed and a rapport was developed ensuring confidentiality regarding the use of data for research purpose only. The tool used was pretested questionnaire. The survey was done by face to face interview and pulmonary function test of the workers was carried out by spirometry.

Workers who were exposed to dust in some Brick industry in Wardha, all the workers who were willing and working in the selected brick industry, exposed to the dust for more than 1 year and Work such as Clay Carriers, Brick Moulders, Coal Firers in the Kiln and extractors leads to direct exposure to dusts. Those workers directly exposed to dusts for more than 1 year formed the inclusion criteria and were selected for the study from these industry situated in Arvi-Naka, Yelakeli, Sawangi By-pass, Deoli areas in Wardha district were the Exposed Population. Known case of Asthma, Tuberculosis, Clerical workers not exposed to dust, Workers working less than 1 year in Brick Industry formed the exclusion criteria.

Statistical analysis:-

Data was analyzed using appropriate computer software. Collected data was analyzed by using computer statistical software program and chi square test was applied to test statistical significance at $p < 0.05$.

Results:-**Table 1 Distribution of brick workers according to different parameters**

Work Place Environment	Number of workers (n=100) (%)
Clean	0(0.00%)
Dirty	100(100.00%)
Work place Temperature	
Comfortable	0(0.00%)
Not comfortable	100(100.00%)
Periodic Health examination	
Done	0(0.00%)
Not Done	100(100.00%)
First aid kits	
Available	21(21.00%)
Not available	79(79.00%)
Body Mass Index	
Normal	68(68.00%)
Underweight	32(32.00%)

Table 2 Distribution of workers according to their temperature

Parameters	Number of workers (n=100) (%)	
Temperature	Febrile	Afebrile
	7(7.00%)	93(93.00%)

Table 3 Distribution of workers according to pallor

Parameters	Number of workers (n=100) (%)	
Pallor	Present	Absent
	38(38.00%)	62(62.00%)

Table 4 Distribution of workers according to their blood pressure

Parameters	Number of workers (n=100) (%)	
Blood Pressure	Hypertensive	14(14.00%)
	Normotensive	68(68.00%)
	Hypotensive	18(18.00%)

Table 5 Distribution of workers according to lung function test with respect to duration of work

Pulmonary Function Test	Duration of work		Number of workers (n=100) (%)	Chi Square
	10 years of work	> 10 years of work		
Normal	29(29.00%)	26(26.00%)	55(55.00%)	Yates Chi- square $\chi^2=8.227$ df=3 p=0.0415
Mixed	1(1.00%)	2(2.00%)	3(3.00%)	
Obstruction	5(5.00%)	21(21.00%)	26(26.00%)	
Restriction	4(4.00%)	12(12.00%)	16(16.00%)	

Every brick worker replied their work place environment was dirt and they worked in dusty atmosphere. Every brick worker replied their work place temperature was not comfortable and irritating. None of the workers replied they had done their periodic health examination as no doctor used to visit the work site. Most (79.00%) workers replied they did not know whether first aid kit was available at the work site or not. 38% workers were found to have pallor. 68% workers had normal BMI while 32% were underweight. 93% workers were Afebrile and 7% were found febrile. 68% workers were found normotensive, 18% were found hypotensive and 14% hypertensive. As the duration of work increases the abnormality in pulmonary function test was observed to increase and this comparison was observed as statistically significant $p < 0.05$.

Discussion:-

Every brick worker replied their work place environment was dirt and they worked in dusty atmosphere. Every brick worker replied their work place temperature was not comfortable and irritating which shows that a lot needs to be done to make the brick industry atmosphere comfortable and dust free. Most (79.00%) workers replied they did not know whether first aid kit was available at the work site or not. Thus although first aid kits were available at a few brick kiln sites, most of the workers were unaware about its presence. **Sett M**⁵ in a study conducted in West Bengal observed that most uncomfortable months are March, April, and May, which have significantly higher temperatures ($p < 0.01$) and higher relative humidity ($p < 0.05$) than the other months.

None of the workers replied they had done their periodic health examination as no doctor used to visit the work site. In the present study 93% workers were Afebrile and 7% were found febrile. In a study conducted by **Dehghan**⁶ et al. in Iran showed that people participated in lung function test conducted periodically. In a study by **Shewale A**⁷, conducted in Thane district observed that 44.6% were undernourished. 12.6% complained about fever.

In the present study 38% workers were found to have pallor. 68% workers had normal BMI while 32% were underweight. In a study by **Tiwari G**⁸ et al. conducted in construction workers they found that the average BMI of workers was $18.9 \pm 5.0 \text{ Kg/m}^2$. The mean value of the BMI of the subjects was within normal range. About 35% of subjects were suffering from chronic energy deficiency (CED) with BMI $< 18.5 \text{ Kg/m}^2$. BMI $> 24.9 \text{ Kg/m}^2$ was noted in about 5% subjects and they were in obese category. Anemia was found in 28% of the workers

In the present study it can be seen that as the duration of work increases the abnormality in pulmonary function test was observed to increase 26% obstruction, 16% restriction and 3% with mixed pattern. In a study conducted by **Kreiss K**⁹ in year 2015 found a restrictive pattern in 30/106 (28%) employees. Additionally the study identified two employees with mild obstruction, one employee with moderate obstruction, and one with a very severe mixed pattern. In a study by **Dehghan**⁶ et al. conducted in Iran showed that, 24 subjects (9.8%) had obstructive and 17 subjects (6.9%) had restrictive patterns.

Conclusion:-

All the workers replied they used to work in a clean and dusty environment in non-comfortable surrounding temperature. None of them had undergone a periodic health examination. More than 2/3rd workers had normal BMI and 1/3rd were found underweight. Only a few reportedly had fever, more than 1/3rd had findings of pallor. 2/3rd workers were normotensive, a nearly 1/6th were found hypertensive and hypotensive. Musculoskeletal problem, respiratory problem and weakness are some of the common problems. 1/4th workers were found to have obstruction and nearly 1/6th was found to have restriction on spirometry.

Recommendation:-

Continuous use of personal protective measures during the working hours will improve the quality of life. Awareness should be created regarding causation, signs and symptoms, early diagnosis, treatment and if necessary advice about change of occupation. Pre-placement examination and periodic examinations should be done. Regular measurement of lung functions would be a useful tool to detect the lung abnormalities in the early stages. Proper legislation should be formed at the national level for the prevention and safety of the workers.

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