Research Paper

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Ergonomic Study on Postural Discomfort and Exertion Perceived by House Construction Workers

Home Science

KEYWORDS :

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ABSTRACT

The construction industry in India is an integral part of the nation and can be identified as one of the rapidly growing sector which gives employment to maximum of the workers after agriculture. Construction workers are the backbone of the Indian economy. The workers who work in construction industry perform a large variety of duties like building, repairing, mixing sand, cement, concrete, spreading concrete and other material etc. The work involves hard physical labour as the workers work under difficult conditions including hot, cold, and wet weather. The workplace, work, environment and variety of postures bring body discomfort to the workers. Ergonomics tries to come up with solution to make sure that the workers stay safe, comfortable and productive. Thus, the present study was done with the objectives to analyze various postures used by the workers in selected manually performed construction activities, to find the musculoskeletal risks and to assess the exertion perceived by them. The study was conducted in Udaipur city. A sample of 60 male workers 30 skilled and 30 unskilled were purposively selected. The results of the study show that approximately 23.33 percent of the respondents were in this occupation from last 16-20 years. The respondent were in the category of low weight normal and only one-forth had normal Body Mass Index (BMI). Regarding VO2 max more than 60 percent of the total respondents were in the category of good to excellent. Time spent on work by the respondents was 9 hours/day with break of one hour for lunch. Continuous sitting and bending postures were adopted by the construction workers and more than half of the respondents carried load in hand. Regarding feeling of pain during and after work it was found that more than half of the respondents reported pain after work. Rapid Entire Body Assessment (REBA) was used to assess musculoskeletal risks to the workers due to work. It was observed that the majority of respondents were at very high risk of body discomfort and change in work method and posture was immediately required. The ergonomic guideline for improving the change in work process and equipment, use of personal protective equipment was suggested by the investigator so that health and efficiency of the house construction workers could be enhanced.

INTRODUCTION

Construction workers are the backbone of the Indian economy as they create the infrastructure necessary for industrial growth. It provides employment and growth of other parallel industries such as cement, paint, wood, electrical work, hardware etc. It is basically a lab our intensive industry. The construction industry employs nearly 3.4 crore people in India. The Indian construction industry has accounted for around 40% of the development investment during the past 50 years and around 16% of the nation's working population depends on construction for its livelihood. The workers who work in construction industry perform a large variety of duties like building, repairing, mixing sand, cement, concrete, spreading concrete & other materials etc. The work involves hard physical labour as the workers work under difficult conditions including hot, cold and wet weather. The work place, work and environment lead to many problems as the construction workers are exposed to a wide variety of health hazards at work vedder and carey (2003).Construction activities performed by the workers are usually respective and involve a variety of postures bringing body discomfort to the workers. The importance of correct work posture is directly related with efficiency and good health. Good posture involves establishing a center of gravity so that the whole weight of body falls directly on the weight bearing areas. Undesirable posture during work leads to pain and discomfort. This affects the productivity of the worker. During performing various construction related activities the workers adopt postures such as bending forward, twisting, reaching above shoulder height, squatting to work & the like. Postural discomfort is the body pain assessed as result of the working posture or the excessive stress on the muscles due to effort involved in the activity.

METHODOLOGY

The present study was conducted on the construction workers in Udaipur city in Rajasthan state. A total of 60 male workers in which 30 skilled and 30 unskilled were selected purposively. Interview schedule was used for collecting general background information, work profile and postures used during work. Physical fitness was determined in accordance to the Body Mass Index (BMI) classification given by Garrow (1984) and cardio-respiratory fitness was measured in terms of VO_2 max (Varghese et.al 1994). Rating of Perceived Exertion (RPE) was used to determine the work load of the respondents given by Varghese et.al (1994). Musculoskeletal risk was analyzed using Rapid Entire Body Assessment (REBA) worksheet, given by Hignett and McAtamney (2000).

RESULTS

Background information of the respondents:

Sixty per cent of the respondents were in the age group of 15-25 years. The mean age, height and weight of the skilled respondents was 25.23±0.86, 162.36±1.23, 51.93±1.90 respectively and that of unskilled workers was 27.7±0.98, 156.9±4.61 and 48.76±1.53 respectively. Approximately 40 per cent of house construction workers earned Rs 5001-6000 monthly income.

Activity profile of the respondents:

Activities performed by the worker are one of the ways of assessing the workload of an individual. It would help to know the extent of strain experienced by the subject that may lead to body discomfort and exertion. Approximately 25 per cent of the skilled and unskilled respondents were involved in house construction work since 16-20 years. Majority of the respondents' i.e. 68.33 per cent performed the construction activity daily. The data revealed that 56.66 per cent of respondents performed the work of construction for 21-25 days in the last month.

The construction material is often heavy and the workers are required to carry it to the site of work where it is required. More than half of the respondents transported the load by carrying it in hand. A 30-40 kg of weight is carried by a worker when transporting pebbles, bricks, excavation material, for masonry work 10-20 kg of material is carried while lifting material 16-30 kg of load is transported and when work such as drilling, concreting, wetting etc. load up to 15 kg is held by the worker.

Physical health assessment of the respondents:

Body Mass Index and VO_2 max. has been used in the present research to find the physical health of the respondents. These parameters are based on the height and weight data of the subjects. BMI is an indicator of physical fitness of the person and also one can depict his nutritional status from it. The results of BMI revealed that approximately 37 per cent of the respondents were in the category of low weight normal, 26.67 per cent and 20 percent of unskilled and skilled workers respectively were in the category of CED Grade III which indicates severe energy deficiency. Only 25 per cent of the total respondents were in normal category of BMI (Table 1).

Table 1 : Distribution of respondents according to their Body Mass Index

S. No.	Body Mass Index	Range	Unskilled (n=30)		Skilled (n=30)		Total (n=60)	
			F	%	F	%	F	%
1.	* CED grade III (Severe)	<16.0	8	26.67	6	20.00	14	23.34
2.	* CED grade II (Moderate)	16.0-17.0	2	6.67	2	6.67	4	6.67
3.	* CED grade I (Mild)	17.0-18.5	0	0.00	3	10.00	3	5.00
4.	Low weight normal	18.5-20.0	11	36.66	11	36.66	22	36.66
5.	Normal	20.0-25.0	7	23.34	8	26.67	15	25.00
6.	Obese Grade	25.0-30.0	2	6.66	0	00.00	2	3.33
Mean ± S.D.			19.34±0.55		19.46±1.51		19.4±1.03	

* CED – Chronic energy deficiency.

VO_2 max is the maximum amount of oxygen that can be absorbed, transported and utilized during a given physical activity. It is normally expressed relative to body weight (ml of O_2 per kg body weight) (ml/kg/min.). The data in Table 2 reveals that the VO_2 max. of 36.66 per cent unskilled and skilled respondents was between 31-40 ml/min. which indicate that they were having good physical fitness and an equal number of the respondents i.e. 11.66 per cent were in the poor, low average, very good and excellent physical fitness level category. VO_2 max. of approximately 17 per cent of the respondents was between 26-30 ml/min showing that their physical fitness level was in high average category. Thus, it can be concluded that the aerobic capacity of majority of the respondents was high average to good indicating their good cardio respiratory fitness.

Table 2 : Distribution of respondents according to their VO2 Max

S. No.	VO_2 Max (ml/min.)	Physical Fitness Level	Unskilled (n=30)		Skilled (n=30)		Total (n=60)	
			F	%	F	%	F	%
1.	up to 15	Poor	2	6.66	5	16.66	7	11.66
2.	16-25	Low average	1	3.33	6	20.0	7	11.66
3.	26-30	High average	6	20.00	4	13.33	10	16.70
4.	31-40	Good	11	36.66	11	36.66	22	36.66
5.	41-45	Very good	5	16.67	2	6.67	7	11.66
6.	beyond 45	Excellent	5	16.67	2	6.67	7	11.66
Mean ± S.D.			38.16±1.16		32.40±1.34		35.28±1.25	

Posture Discomfort and Exertion Perceived by the respondents

The postures adopted by the respondents in various activities were analyzed for determine the health effect on the workers. A good posture (working) reduces physiological cost of work and discomfort to minimum. The data revealed that several activities were being performed by the construction workers such as manual handling of material, digging, mixing cement and concrete, brick layering, stone cutting, flooring work and carrying load etc. Maximum number i.e. 80 per cent of the total respondents performed the activity in combination of posture such as sitting, standing, bending, stooping and squatting. The posture was changed twice by 43.33 per cent of the respondents in 5 minutes duration.

Posture used for various construction activities put certain amount of stress and strain on human body especially the muscles, joints, spine as well as internal organs. The data of Rating of Perceived Exertion (RPE) reflected in Fig 1 shows that the exertion perceived was heavy, which was reported by approximately 43 per cent of the respondents whereas approximately 28 per cent perceived exertion as moderately heavy and 13.33 per cent rated the exertion perceived as very heavy.

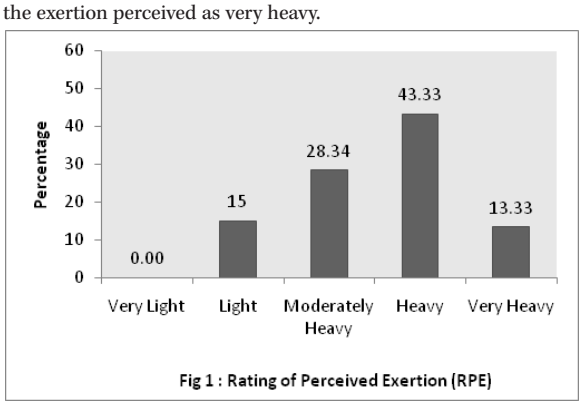

Fig 1 : Rating of Perceived Exertion (RPE)

Majority of the respondents felt pain/discomfort frequently and half of the respondents felt pain in various parts of the body after work. It was reported by 28.33 per cent of the respondents that they took medicines for relief while 50 per cent resorted to only rest and other did massage or adopted other relief measure. 37 per cent of the respondents reported that they never visited the doctor for medical treatment in the last one year.

Musculoskeletal Risk Assessment through REBA

Rapid Entire Body Assessment (REBA) method has been used for the present research which is a quick and easy to use observational postural analysis tool for whole body activities giving a musculoskeletal risk action level. It assesses wrists, forearms, elbows, shoulders, neck, trunk, back, legs and knees. The method is specifically developed to be useful for assessing MSD risks/working postures.

It was elicited from the data that majority of the respondents i.e.75 per cent worked with the trunk twisted or tilted to side. A high majority i.e. 78.34 per cent of the respondents were working with neck twisted or tilted to the side. It was observed that during work, upper arm of the unskilled and skilled workers were in flexion of 45-90º with shoulders raised. The respondents were working with lower arm flexion of < 60o or extension of >100o. Majority i.e. 85 per cent of the respondents were working with wrist deviated or in twisted position.

The risk assessment through REBA in Table 3 elicited that majority of respondents i.e.75 per cent fall under action level 5 which indicates that there is very high risk and change needed to be implemented immediately. It was also alarming to know that 8.34 percent of respondents fall in the action level 4 mean-

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ing high risk indicating investigate and implement change.

Table 3 : Distribution of respondents by their REBA scores

S. No.	Score	Risk assessment	Unskilled (n=30)		Skilled (n=30)		Total (n=60)	
			F	%	F	%	F	%
1.	1	Negligible risk, no action required	–	–	–	–	–	–
2.	2-3	Low risk, change may be needed	3	10.00	4	13.34	7	11.66
3.	4-7	Medium risk, further investigation, change soon	1	33.34	2	6.66	3	5.00
4.	8-10	High risk, investigate and implement change	2	6.66	3	10.00	5	8.34
5.	11	Very high risk, implement change	24	80.00	21	7.00	5	75.00

The scores obtained for REBA reveal that as the workers were using awkward postures they were at risk of having musculoskeletal problems which could only be avoided by providing Ergonomic solutions to them

CONCLUSION:

Thus we can conclude that the type of work, work posture, time spent have an impact on physical health, body discomfort and musculoskeletal system by the worker. Perceived exertion during work is a risk factor for development of musculoskeletal disorders. Good health has long been acknowledged as one of the most critical element to quality of life. The health of workers is a vital resource to protect as all the activities revolve around them. Compatibility between the construction workers and the work and work environment can be brought about by the use of Ergonomics. Ergonomic guidelines have been suggested with a view to promote the health and well being and consequently improve quality of life of the construction workers. The strategies usually involve changing tools, equipment, materials, work methods or the workplace itself. A well educated workforce will lead to healthier workforce.

REFERENCE

Adsul, B.B., and Laad, P.S., (2011). Health Problems among Migrant Construction Workers. Indian Journal of Occupational and Environment Medicine, Vol.15, pp 29-32. | Bhattacharaya, R. and Biswas, G. (2011). Assessment of Working Postures and Associated Health Status of Construction Workers. Science and Culture. 77 (1-2), pp 52-57 | David, G. C. (2005). Ergonomic Methods for Assessing Exposure to Risk Factors for Work-related Musculoskeletal Disorders. Occupational Medicine, 55(3): 190–199 | Garrow, J., S., (1984).Trest obest seriously.A cllinical manual, Eding Churchil Livingstone.Himanshu Publication New Delhi, pp.40-66. | Gangopadhyay, S., Das, B., Das, T. and Ghoshal, G. (2010). An Ergonomic Study on Posture-Related Discomfort and Occupational-related Disorders among Stonecutters of West Bengal, India. International Journal of Occupational Safety and Ergonomics (JOSE), Vol. 16, No.1, pp 69-79 | Hignett, S. and McAtamney, L. (2006). Rapid Entire Body Assessment (REBA); | Applied Ergonomics. Vol. 31, pp 201-205. | Varghese, M., Saha, P.N., and Atreya, N. (1994). A Rapid Appraisal of Occupational Workload from a Modified Scale of Perceived Exertion. Ergonomics, Vol. 37, No.3, pp 485-491. |