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Evaluation of posture by REBA and RULA at small scale manufacturing

industry

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ABSTRACT

Musculoskeletal disorders (MSDs) are surrounded by the most common work-related problem in India. In an Indian manufacturing industry most of the work is still carried out manually hence issues of work related musculoskeletal disorders and injury in different sites of the body are prominent. Postural analysis using Rapid entire body assessment (REBA), Rapid upper limb assessment (RULA) indicates that the workers are working above the secure limit. The presents study is focused on posture analysis of the workers working in small scale manufacturing industry. The study was conducted on 15 workers engaged in small scale manufacturing industry Wardha (Maharashtra, India). Video tape on different activities of the workers was done and then images were cropped from it for the analysis. This study presents assessment of work posture of worker engaged in different activities of small scale manufacturing industry. Posture analysis tools REBA and RULA method both software as well as worksheet were used. The results of REBA showed that some of the workers were under lower levels and majority at high risk levels. Further the results of RULA showed that majority of the workers were under high risk levels and required immediate change. It was concluded that; there is a lack of ergonomics social contact and understanding in small scale manufacturing industries (SSMIs). Postural analysis using REBA, RULA indicates that the workers are working above the secure limit. A major quantity of the workers is working in awkward postures. Thus the workers are under moderate to high risk of Musculoskeletal disorders (MSDs).

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Introduction

Musculoskeletal disorders (MSDs) are amongst the most common work-related problem in India. Small scale industry plays a vital role in development in countries like India; they play an important role in employing the majority of the industrial workers. In an Indian small scale manufacturing industries most of the work is still carried out standing and manually hence issues of work related musculoskeletal disorders and injury in different parts of the body are prominent. Performing jobs in prolonged standing has contributed numerous health effects such as work-related musculoskeletal disorders, chronic venous insufficiency, preterm birth and spontaneous abortion, and carotid atherosclerosis. However, those injuries can be minimized through application of engineering and administrative controls [1]. Lack of knowledge about ergonomics is observed in industry in which work is carried out. Musculoskeletal disorders are there in the welding process where workers are working in kneeling posture and it shows that there is need to change the body postures [2]. The application of ergonomic principles would help to increase machine performance and productivity, but mostly help human operator to be comfortable and secure [3]. Workers work under tough conditions to perform the desired task. These tough conditions normally give rise to various musculoskeletal disorders within the workers. These disorders emerge within the workers body due to repetitive lifting, differential lifting height, ambient conditions etc [4]. The importance of ergonomics in product design, working environment, and its influence in industrial workstation design, the interdisciplinary nature of

ergonomics and the implications of ergonomics in industrial engineering function [5]. The study revealed that there had been several gaps in work environment, tools and equipment that affect the health and safety of workers at the work site [6]. Ergonomics related to the design of methods and processes can help eliminate or decrease work related risks as well as improve the company's quality and productivity [7]. Awkward posture, lifting, forceful movement and manual work at rapid rate contribute to musculoskeletal disorder. Present study is focused on assessing the work posture of worker engaged in different activities of casting [8]. The application of ergonomic principles would help to increase machine performance and productivity, but mostly help human operator to be comfortable and secure [9]. RULA (rapid upper limb assessment) is a survey method developed for use in ergonomics investigations of workplaces where work-related upper limb disorders are reported [10]. The REBA is a postural analysis tool sensitive to musculoskeletal risks in a variety of tasks and assessment of working postures found in health care and other service industries [11]. Material and methods

The study was done in small scale manufacturing industry in Wardha (Maharashtra). The 15 workers of average stature 168.34 cm \pm 2.69 s.d., average age 35.8 years \pm 3.02 s.d., average weight 63.6 kgs \pm 6.66 s.d. and average experience 11.2 years were selected for study. A different video tape of different postures showing different working movements of the workers during an activity was recorded. After footage the video, it was cropped to get snapshots for the analysis of posture of the worker. Snapshots of 15 workers working in different work

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were obtained. The snapshots were analyzed to fill the scores in REBA and RULA; score sheets (appendix). The first step was overall body posture assessment using REBA method. The works with the involvement of high risk were scored higher and those with less risk involvement were scored 0. Immediate corrective actions and necessary changes were recommended for activities scored higher to keep away from any risk.

Figure 1 shows the selected photos of different jobs performed at the manufacturing unit. After a critical analysis of the recorded videos and the gathered data, RULA and REBA Score were calculated and as an example the calculation for posture 1 is presented next. ErgointelligenceTM software was also utilized to verify the results; the input and output screen shots of the same are shown in figure 2 and 3 respectively.

Fig. 1: Different working postures in standing position



Fig. 2: REBA Scores on ErgointelligenceTM Software





Fig 3. RULA Scores on ErgointelligenceTM Software

The upper limbs mainly arms and wrist of posture was assessed using RULA score sheet; the range of movement for each body site is divided into sections. These sections are scored so that the score 1 is given to the range of movement or working posture where the risk factors present are minimum. Higher scores are allocated to sites of the movement range with more extreme postures indicating an increasing presence of risk factors causing load on the structures of the body segment. The exposure scores according to RULA were divided into four 0, 1, 2, and 3 exposure categories: negligible, low, medium and high respectively. Medium and high risk actions should be urgently addressed to reduce the level of exposure of risk factors. For those activities where whole body and limbs motion needs to be assessed REBA was used which is also a pen paper technique. In REBA the body parts are divided into sections and each body part is scored according to its range of movement. Higher scores are given to the body parts where presence of risk factors are more and lower scores are given to those where presence of risk factors are minimum. The REBA scores were divided into five 0, 1, 2, 3, and 4 are categories: negligible, low, medium, high and very high. Medium, high and very high needed an immediate action to keep away from any musculoskeletal disorder.

Results and discussions

The results of the RULA assessment worksheet are shown in appendix. Table 1 reveals the different categories of the risk levels as obtained after analyzing the posture.

RULA score	RULA Level	Risk Level	Action	% of workers
1-2	0	Negligible	Acceptable	
3-4	1	Low	Investigate further	13.33
5-6	2	Medium	Investigate further and change soon	46.67
7	3	High	Investigate and change immediately	40





Figure 4. RULA Level

Figure 4 showed that around 40 % of the workers are at high risk level and needs a Investigate and change immediately, whereas 46.67 % workers were found at medium risk levels and needs a Investigate further and change soon. Around 13.33% of the workers are working in Investigate further. The results of the posture analysis using RULA are shown in Table 1. These results reveal that all categories of the risk levels exist in jobs postures. The table showed that posture of 40 % workers who used in performing the activities is at high risk levels. A further investigation with an immediate change was recommended to these workers. The table also shows that none of the worker is at negligible risk level. The study was done on workers working in different sections of the manufacturing industry and their

activities were divided in different categories. The posture analysis was done according to these activities using the same sequence of RULA and REBA.

Using the REBA analysis method, it was observed that the major parts of the workers were working in unacceptable posture at high risk levels.

Table 2. Overall Distributions of REBA Scores

REBA score	REBA Level	Risk Level	Action	% of workers
1	0	Negligible	None necessary	
2-3	1	Low	May be necessary	13.33
4-7	2	Medium	Necessary	33.33
8-10	3	High	Necessary soon	53.33
11-15	4	Very high	Necessary now	



Figure 5. REBA Level

Around 53.33% of the workers were working at high risk levels. It was found that, if the workers continued to work in the same posture they suffer from the MSDs related to neck, trunk and wrist in the near future. It was recommended to take the corrective action as soon as possible. However, when these units were studied using the REBA tool, REBA showed that most of the workers in the drilling operation were working in acceptable posture and a necessary change may be required for them. Around 53.33% of the workers were working at high risk levels and their neck, trunk and wrist were under high physical strain and needed a necessary action soon. Around 33.33 % of the workers in the jobs were at medium risk levels and needed a necessary change. Some of the workers in the turning jobs were bending their trunk to unacceptable limit and most of them had upper arm under high strain. The workers were suggested to keep their trunk straight while working. Also, in some jobs the workers were bending their trunk to a higher degree which was not acceptable and they needed an necessary change. However, in rest of the activities the workers were working in fine posture and they may require a necessary action.

Conclusion

On the basis of analysis of results and scores obtained by REBA and RULA tools, it can be concluded that; there is a lack of ergonomics knowledge and awareness in small scale manufacturing industry. A significant proportion of the workers are working in awkward postures. Thus the workers are under moderate to high risk of Musculoskeletal disorders (MSDs). The study recommended that there is horrible need of implementation of ergonomics interventions with proper knowledge among workers.

Appendix



Source [10]: McAtamney, L. & Corlett, E.N. (1993)



Source [11]: HIGNETT S AND McAtamney, L. (2000)

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