DE GRUYTER OPEN

Transactions of the VSB - Technical university of Ostrava Vol. XII, No. 2, 2017

Safety Engineering Series, ISSN 1805-3238 pp. 61 - 65, DOI 10.1515/tvsbses-2017-0015

ERGONOMICS INVESTIGATION OF MUSCULOSKELETAL DISORDER AMONG THE WORKFORCE OF WASTE MANAGEMENT INDUSTRY IN NIGERIA

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Review article

Abstract: The objective of this study is to undertake an Ergonomic Scrutiny of Desecrate Management Industry. Ten (10) employees of the parking and collection department of Kim Waste Management Authority (KWMA) were selected. Their activities were video and recorded while working and their different postures were analyzed using Rapid Entire Body Assessment (REBA) and Rapid Upper Limb Assessment (RULA). Result showed that 10 % were at medium risk; 40 % were at high risk and 50 % were at very high risk for the workers in KWMA. It as discovered that workers are subjected to Musculoskeletal Disorder (MSDs) as a result of the postures adopted during the work process.

Keywords: MSD, REBA, RULA, KWMA, Ergonomics.

Introduction

Musculoskeletal disorders (MSDs) are injuries or pains in the body's joint, ligaments, muscles, nerves, tendon and structures that support limb, neck and back. MSDs have proven to be a major problem of modern industrialized countries (Mattila et al., 1993). Several researches have shown that application of ergonomics principle result in increase in production and decrease in working musculoskeletal disorders (WMSDs) (Saraji et al., 2004).

MSDs are part of the occupational health problems in waste industries in developing countries (Mattila et al., 1993). According to International statistics the proportion of musculoskeletal disorders' diseases of all occupational diseases in Finland was 31 % and 44 % in the United States (Bureau of Labour Statistics, 1999). Federation of Accident Insurance Institution (2006) noted that approximately 10 % of occupational accident resulted from sudden movement, lifting repetitive motion or over use. Physical workload has been recognized as a factor affecting worker's health in several jobs. For example, about 33 % of occupational diseases attributed to constructions sites in Finland were linked to ergonomics factors associated with manual tastes (Federal of Accident Insurance Institution, 2006). There are three main risk factors of musculoskeletal disorder (MSDs); forces, repetition and awkward posture. Any one or combination of these may contribute to the development of MSDs (Karwowski and Marras, 2003). The design of equipment, environment and workplace layout in conjunction with a required task should be evaluated when attempting to reduce these risk factors. Subsequent development and implementation of effective ergonomics intervention reduces worker exposure to the factor and likelihood of developing MSDs.

Effective application of ergonomics in work system must achieve a balance between providing worker safety as well as physical and mental well being and job satisfaction. Many research studies showed the positive effect of applying ergonomics principle in workplace, machine, tool, environment and facilities (Shikdar and Das, 1995; Resnik and

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Zanotti, 1997; Das and Segupta, 1999). Research studies have produced data and guide lines for industrial application. The features of ergonomic design of machines, work station and facilities are well known (Konz, 1995; Wilson, 1995; McLeod, 1995). However, there is still a low level of acceptance and limited application of ergonomics in industry especially in developing countries (Shikdar and Das, 1995). The main concern of work system design is the improvement of machine and tools. Inadequate or no consideration is given to design of the work system as a whole.

Ergonomics evaluation of workplace

Ergonomics evaluation of workplace is needed to audit and identify ergonomics and /or safety related problems. Researchers have approached ergonomics evaluation of workplace with various methods ranging from comparative studies to use of questionnaires to the experimentally determined result. Wilson (1995) both carried out significant discoveries through the review of detailed subjective and performance - based measurement. Their general findings of these reviews are that the subjective assessment of the body strain and discomfort has been the most frequently used due to the ease of use and apparent face validity (Li and Buckle, 1999). Burdof (1992) stated that questionnaire approach is the most commonly used in epidemiological studies that attempted to assess postural load on the back. However, the subjective rating is prone to many influences other than the task or workplace investigated.

Assessment of working posture

The posture of human body at work is influenced by several factors, including workstation layout (height of the workplace, orientation of tools and work objects), hand tools design, work methods, and work habits, visual control and force exertion requirements and characteristics of the workers (Chaffin et al., 1992) Poor and un-natural working posture have been associated with the onset of fatigue, body discomfort, pains and musculoskeletal disorders (Karhu et al., 1997). The objective of this study is to investigate the MSD'S of the workforce of the waste collection industry in Nigeria due to their awkward posture while collecting waste.

Materials and methods

This study was undertaken in waste management industry at Epe, Lagos State, Nigeria. The waste management industries selected was Kim Waste Management Authority (KWMA) which is privately owned company.

Methods of working posture assessment

There are many research studies on the discomfort working postures using different methods such as Ovako Work Assessment System (OWAS), which was first reported by Karhu et al. (1997); Rapid Upper Limb Assessment (RULA), developed by Corllet et al. (1979) based on recording the position of the head, trunk, upper and lower arms and Rapid Entire Body Assessment (REBA) developed by Hignette and McAtamney (2000). Kivi and Mattila (1991) analyzed the work posture in building construction using OWAS and provided the opportunity to compare the job studied according to the number of posture required.

The following techniques were used in the course of the analysis:

i. Nordic questionnaire: **Kuorinka et al. (1987),**
ii. Rapid Upper Limb Assessment Sheet (RULA): **McAtamney & Corlett (1993),**
iii. Rapid Entire body Assessment Sheet (REBA): **Hignette and McAtamney (2000).**

Materials

The materials used include the following:

i. Digital Camera to capture the workers during the waste collection.
ii. Video recorder to record the activities for data collection.

The procedure used was itemized in the flow chart below:

Tab. 1 Flow diagram for the methods of the study (Ismail et. al. 2009)

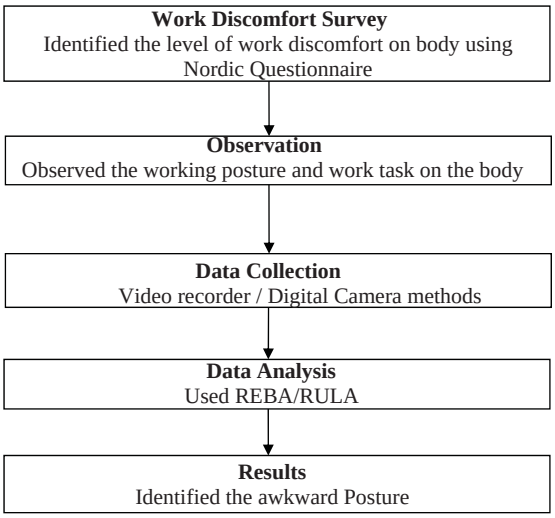

Fig. 1 Workers Picking Waste at Waste Dump Site

Fig. 2 Workers Picking Waste After the Offloading of Waste from the Waste Truck

Results and discussion

The Rapid Entire Body Assessment (REBA) and Rapid Upper Limb Assessment techniques and Nordic questionnaire were used to investigate ergonomics risk of the participants. The participants, were asked about the operation rates and inputting the identified force and posture angles into the assessment worksheet.

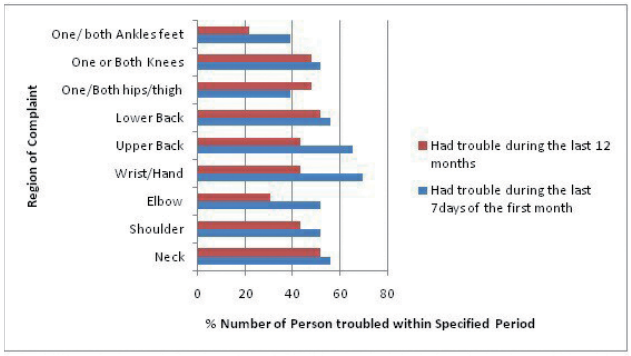

Fig. 3 % Response Analysis of Troubled body features

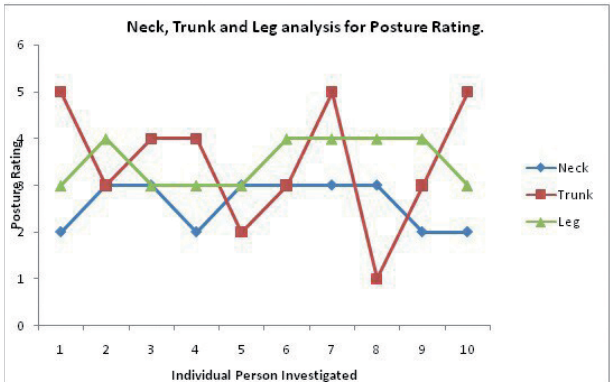

Fig. 4 Neck, Trunk and Leg analysis for Posture Rating

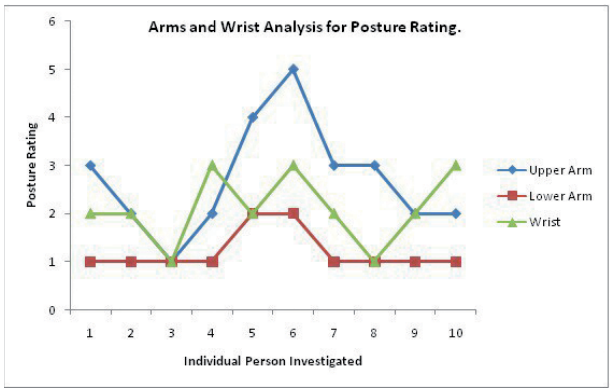

Fig. 5 Arms and Wrist Analysis for Posture Rating

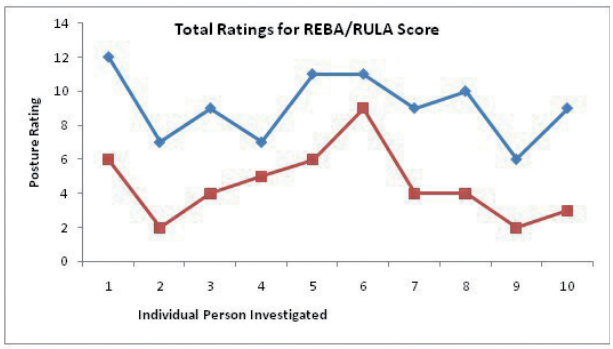

Fig. 6 Total Rating for REBA/ RULA

The result analysis in fig. 3 revealed that 52 % of the workers had pain in the neck 43.5 % had shoulder pain and 30.4 % had elbow pain respectively. Furthermore, 69.2 % had pain in the wrist hand, 65.2 % had upper back pain and 56.2 % had lower back pain as well. The results also showed that 39.1 % had pain in the both thigh, 52 % had knee pain and 21.7 % had ankle feet pains during the 7days of the first month and last 12months of the year.

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The trouble in the first 7days of the first month was higher than the trouble in the last 12months. More so, the workers felt pains mostly in their wrist/ hand and upper back during the first 7days of the first month and neck and lower back in the last 12months of the year.

Tab. 2 Scoring and Description of Result for workers

S/N	Final REBA/ RULA Score	Description Scoring
1	13	Very high risk, implement change
2	9	High risk, investigate & implement change
3	13	Very high risk, implement change
4	9	High risk, investigate & implement change
5	6	Medium risk, further investigation, change soon
6	10	High risk, investigate & implement change
7	14	Very high risk, implement change
8	11	Very high risk, implement change
9	10	High risk, investigate & implement change
10	13	Very high risk, implement change

Note Description Scoring

1 = Negligible risk,

2 or 3 = low risk, change may be needed,

4 - 7 = Medium risk, further investigation , change soon,

8 - 10 = High risk, investigate & implement change,

11 + = Very high risk, implement change (Hignette and McAttamney, 2000).

Tab. 2 result showed that 10 %, 40 % and 50 % respectively were in the medium risk category, high risk category and very high risk category in which the high risk (8-10) and very high risk (11+) required urgent investigation and implementation of change.

This study showed that most of the workers are suffering from one pain or the other which might are as a result of poor working posture. Similarly, the results also revealed that the trunk flexion, lateral bending or twisting muscle also increase the muscle stress and vertebral disc pressure increase the risk of lower back pain and muscle fatigue.

Conclusion

The results analysis showed that the workers are working in an inadequate working environment with awkward postures, due to the poor high motion repetitiveness. The research observed that the workers in Scrutiny of Desecrate Management Industry do suffered from severe pain in the neck, trunk, legs, upper arm, lower arm and wrist. Several physical risk factors for WMSDs can be identified in working life such as postures, manual handling of heavy load, static load, vibration, repetitive work, contact stress, speed or acceleration of movement (Pinzke and Kopp, 2001). This study concluded that the workers working in waste industry are facing MSDs seriously. It was observed that none of the workers falls within the categories of negligible or lower risk to the musculoskeletal disorder (MSD). This submission showed that most of the workers needs urgent health intervention measure. The authors hereby recommend the use of material handling equipment and tools to replaced the manual picking of the waste.

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