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ERGONOMICS RISK ASSESMENT BY REBA AND QEC ON RESIDENTIAL CONSTRUCTION SITE

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ABSTRACT

In residential construction sites workers daily activities need bending, prolonged standing, material handling etc. this leads to musculoskeletal disorder. Some techniques required to identify and control WRMSDs. The aim of research is doing ergonomics risk assessment based on which ergonomics risk level in building construction site is obtained. Through ergonomics assessment tool REBA(rapid entire body assessment) and QEC(quick exposure check) assessment is done .Comparison of QEC and REBA score is done with Wilcoxon signed rank test in SPSS. The result shows that most workers are at higher and medium risk on residential construction site.from results task need to be redesigned.

Keywords: ***Ergonomics Risk Assessment, Rapid Entire Body Assessment, Quick Exposure Check***

I. INTRODUCTION

Work-related musculoskeletal disorders (WMSDs) are a major occupation problem worldwide. In construction sites workers perform activities daily for very long time that leads to musculoskeletal injury at different parts of body. Construction workers are exposed to various factors at work which include awkward posture, heavy lifting, repetitive motion, vibration and forceful exertion which leads to musculoskeletal injuries at construction site .MSDs inherent the productivity of the workers in construction site. Construction workers are the human capital of construction industry. The aim of occupational ergonomics is to decrease injuries at site . MSDs inherent the productivity of the workers in construction site. Construction workers are the human capital of construction industry. The aim of occupational ergonomics is to decrease injuries at site

II. RESEARCH AIM

The main objective is to identify ergonomics risk factor for different activities on residential construction site by doing ergonomics risk assessment at construction site.

III.METHODOLOGY

This research study was conducted at residential building construction sites. The methods used for ergonomics risk assessment are REBA (rapid entire body assessment) and QEC (quick exposure check) as ergonomics assessment tool. The video recording of the posture movements of the workers are recorded .Comparison of QEC and REBA is done.

IV.ANALYSIS AND RESULT

4.1 REBA ANALYSIS

REBA is observation based method of ergonomics risk assessment on construction site. The study was conducted on residential construction site. The observations were taken on construction site for activities related to slab work and wall construction that going on the residential construction site. Through observation the score is noted in the REBA assessment worksheet. The workers performing task activities like rebar tying, concrete screeding, concreting(slab work), mason helpers, brick masonry , rebar bending, rebar cutting , formwork removal , wall plastering (cement). From each studied job tasks were selected for risk analysis by REBA methods based on 1) posture held for the greatest amount of the work cycle or 2) where highest loads occur. Based on following task the below table shows percentage of total workers exposed to different risk level. The worst case situation at the sites were selected for the posture analysis. There were total 90 observations taken for 9 activities.

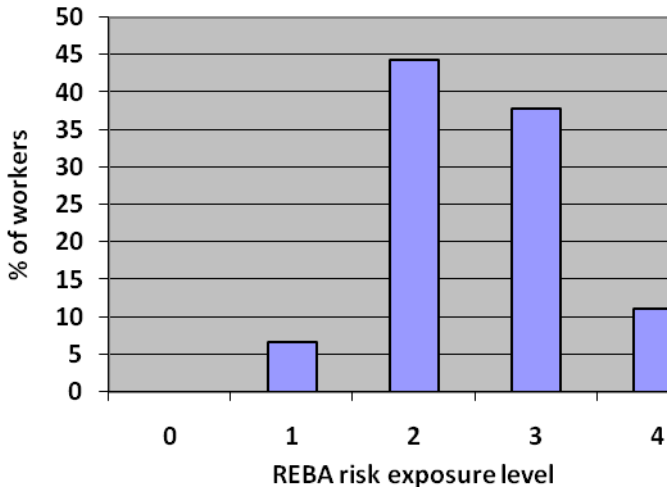

Fig. 1 Reba Risk Exposure Level

The above graph shows results obtained from REBA assessment 11.1% workers are at very high risk i.e their REBA score is 11+ and necessary action should be taken now. 37.8% workers are at high risk i.e their REBA score is 8 to 10 so necessary action needed soon, 44.4% workers at medium risk so necessary action needed, 6.7% workers were at low risk so action may be taken on site. For each activity the average REBA score obtained in the risk assessment worksheet is shown in the below graph.

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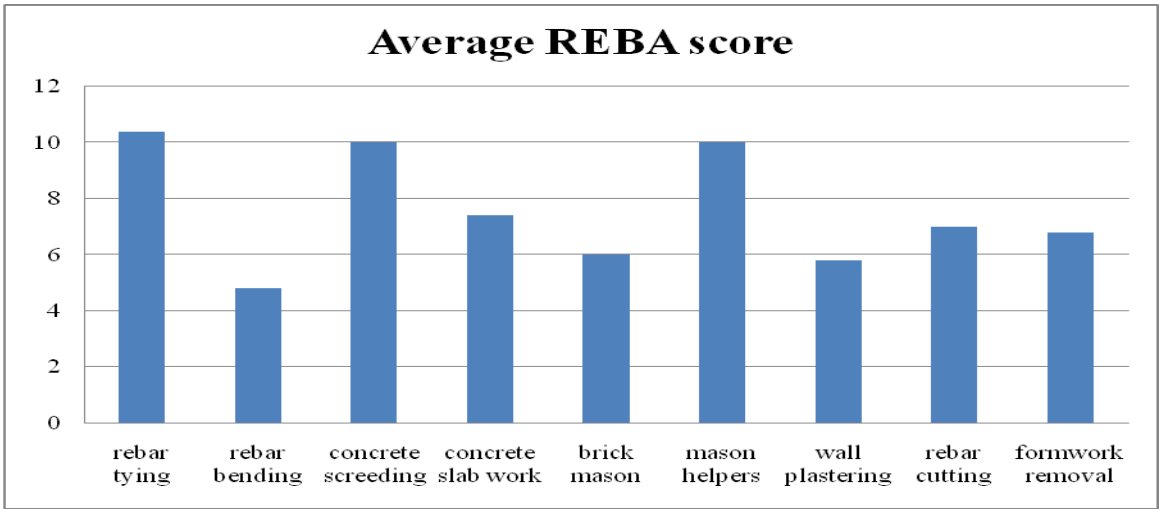

Fig 2 Average Reba Score

4.2 QEC worksheet analysis

- QEC assesses the exposure of the four body areas at greatest risk to the most important risk factors for WMSDs.
- QEC has been designed to assess the changes in exposure to musculoskeletal risk factors of the back, shoulders and arms, hands and wrists, and neck before and after an ergonomic intervention
- involve the practitioner (i.e. the observer) who conducts the assessment, and the worker who has direct experience of the task
- indicate change in exposure scores following an intervention
- QEC has mainly two parts observer's assessment and worker's assessment and data was collected on residential construction site for the selected activity (task). QEC worksheet score is obtained as shown in table below :

Table1 QEC average risk exposure level

Activity	**Average Risk score(exposure level)**			
	Back	Shoulder /Arm	Wrist/Hand	Neck
Concrete screeding	35.6(H)	32(H)	33(H)	12.3(H)
Rebar bending	25.6(H)	33.3(H)	35.6(H)	9.3(M)
Brick masonry	32(H)	25.6(M)	25(M)	9.3 (M)

Rebar cutting	27.6(M)	34.3(H)	38.6(H)	9.3(M)
Mason helpers	34.2(H)	32(H)	35(H)	10(M)
Formwork removal	25.6(M)	32.6(H)	32.3(H)	11.3(H)
Concrete slab work	31.2(H)	28.6(M)	26.2(M)	9.6(M)
Rebar tying	34(H)	33.3(H)	40.33(VH)	9.6(M)
Wall plastering (cement)	30.8(H)	26.4(M)	26.8(M)	9.6(M)

Where L=LOW
M= MODERATE

H = HIGH

VH= VERY HIGH

4.3 A comparison of REBA and QEC ergonomics assessment tool

The comparison of REBA and QEC with exposure level is considered. For comparing both tool QEC scores need to converted. The exposure level (E) is calculated as percentage rate between actual total exposure score X and maximum total possible score Xmax using formula

E(%)= X/Xmax 100%

X = Total score obtained (back+shoulder /arm+wrist/hand+neck)

Xmax = Total maximum score for exposure (back+shoulder / arm+wrist/ hand+neck)

An overall risk score by adding scores from all the body groups and dividing the sum by the maximum score (176 for manual material handling tasks and 162 for others). Low scores (<40%) indicate satisfactory loading (low risk). For 41% to 50%, further investigation is needed and changes may be required (moderate risk). Timely investigation and changes are required soon for scores of 51% to 70% (high risk); and urgent investigation and changes are required for scores over 70% (very high risk). Finally, QEC provides 4 categories for estimating the risk level. These risk levels named from 1 to 4 are corresponding to low, moderate, high and very high risk level respectively.

The exposure level for the REBA score obtained on the assessment worksheet. These risk levels starting from 0 to 4 are corresponding to negligible, low, moderate, high and very high risk level respectively

Table2 Wilcoxon Signed Test

Task activities	REBA exposure level Mean	QEC exposure level Mean	P-Value
Rebar tying	3.6	3.4	0.414
Rebar Bending	1.4	2	0.107
Concrete screeding	3.4	3.6	0.414
Concrete slab work	2.6	2.8	0.317
Bricks mason	2.1	2.6	0.312
Mason helpers	3.4	3.4	1.0
Plastering wall	2.2	2.4	0.317
Rebar cutting	2.4	2.6	0.317
Formwork removal	2.2	2.6	0.102

The analysis was done on SPSS software for comparison of REBA and QEC for each of the selected activities (task) using the exposure level for each task activities on residential construction site.

The analysis for comparing of REBA and QEC exposure level was done in SPSS software using the Wilcoxon signed rank test. The Wilcoxon signed-rank test showed that REBA and QEC action levels generally have no significant differences in exposure level of both the methods for the selected task activities. P values <0.05 were considered statistically significant. Below table shows the mean and p- value for Wilcoxon signed rank test. Results shows that there is no significant difference in REBA and QEC exposure level.

V. CONCLUSION

It is important to identify ergonomic hazard on construction site as it is directly connected to mitigate workers risk including the musculoskeletal work disorder and injuries occurring to construction workers. Ergonomics risk assessment shows workers discomfort , risk factors which leads to injuries and this helps to elaborate corrective measures for risk hazard. It is good to know about Musculoskeletal disorders for construction workers as it helps to

identify risk factors and amount of risk at early stages this helps in reducing the ergonomics risk.. By carrying out ergonomics risk assessment at early stages (planning) WRMSDs or injuries does not occur so that various cost can be reduced for residential site. The result of comparison shows that there is no significant difference in risk exposure level for REBA and QEC so alternative may be used.Task need to be redesigned and reassessed.

RECOMMENDATIONS

1. Ergonomics programs should be conducted at regular intervals at construction sites. It helps the workers to work in proper posture and thus ergonomics injuries can be avoided. There should be proper awareness of workers to ergonomics. This programs also motivate the workers to work in proper position.
2. Proper pre-planning for carrying out activities at site so that also reduces the ergonomics risk factor for example :bricks laying at site should be nearer to the work going on for wall construction. This reduces distance to carry load for workers, for reinforcement bar also.
3. Supervisors or instructors should be placed at site for proper helping the workers to guide them if they are working in the wrong position. If not special supervisors then managers or engineers should also guide.
4. The proper site layout plays major role in ergonomic risk. control. If the site layout is good then workers ergonomics risk is lower. Manual material loading distance decreases, no injuries due to uneven lying of materials.
5. Use of ergonomically designed tools so that less risk and faster works can be done. This tools helps in many ways like no working in awkward posture, less vibration and discomfort in body parts reduces.
6. Instead of working on ground surface platforms for various activities should be provided so no awkward posture is required in many activities.
7. The workplace should be properly redesigned
8. Job rotation and sharing of jobs is important factor to control musculoskeletal disorder on construction sites. Related jobs can be most likely rotated for most of activities. This helps workers not exposed to continuously on one or two body parts (discomfort don't occur).
9. PPE (Personal protective equipment) are used but changes in PPE equipments needed. PPE should be improved. PPE should be designed ergonomically so proper control to risk hazard eg. gloves, helmets
10. As seen at the site that long continuous shifts are there at residential construction. So short breaks should be taken in between performing the task so that continuous exposure in body parts becomes less. Musculoskeletal disorder generally occur due to continuous long tiring work done.

REFERENCES

1. Ergonomics Analysis and the need for its integration for planning and assessing construction tasks" by Ndukeabasi Inyang; Mohamed Al-Hussien Source: ASCE

2. Hignett, S., and McAtamney, L. (2000). "Rapid entire body assessment (REBA)." Appl. Ergon., 31(2), 201–205.
3. Quick Exposure Check (QEC) Curtis VanderGriendt, CCPE Ergonomist http://www.ohcow.on.ca/edit/files/25thanniversary/Quick%20Exposure%20Check%20Overview.pdf
4. A Step-by-Step Guide Rapid Entire Body Assessment (REBA) http://ergo-plus.com/wp-content/uploads/REBA-A-Step-by-Step-Guide.pdf
5. The development of the Quick Exposure Check (QEC) for assessing exposure to risk factors for work-related musculoskeletal disorders Geoffrey David , Valerie Woods, Guangyan Li, Peter Buckle