

Ergonomic Assessment of Cashewnut Kernel Peeling Activity in Women Workers Using REBA

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ABSTRACT

Women are the major work force in cashewnut processing industries in south Maharashtra. Various processes carried out to obtain final edible cashewnut in these industries are, sun drying, roasting, kernel peeling etc. Peeling of outer hard shell called kernel peeling (Shelling) is very time consuming and cumbersome operation and requires labor work force. The women carrying out this activity are at high ergonomic risk which develops musculoskeletal disorders (MSD). This research paper presents an ergonomic assessment of cashew nut kernel peeling activity among 25 women workers using the Rapid Entire Body Assessment (REBA) method. Twenty five women workers were randomly selected for the study from Malvan in District Sindhudurg, Maharashtra. Prolonged and repetitive manual peeling activities can lead to musculoskeletal disorders. The REBA method was applied to evaluate the ergonomic risks associated with cashew nut peeling and to propose potential interventions to improve the working conditions. The study found that the peeling activity poses significant ergonomic challenges and recommends modifications to reduce the risk of work-related injuries among cashew nut peelers. During the survey, it was found that about 85% of the employees were women. Intensity of body pain, postural deviation, joint discomfort and musculoskeletal problems were recorded during survey. Analysis of MSDs reveal that 95% of workers are has low back pain more predominant followed by neck 83% and shoulder pain of about 75%. Further Rapid entire body assessment (REBA) analysis reveals that 25% of the workers are facing sever discomfort in low back pain and 46 % of worker had severed discomfort in neck pain. This study clearly shows that postural behavior in cashewnut processing industries may be the reason for the MSDs in women workers. Thus for human-wellbeing and to sustain human progress, there is urgent need to solve these problems of workers.

Keywords: Cashew Nut Peeling, Musculoskeletal Disorder, Rapid Entire Body Assessment (REBA), Ergonomics, Women Workers.

1. INTRODUCTION

Cashew nut peeling is a vital process in the cashew nut industry, and it plays a significant role in the overall quality of cashew kernels. In many developing countries, this labor-intensive task is predominantly carried out by women workers who manually peel the outer shell of cashew nuts. The repetitive and forceful nature of this activity exposes workers to ergonomic risk factors that may lead to musculoskeletal disorders (MSDs). To ensure the well-being of these workers and enhance productivity,

it is crucial to conduct an ergonomic assessment of cashew nut peeling activities. Various developing countries take great efforts towards the development of small scale industries for their economic growth. WHO reported that over 1000 million people all over world are employed in small scale industries (SSIs) [1]. Even in India trend is towards industrialization. Occupational health and safety are now major concern in the SSIs. India is one of the leading countries in the world scenario who contribute about 43 % of cashewnut production. Konkans South Maharashtra state in India where cashewnut processing is major new area in agro-industrial development. Women are the major work force in cashewnut processing industries in south Maharashtra. The raw cashew is very acidic which have various side effects on skin, therefore it requires various processes to undergo like sun drying, roasting, heating and kernel peeling to make it edible [2]. These aforesaid intensive works resulting in fatigue and body pain. Worker has to be in unnatural squatting posture all the time. They use fourfold gunny bags while performing these activities which create severe MSDs such as back pain, knee pain, arthritis, tingling, stiff joint pain etc. Due to this static squatting posture on the ground, they always suffer from aches in legs which may lead to many nerve and MSDs.

So for human-wellbeing and to sustain human progress, there is urgent need to study the MSDs in details, so that suitable techniques could be developed to attain these problems of women workers in cashewnut processing industries.

This research aims to evaluate the ergonomic risks associated with cashew nut kernel peeling among women workers using the Rapid Entire Body Assessment (REBA) method. The study also seeks to identify potential interventions to reduce the risk of work-related injuries and improve the working conditions for these workers.

Automation of cashewnut processing is possible to a limited extent but difficult for SSIs due to high costs. Small foundries use labor intensive processes which cause MSDs. Very few studies have reported MSD issues in Indian cashewnut processing industries.

From the various tools available, Rapid Entire Body Assessment (REBA) was selected for this study to examine MSD risks as the selected cashewnut peeling activity. REBA is a postural analysis system related to musculoskeletal risks in varieties of jobs based on body segment specific ratings within specific movement planes. This method provides a scale which indicates urgency of intervention and hence perceived to be useful in various work systems.

2. METHODS

2.1 Participants: Twenty five women workers engaged in cashew nut kernel peeling activities in a local cashew processing facility were recruited for this study. They were aged between 20 and 45 years and had varying levels of experience in cashew nut peeling. Preliminary information like age, height, weight, and work experience was collected. Photographs of workers were taken while they were performing specific tasks and used for REBA analysis.

2.2 Data Collection:

Data was collected through the following steps:

- a. Workstation Assessment: The researchers conducted a detailed assessment of the cashew nut peeling workstations, including workstation height, chair design, tools used, and lighting conditions.
- b. Video Recording: The workers' peeling activities were recorded using video cameras from various angles to capture their body postures and movements.

c. REBA Analysis: The video footage was analyzed using the REBA method, which evaluates the entire body posture of the workers during their activities. The REBA method assigns a score based on the posture and identifies ergonomic risk factors.

2.3 Data Analysis

The REBA scores were calculated for each worker, and the data were analyzed to identify common ergonomic issues and areas of concern.

Ergonomic Assessment of selected cashewnut peeling activity:

Calculations of REBA score:

In this method the angles were marked on these photos taken by the assessor of different samples while performing selected task. Score are assigned to postures and body alignment based on body diagram as shown in Fig.1. REBA scores were calculated using standard procedure and a database of all 25 samples were created identifying risk involved. One sample for selected activity is taken for intervention. Under selected activity as shown in Fig. 1 following analysis was carried out.

A. Neck, Trunk, & Leg Analysis:

STEP I Neck Position: From Fig. 1 it is seen that neck has a flexion of 20° forward directions. So the neck score is +2

STEP II Trunk Position: It can be seen from fig. that trunk is under flexion 20° - 60° . Score for trunk is +3

STEP III Analysis of Leg Position: Position of leg in fig. is in between 20° - 60° . So the score for the leg is +3.

STEP IV. Evaluating the score for Table A: using step 1-3 total score for Table A is 7 by adding scores of step 1-3 and +. Since the subject is always subjected to load less than 5Kg. so load score is +1.

B. Arm and Wrist Analysis :

STEP V Upper arm position: considering the photograph of the subject it is understood that upper arm is under extension in between 20° - 45° . The arm is not supported so upper arm score is +2.

STEPVI Lower arm position: The lower arm position is under flexion is in between 20° - 60° . So lower arm score is taken as +2

STEPVII Location of wrist position: The wrist is under extension which is more than 15° so we took wrist score +2.

STEPVII Total score for Table B: The score of Table B is determined by adding scores of step 5- 7 and coupling score which is +1 from standard REBA sheet. So final score for Table B is 4.

STEP VIII Finding the column in Table C: The column in the table C is found and matched with score of Table A, which was determined in previous steps. Thus we can reveal the score C which comes out +8

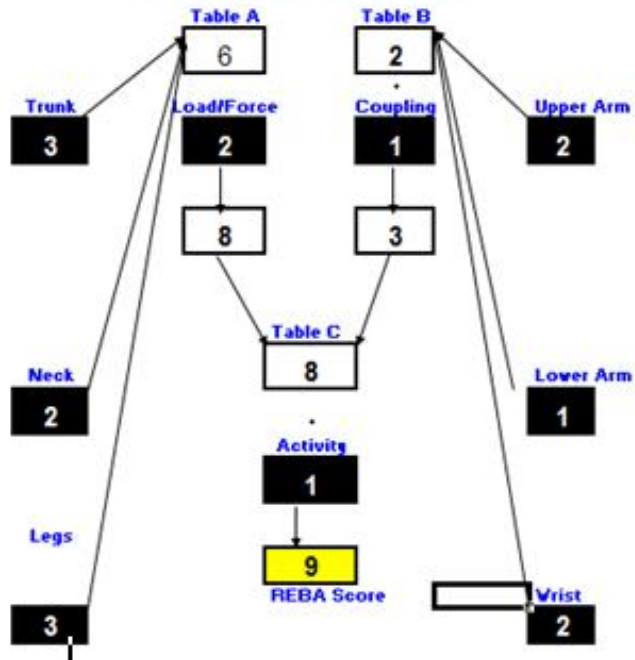
STEP IX Determining the activity score: for selected activity one or more body parts are kept in static for more than 1 min. so the activity score is taken as +1.

Thus final REBA score for the selected activity was. Score of Table C + Activity Score = $8+1 = 9$. So final score of REBA analysis is +9 which is quite high and needs necessary action.



Subject: Women worker 1
Task: Cashewnut Kernel Peeling
Assessor: Sachin S. Shinde
Date: 20/11/15

REBA Assessment Worksheet



REBA Score	Risk Level	Action
1	Negligable	None necessary
2-3	Low	Mag be necessary
4-7	Medium	Necessary
8-10	High	Necessary soon
11-15	Very High	Necessary now

Fig.1: Illustrative Photograph

3. RESULTS

REBA score were calculated for 25 selected samples and were used to decide risk levels of the activity under consideration. Analysis of each subject was carried out. REBA analysis reveals that 25% of the workers are facing severe discomfort in low back pain and 46 % of worker had severe discomfort in neck pain. The average REBA score recorded was found to be 8 and from std. REBA Sheet it is clear that risk is high.

The analysis of the data using the REBA method revealed several ergonomic issues associated with cashew nut kernel peeling activities among women workers:

3.1 Awkward Postures: Workers often maintained awkward postures, such as leaning forward or twisting their bodies, which resulted in high REBA scores.

3.2 Repetitive Movements: The peeling process involved repetitive movements of the upper body and arms, leading to muscle fatigue and discomfort.

3.3 Forceful Exertion: Some workers applied excessive force while peeling, leading to increased ergonomic risks, especially in the wrist and hand areas.

3.4 Inadequate Seating: The chairs provided at the workstations were found to be unsuitable for the task, leading to poor ergonomics and discomfort.

4. DISCUSSION

The findings of this study highlight the significant ergonomic challenges faced by women workers engaged in cashew nut kernel peeling activities. The combination of awkward postures, repetitive movements, and forceful exertion contributes to the risk of musculoskeletal disorders.

To address these issues, several interventions can be considered:

4.1 Redesigning Workstations: The workstations should be redesigned to accommodate the workers' body postures, ensuring a more neutral and comfortable position.

4.2 Providing Ergonomic Tools: The use of ergonomic peeling tools that require less force can reduce the risk of hand and wrist injuries.

4.3 Training and Education: Workers should receive training on proper peeling techniques and ergonomic principles to minimize the risk of injuries.

4.4 Regular Breaks: Encouraging workers to take regular breaks to stretch and relax their muscles can help reduce the impact of repetitive movements.

5. CONCLUSION

This research paper has demonstrated the importance of ergonomic assessment in cashew nut kernel peeling activities among women workers.

By addressing ergonomic concerns, it is possible to reduce the risk of musculoskeletal disorders among cashew nut peelers, improve productivity, and promote a healthier working environment for women workers in the cashew nut industry.

Postural behavior in Cashewnut processing industries, extended working hours, monotonous cumbersome work might be very serious reason for MSDs in selected population. Occupational health and safety of workers in SSIs are measure concern as it directly linked with a good work. Thus it is necessary to conduct proper ergonomic assessment to reduce their discomfort. Ergonomic risk can be reduced through automation, however small scale industries find this cost prohibitive. Also certain activities cannot be automated easily. Hence it becomes necessary to suggest simple and cost effective

intervention in terms of work place design, job rotation, and awareness programs to reduce ergonomic risk levels. These simple interventions reduce risk levels at the same time it reduces time required for the activity and productivity. As very few studies of such kind are done in Indian cashewnut processing industries, more such investigations are possible in future.

REFERENCES

1. Forsman M. (1999). Motor unit recruitment in the trapezius muscle during arm movement. *Occupational health industrial medicine*, 41: 288.
2. Kanji, Nazneen and Vijfhuizen, Carin (2003). Cracking the cashewnut myth? The dilemmas of gendered policy research in the cashew sector in Mozambique. Paper presented at the gender myths and feminist fables workshop, IDS University of Sussex, Brighton, 2- 4 July.
3. Ling Lei, Patrick G. Dempsey, Jian-guoXu, Lin-naGe, You – xin Liang, (2005). Risk factors for the prevalence of musculoskeletal disorders among Chinese foundry workers. *International Journal of Industrial ergonomics* 35:197-204
4. Gerwatowski L.J, McFall DB, Stach DJ, (2003). An Introduction to Ergonomics: Risk Factors, MSDs, Approaches and Interventions. *Applied Industrial Ergonomics*.
5. Corlett, E.N., Bishop, R.P., (1976). A technique for assessing postural discomfort. *Ergonomics* 19(2), 175-182.