

## Chapter 19

# Investigation of Ergonomic Risk Factors in Snacks Manufacturing in Central India: Ergonomics in Unorganized Sector

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### ABSTRACT

*Hand-made snacks (locally known as papadam) manufacturing is a popular profession in Central India employing a large number of women workers. The objective of this study was to identify the ergonomic risk factors for Work related musculoskeletal disorders (WMSDs) in this sector. Direct observation, activity analysis was applied along with postural analysis methods. Pre and post exercise heart rate was measured by the 10 beats method. Lower back (30%), upper arm (30%) and shoulder were the zones where maximum post work pain and discomfort was reported in the dough cutting section. The maximum post work heart rate was at 116.3 beats per minute in the dough cutting section. High REBA score of 15/15 was observed in the grading, kneading and dough cutting sections. Similarly the RULA scores were very high at 7/7 in majority of the sections. Strain Index scores were very high at 60.8 in the dough cutting section.*

### INTRODUCTION

Hand-made snacks manufacturing as a profession employs a large number of rural and urban women in Central India who otherwise does not have any other avenues of earning an income. These women are most illiterate and supplement their family income by working in these labour intensive manufacturing units. As these units require a significant amount of forceful exertions in awkward postures and involves frequent repetitive movements, it leads to different types of Work Related Musculoskeletal Disorders which manifests themselves in the form of pain and numbness in different body parts. These contribute to a decline in productivity and quality of work. To date there has not been an investigation on the

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magnitude and the nature of the problem and the feasibility of any ergonomic design intervention for this sector. For any successful ergonomic intervention, it is imperative to identify the hazards and the levels of risk implicit in performing the required tasks. This research was an attempt in that direction.

## **LEARNING OBJECTIVES**

After completing this chapter the reader will gain an insight into the following:

1. Ergonomic risk factors related to WMSD in the informal sector like hand-made snacks manufacturing involving women
2. The process of identifying the risk factors for WMSD in this sector
3. Directions for ergonomic solutions for the risk factors identified

## **BACKGROUND**

Work related musculoskeletal disorders (WMSDs) are the single largest category of illness globally (Messing et al., 1998) affecting the back and upper extremities. The risk factors for such disorders have been found to be repetitive motions, forceful exertions, non-neutral body positions and vibrations. This has been substantiated by the works of Kattel et al. (1996), and Wiker et al. (1989) wherein it was stressed that poor work space layout and/or hand tool design forces workers to adopt awkward postures over long periods of time; thus, these are risk factors for the occurrence of WMSDs. Therefore, WMSDs are a proven health concern among workers worldwide (Kattel et al., 1996, Wiker et al., 1989). It is important to acknowledge the risk factors for WMSDs, including awkward postures, repetitive movements, and forceful exertions, be identified (Mukhopadhyay et. Al., 2006) before workers develop WMSDs, as they can result in decreased productivity and decreased quality of work as previously mentioned.

Globally, WMSDs have been found to account for huge losses in industry. For example, in the United Kingdom an estimated 9,466,000 working days (HSE, 2015) was lost due to WMSDs, which accounts for an average of 17.1 days lost in each case. Similarly, in the United States (BLS, 2001), WMSDs were responsible for maximum temporary work disability after a common cold. It has been found that WMSDs (BLS, 2001) cost US\$215 billion in 1991 in the USA, C\$26 billion in Canada in 1998, and 38 billion Euros in Germany in 2002 (European Agency for Safety and Health at Work, 2014).

In Canada, WMSD problems resulted in lower productivity in manufacturing sectors causing approximately 34% of the annual lost time (Xu et al., 2012). However, there was no data available for the unorganized sector globally. In the Indian context, such data linking WMSDs and productivity remain unavailable.

WMSDs have been found to be especially prevalent in unorganized occupational sectors, since risk factors and control measures are less well understood in the informal economy (Mukhopadhyay, 2007). Such unorganized sectors form the backbone of the developing economies such as in India. The recent trend in India reflects an increase in the number of women workforce in these sectors for various reasons, one of which is supplementing the family income. Most of these sectors are related to agriculture, handicrafts, and hand-made snacks where a significant amount of physical labour is required. These

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