



## PREVALENCE OF MUSCULOSKELETAL DISORDERS IN FEMALE WORKERS ENGAGED IN KHAKHRA MAKING IN GUJARAT - A CROSS SECTIONAL STUDY

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**ABSTRACT** **Introduction:** Khakhra making involves working in awkward postures, repetitive and forceful movements and handling of objects with different weights, shapes & grip. This study was aimed to find out the prevalence of musculoskeletal disorders in the female workers engaged in khakhra making in Gujarat. **Methodology:** Study was conducted on 72 female workers involved in khakhra making. Video of working posture was recorded, snapshots were taken & analysed by using REBA. Workers were asked to fill up Cornell Musculoskeletal Discomfort Questionnaire. **Result:** The study showed that 78% of workers were under high risk, 13% of workers under medium & 9% of workers under low risk of developing MSD. Result of CMDQ showed prevalence of neck pain was 71%, low back pain 64%, knee pain 58%, wrist & hand pain was 60%. **Conclusion:** The study concludes that there is High prevalence rate of Musculoskeletal disorders among the female workers engaged in khakhra making kitchen gruh udhyog in Gujarat.

**KEYWORDS :** Khakhra, MSD, Prevalence

### INTRODUCTION :

Food-processing is considered to be a sunrise sector because of its large potential for growth and socio economic impact. It is of enormous significance for India's development because of the vital linkages and synergies it promotes between the two pillars of our economy, industry and agriculture.<sup>(1)</sup>

The kitchen gruh udhyog industry of India is one of the small scale industries which has provided ample opportunity of employment for the women of low socioeconomic class.<sup>(2)</sup> Khakhras are thinly rolled out chapattis in Gujarati & Rajasthani cuisines which are made crisp over a griddle made from mat bean, wheat flour and oil. In khakhra making, workers frequently adopt awkward postures like sitting, squatting, forward bending etc. while performing various activities.<sup>(3)</sup> Apart from that, the highly repetitive, forceful movements performed by workers leads to development of musculoskeletal disorders.<sup>(4)</sup> Most work-related musculoskeletal disorders (WRMSDs) develop over time and are caused either by the work itself or by the employee's working environment.

Health problems range from minor pain, discomfort, inflammatory and degenerative diseases to more serious medical conditions requiring time off the work and even medical treatment.<sup>(5-6)</sup>

Various ergonomic assessment tools & questionnaire are used to screen the musculoskeletal disorders in early stages.

REBA is a reliable & valid ergonomic assessment tool used to evaluate working posture of whole body along with force exertion, type of movement, repetition & coupling.<sup>(7)</sup> Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) is valid & reliable tool to assess pain & discomfort in different regions of the body.<sup>(8)</sup>

Although kitchen gruh udhyog industries have provided employment to large number of women of lower socioeconomic class, there is lack of guidelines regarding working habits & techniques.

Many of the workers of these industries suffer from musculoskeletal disorders but are unaware of their faulty working habits and postures.

As this area is unexplored for ergonomic evaluation, there is tremendous need to assess the risk of development of musculoskeletal disorders & to find out its prevalence among the workers engaged in khakhra making & there by reducing the postural stresses of the workers during work.

### MATERIALS AND METHODOLOGY:

#### METHODOLOGY:

A cross sectional study was done on 72 healthy khakhra making workers of 7 units (4 Home based & 3 Factory based selected by simple random sampling) of Gujarat, India. Ethical approval was taken from institutional ethics committee, Gandhinagar.

Written informed consent from participants were taken before starting the study.

Consent for video graphy was also taken from employers and workers. Only Female workers with age group between 20 to 45 years, work experience of minimum 2 years & working for atleast 5 hours/day & 6 days in a week were included in the study by simple random sampling. Workers with history of trauma within last one year, with any congenital/acquired musculoskeletal deformity, neurological conditions, cardio-pulmonary conditions, degenerative disease & with acute musculo-skeletal pain were excluded.

Explanation of study procedure & ergonomic assessment of the workers were done prior to the study. Khakhra making involves Dough making, Lump making, Rolling & Roasting. None of the workers were performing more than one task. CMDQ questionnaire was filled up by interviewing with workers, questionnaire includes pain/discomfort felt by the patient in different segments of the body, its frequency & interference with her ability to work during last 7 days.

Videography of the workers was done when they were performing the tasks like- dough making, lump making, rolling & roasting.

From videos snapshots of 72 workers working in different sections were obtained for REBA. Both frontal and sagittal plane analysis was done. The snapshots were analyzed to fill the scores in REBA.



**Figure-1: Process of Khakhra making**

Following is core level of MSD risk by REBA

REBA score 0-1 : Negligible risk

REBA score 2-3: Low risk

REBA score 4-7 : Medium risk

REBA score 8-10 : High risk

REBA score >11 : Very High risk

### RESULTS:

Data was analyzed using Microsoft Excel-2013 software. Percentage calculation of workers in each MSDs risk category was done.

**Table No-1 : Age distribution female workers among different categories of khakhra making:**

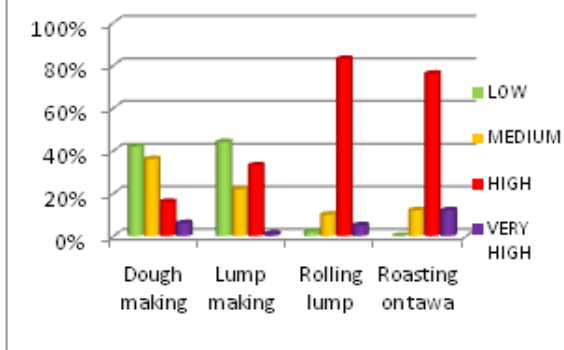
	Dough making	Lump making	Rolling lump	Roasting
No. of workers	09	14	26	23
Mean age (years) + SD	33.3 + 6.06	32.43 + 7.33	32.68 + 5.84	33.04 + 4.82

**Table No-2 : % of workers at risk for MSDs development by REBA score for Right side Dominant and Left side Dominant :Out of Total 72 female workers, 56 were right dominant & 16 were left dominant.**

	% of workers in different categories of MSDs Risk			
	Low	Medium	High	Very high
Right side Dominant	7%	13%	72%	6%
Left side Dominant	9%	14%	66%	7%

**Table No-3 : % of workers at risk for MSDs development by REBA score in different process of khakhra making**

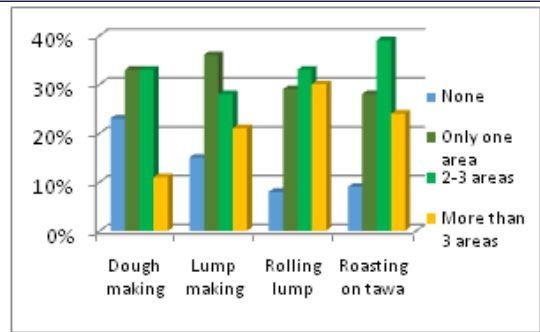
Process of khakhra making	% of workers in different categories of MSDs risk			
	Low	Medium	High	Very high
Dough making	42%	36%	16%	06%
Lump making	44%	22%	33%	01%
Rolling lump	02%	10%	83%	05%
Roasting	0%	12%	76%	12%



**Graph - 1 : % of workers at risk for MSDs development in different process of khakhra making**

**Table No-4 : Musculoskeletal discomfort in affected body part by Cornell Questionnaire.**

CORNELL MUSCULOSKELETAL DISCOMFORT QUESTIONNAIRE			
Complaint region	% of workers having pain	Average discomfort severity	Average interfere in work
Neck	71%	Severe	Substantially interfered
Upper back	50%	Mild	Slightly interfered
Lower back	64%	Severe	Substantially interfered
Shoulder	45%	Moderate	Slightly interfered
Arm	35%	Mild	Slightly interfered
Forearm	46%	Moderate	Slightly interfered
Wrist	57%	Severe	Substantially interfered
Hand	64%	Severe	Substantially interfered
Hip	33%	Mild	Slightly interfered
Thigh	19%	Mild	Not at all
Knee	58%	Severe	Substantially interfered
Leg	37%	Mild	Not at all
Foot	41%	Mild	Not at all



**Graph-2 : Workers distribution according to numbers of painful area in different process of khakhra making:**

**Table No-5 : Number of years of experience & % workers with MSD**

No. of years of work experience	No. of workers	No. of workers with MSD	% of workers with MSD
0-2 years	08	02	25%
2-5 years	09	04	44%
5-10 years	07	05	71.4%
10-15 years	29	24	82%
15-20 years	14	13	92%
> 20 years	05	05	100%

**DISCUSSION:**

From the above study, it was found that 90-92% of female workers working in sitting/ squatting position for prolonged period of time. Sitting posture alter the normal spinal curvature, prolonged work in awkward posture with sustain or frequent neck bending leads to chronic neck & low back pain. Repetitive activity of upper limb with manual handling of objects with various size & shape during different phases of khakhra making leads to pain & discomfort to wrist & hand.

From the above study, it was assessed that 92-95% workers engaged in khakhra making have risks of MSDs. Workers engaged in rolling & roasting of dough are at high risk, while workers engaged in making of dough & small lumps are at medium to low risk of MSDs. Among that 72% workers have high risks, 6% have very high risks, 13% medium risk, 7% have low risk on (Rt) side. While on (Lt) side 68% have high risk, 7% have very high risk, 14% have medium risks, 7% low risks.

Result of CMDQ showed, 88% of the females reported musculoskeletal discomfort of at least mild severity in at least one body part in the previous seven days. 61% reported that the discomfort experienced interfered with their ability to perform work efficiently. There was high prevalence of pain in neck (71%), low back (64%), wrist & hand (60%) & knee (58%) due to awkward posture & repetitive activities.

Roopa Rao et al. (2014) had conducted a study over 300 female workers of 18 khakhra units of thane district of Maharashtra state with age group between 30-50 years. Workers were interviewed & cornell musculoskeletal disorders questionnaire was administered. 89% of sample had reported musculoskeletal discomfort at least in one part of the body with moderate severity. There was high prevalence rate of 53% in wrist & 50% in hands & fingers. 79% reported discomfort experienced interfered with their ability to perform the work efficiently.<sup>(3)</sup> In our study 81% females have reported musculoskeletal discomfort & 61% have experienced that it affects their work efficiency.

Ritu Gupta et al. (2012) had carried out a study over 200 workers engaged in papad rolling Ludhiana district of Punjab to study work environment, posture adopted & musculoskeletal discomfort experienced by the workers. Results suggested frequent awkward postures like squatting, forward bending by the workers & highly repetitive & forceful movements of upper limb with manual handling of instruments. 69% of musculoskeletal discomfort in neck, back & shoulder joint due to prolonged working hours in poor posture. 25% workers reported numbness in one of other parts of the extremities.<sup>(9)</sup> Similar tasks & postures were also acquired in khakhra making which makes workers at high risk of developing MSDs.

Workers engaged in Khakhra making are involved in repetitive,

forceful movements of upper limb & lower limbs maintain the static posture in cross leg sitting, squatting and forward bending posture for prolonged hours. These positions generally leads to musculo-skeletal disorders to back and knee if it is continued for prolonged period of time. Prolonged non-neutral static postures such as cross-legged sitting postures can increase the fatigability of the lumbar-pelvic muscles, particularly the lumbar multifidus and oblique muscles. Prolonged Squat position leads to posterior pelvic tilt which may result in tightness of hamstring muscle & exert stress over knee joint. Squatting with forward bending may leads to increase stress over lumbosacral junction. Thus they are vulnerable to sustaining musculoskeletal disorders during the course of their work routine. So, there is need for urgent improvement in the industries for betterment of the workers to perform their operations with minimum load and stress on their bodies.

#### **CONCLUSION:**

It is concluded from the present study that the prevalence of MSD is high in females involved in khakhra making and majority of them suffer from severe MSDs problem. The study also concludes that Neck & Low back are most affected regions followed by Knee, Wrist & Hand.

#### **CONFLICTS OF INTEREST:**

Authors do not have any conflicts of interest.

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