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A Study of the Occurrence of Work-Related Musculoskeletal Disorders in Rice Farmers of Rural Konkan

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Abstract
This study investigates the prevalence and associated factors of work-related musculoskeletal disorders (WRMSDs) among rice farmers in rural Konkan. Using a cross-sectional design, 100 rice farmers aged 30-60 years were assessed using the Nordic Musculoskeletal Questionnaire (NMQ). Results revealed the highest prevalence of WRMSDs in the lower back (42%) and shoulders (41%) over the past 12 months, with moderate to severe pain levels reported in most cases. Findings emphasize the need for ergonomic interventions and preventive measures tailored to the agricultural workforce.

Keywords: MSDs, Rice farming, Manual labour, Postural stress, Ergonomics

INTRODUCTION

Musculoskeletal disorders (MSDs) are defined as a group of disorders that affect the musculoskeletal system including the nerves, tendons, muscles, and supporting structures such as inter-vertebral discs [1]. MSDs affect millions of people around the world and are the most common cause of severe long-term pain and physical disability [2].MSDs are most commonly a result of cumulative trauma, that is, repetitive minor traumas and biomechanical stresses. Work-related musculoskeletal disorders (WRMSDs) describe disorders and diseases of the musculoskeletal system that are associated with cumulative traumas such as repetitive motion, excessive force, awkward and/or sustained postures, prolonged sitting and standing in the course of work .Musculoskeletal disorders which are the most common cause of short-term and long term pains as well as physical disability, affect millions of people throughout the world [2].

According to some studies MSDs can result in severe long-term pain and suffering for individuals. In addition to their physical effects, they can also lead to further negative consequences such as reduced work ability, lower farm income, poor quality of life, and the onset of other health problems such as stress or depression[3]. WMSDs are found to be associated with absenteeism, loss of productivity and economic loss to the worker, industry and the nation at large[4].

India has world's largest area devoted to rice cultivation, and it is the second largest producer of rice after China (Thiyagarajan and Gujja, 2013). Kokan is coastal part of Maharashtra between Western ghat and

Arabian Sea. The climate is hot humid with annual rainfall of 3500 mm. This climatically condition proves paddy is major crop of this region.At the time of data collection it was found that, except primary and secondary tillage operation in Kokan area, all cultivation practices followed in rice crop are done by manually it includes transplanting, intercultural operation, threshing, fertilizer and manure application. Energy audit of paddy cultivation practices in Kokan region of Maharashtra[5]. Agriculture and its related activities have provided nearly 60% of the employment opportunities in India.

In Indian agriculture human workforce contributes substantially for crop production. A large portion of Indian population lives in rural area. They maintain their livelihood depending on agriculture. In rural areas of Konkan region of Maharashtra state large number of people including male and females are engaged in different types of agricultural jobs, of which rice cultivation occupies a major share. The rice is the main crop in this region. The socioeconomic condition of the agricultural workers depends on the cultivation. The agricultural workers of rural region and their family members remain busy for crop production, processing of food grain and selling them through the year[6].

Rice cultivation contains several tasks and workers were compelled to adopt some harmful and awkward posture during performing cultivation activites.[6] Specific region or state wise study of MSDs in India is advantageous as the race and cultures of Indian populace variates from state to state.[7]

Rice farming involves in various tedious processes like preparation of land, sowing of seeds, uprooting of seedlings, transplantation of seedlings, weeding, reaping, binding of straw bundle, carrying of straw bundle, threshing of straw bundle and collection of crop. Some of the postures adopted by theses farmers were found to be very harmful. But they were compelled to adopt those postures during activities for a long time. During preparation of land, the male workers only do ploughing. They adopt a bent posture and they are required to walk continuously in the muddy field. Also driving a tractor was the activity which was most frequently described as increasing symptoms in both conditions. While driving a tractor, farmers are exposed to whole-body vibration and assume a rotated neck posture.[8] Observation showed that, the male workers work in kneeling posture during uprooting job, whereas, female workers take squatting posture for the same. During transplantation the workers adopt strongly bent posture in the muddy field for a long time in heavy rains. But during weeding and reaping both male and female workers adopt both bent and squat postures. Standing for a long time with frequently wrist movement of the workers required during binding and threshing operation of straw bundle. In all the tasks of rice cultivation are repetitive in nature.[6] Due to the nature of farm work, which involves strenuous physical activities and high levels of manual labor, farmers and farm workers are at particular risk of developing WRMSDs [9].

Farmers are vulnerable to a range of MSDs including: osteoarthritis of the hip and knee, low back pain (LBP), upper limb disorders, and hand/arm vibration syndrome, as well as to the consequences of trauma such as sprains, fractures, and dislocations[9]. However, the association between some farming characteristic factors and MSDs in Thai farmers is still unclear.[10] In Indian agriculture human workforce contributes substantially for crop production. The prevalence of musculoskeletal discomfort (MSD) among Indian farm workers is not well documented.[11]

Therefore there arises a need to study the prevalence of MSDs and the factors associated with pain in different parts of the body among rice farmers in rural areas of Konkan.

NEED OF STUDY

Largest population of India is dependent on agriculture for their livelihood. In Indian agriculture, human workforce contributes substantially for crop production. Musculoskeletal injuries are significant health

problems in farmers. This study will help to understand the prevalence of MSDs so that guidance for appropriate practices can be given to prevent MSDs. There exists a need for the study so that the occupational health hazards can be prevented and safety practices in agriculture can be practiced.

RESEARCH QUESTION

How much is the occurrence of Work Related Musculoskeletal Disorders in rice farmers and what can be the possible risk factors?

REVIEW OF LITERATURE

1. Ekarat Sombatsawat , Titaporn Luangwilai ,Parichat Ong-artborirak and Wattasit Siriwong (: 2019) in their study titled "**Musculoskeletal disorders among rice farmers in Phimai District, Nakhon Ratchasima Province, Thailand**" aimed to explore the prevalence of musculoskeletal disorders (MSDs) and determine factors influencing MSDs among rice farmers.They found that all rice farmers reported MSDs in at least one body region during the six months preceding the interview. The highest prevalence of MSDs showed 86.5 percent in the lower back area, followed by 85.9 percent in the neck, and 80.7 percent in the shoulders. It was also observed that factors such as gender, age, BMI, work experience and farm size influence MSDs' occurrence, and pain severity in one or more body regions.
2. SK Kar and PC Dhara (2007) in thier study titled "**An evaluation of musculoskeletal disorder and socioeconomic status of farmers in West Bangal, India**'' aimed to identify the socioeconomic status of the farmers considering the issues of community health development and stated that that MSD among the workers might be related to the stressful work posture, long duration jobs, nature of jobs and use of ill-fitted hand tools. From the MSD assessment lower back problem was prevalent (48.8%) among the workers when all rice cultivation tasks were consider together, but it was extremely prevalent in reaping job (92.0%) and transplantation job (84.0%). It was concluded that MSD among the workers might be related to the stressful work posture, long duration jobs, nature of jobs and use of ill-fitted hand tools. So, some free-hand exercise, proper work-rest scheduled and awareness program may be helpful for reducing the MSD and proper handling of hand tools.
3. Nathan B. Fethke PhD, Linda A. Merlino MS, Fredric Gerr MD, Mark C. Schall Jr. MS, Cassidy A. Branch MS (2015) in their Study titled "**Musculoskeletal pain among Midwest farmers and associations with agricultural activities**" in which Among 518 regional farmers, responses to a mailed questionnaire were used to estimate (i) the 2-week prevalence of low back, neck/shoulder, and elbow/wrist/hand pain, and (ii) associations between the average hours per week performing common agricultural activities and musculoskeletal pain. The study concluded that the low back was the most common location of musculoskeletal pain (33.2%), followed by the neck/shoulder (30.8%) and elbow/wrist/hand (21.6%). Statistically significant adjusted associations were observed between performing equipment repair and maintenance with low back pain; milking animals with neck/shoulder pain; and manual material handling with elbow/wrist/hand pain, among others.
4. A.Osborne, C. Blake, J. McNamara, D. Meredith, J. Phelan, C. Cunningham (2010) in their Study "**Musculoskeletal disorders amongst irish farmers**" concluded that of the 600 farmers, 56% had experienced a MSD in the previous year. The most commonly experienced MSDs were back pain (37%) and neck/shoulder pain (25%). Other MSDs experienced in the previous year included knee pain (9%), hand–wrist–elbow pain (9%), ankle/foot pain (9%) and hip pain (8%). Overall, MSDs were

more common in farmers working longer hours ($P < 0.05$). Back pain was more prevalent in full-time farmers ($P < 0.05$), while prevalence of hip pain was greater in farmers who were older ($P < 0.01$), full time ($P < 0.05$), farming for longer ($P < 0.01$) and working for longer hours ($P < 0.01$).

5. Deirdre O'Sullivan, Caitriona Cunningham and Catherine Blake (2008) in their study titled "**Low back pain among Irish farmers**" aimed to establish LBP prevalence, beliefs regarding LBP, perceived LBP risk factors, related health service utilization, awareness and participation in manual-handling training among farmers in Ireland. It was concluded that lifetime, annual and point prevalence of LBP was 74% (n 5 77), 54% (n 5 56) and 27% (n 5 28), respectively. A high prevalence of LBP was found among farmers, with lifting being reported as the major contributing factor. . There is a need for high-quality studies to examine the effectiveness of different interventions to prevent LBP among the Irish farming population

Aim: The study aimed to measure the occurrence of Work Related Musculoskeletal disorders in farmers working in rice fields.

Objectives:

1. To determine prevalence of musculoskeletal problems in rice farmers.
2. To identify most common body region of MSDs in farmers.

METHODOLOGY

- STUDY DESIGN : A cross sectional study
- STUDY POPULATION : Rice farmers of age 20 to 60 years
- STUDY SAMPLING : convenience sampling
- STUDY SETTING : Regions of rural Konkan , villages near south Konkan
- STUDY DURATION : 3 months
- SELECTION CRITERIA :-

INCLUSION CRITERIA-

1. Male or female rice farmer
2. Aged 30 to 60 years old
3. Grow rice by themselves, involved in every farming activity
4. Experience of more than 5 years in farming practices

EXCLUSION CRITERIA-

1. History of surgeries , co-morbidities
2. Medical records of musculoskeletal injuries /trauma
3. Part-time farmers subjects
4. Any farmer diagnosed with congenital skeletal deformities or

deformities due to fractures:

5) Subjects diagnosed with any psychiatric illness;

6) Subjects who were known to have spinal fracture resulting from tumours, infections or any major trauma to the spine or having diagnosed neurological problems.

7) Subjects unwilling to participate in study.

TESTING EQUIPMENTS

1. Demographic data form
2. Paper, pen, pencil
3. Nordic Musculoskeletal Questionnaire (NMQ)
4. Consent form

PROCEDURE

The samples were collected through convenient sampling from farmers of rural Konkan. Informed written consent was taken from all included farmers. Those who fulfilled the inclusion and exclusion criterion was then asked for their demographic details, about present and past medical history, family history and surgery undergone if any, and so on. Patients were then given clear-cut instruction for responding to the Nordic musculoskeletal questionnaire; there was no any further assistance or prompting to the respondents. Data was recorded on the assessment sheets and data collection forms.

To answer the research questions on prevalence of musculoskeletal discomfort in farmers of rural Konkan, India an appropriate scale: Nordic musculoskeletal questionnaire (NMQ) was used. The NMQ was used as a questionnaire or as a structured interview. In very explicit and simple terms respondents was asked if they had experienced any musculoskeletal discomfort in any of the joints in their body which prevented them from performing normal activity during the past 12 months or for a short and temporary period of 7 days.

Data was enter into Microsoft excel and statistical analysis with help of SPSS. The descriptive, analysis including percentage was computed for every variable.

STATISTICAL ANALYSIS

- Collected data was entered in excel software and analyzed using SPSS (version 25.0). Continuous variables were presented as mean and standard deviation.
- Pie charts and histograms were constructed for Nordic Musculoskeletal Questionaire and Pain intensity distribution.

RESULT

Lower back (42%) and shoulder (41%) are the most common body region for musculoskeletal disorder since last 12 months.

During the last 12 months 27% have been prevented from carrying out normal shoulder related activates and 25% have been prevented from carrying out normal lower back related activities. Out of all only 17% people visited physician for lower back pain and 12% for shoulder pain. Lower back (34%) and shoulders (32%) followed by upper back (24%) , wrist(21%) are most common body region for musculoskeletal disorders since last 7 days.

Q1: Pain during 12 months

Q2: During last 12 months have you been prevented from carrying out normal activities (because of pain)

Q3: During last 12 months have you seen physician for this condition,

Q4: During last 7 days have you had trouble in

Fig:1

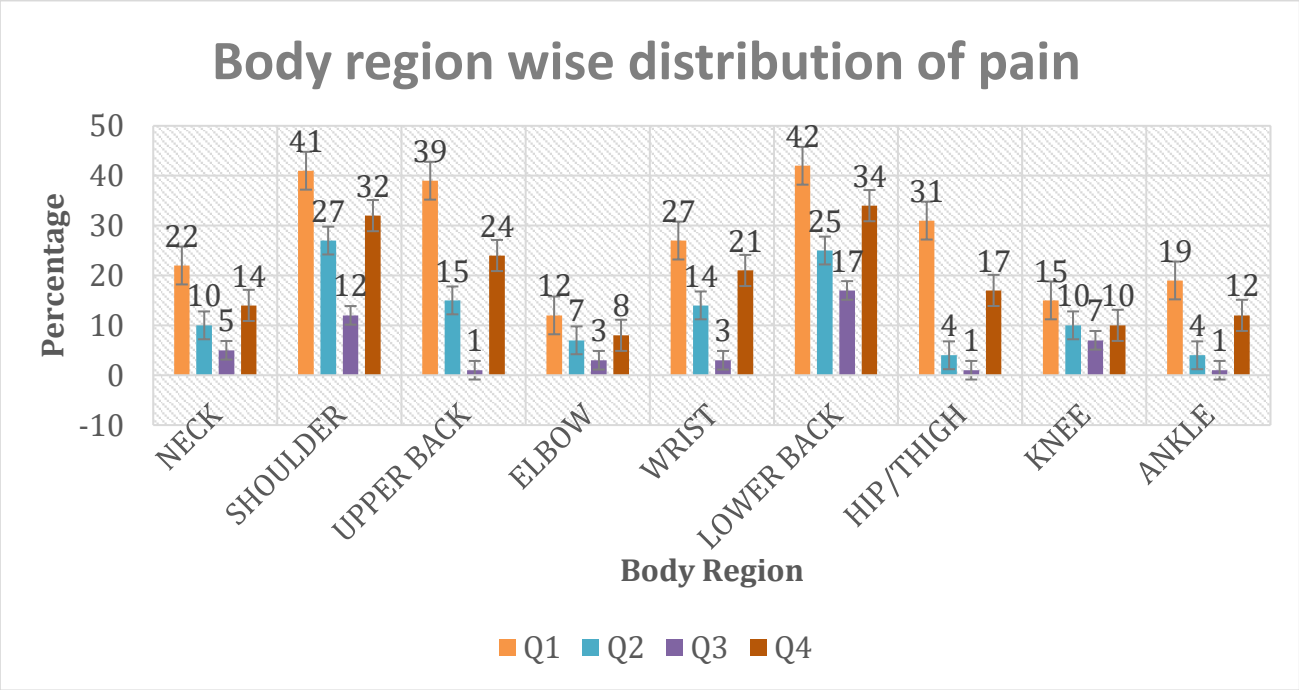
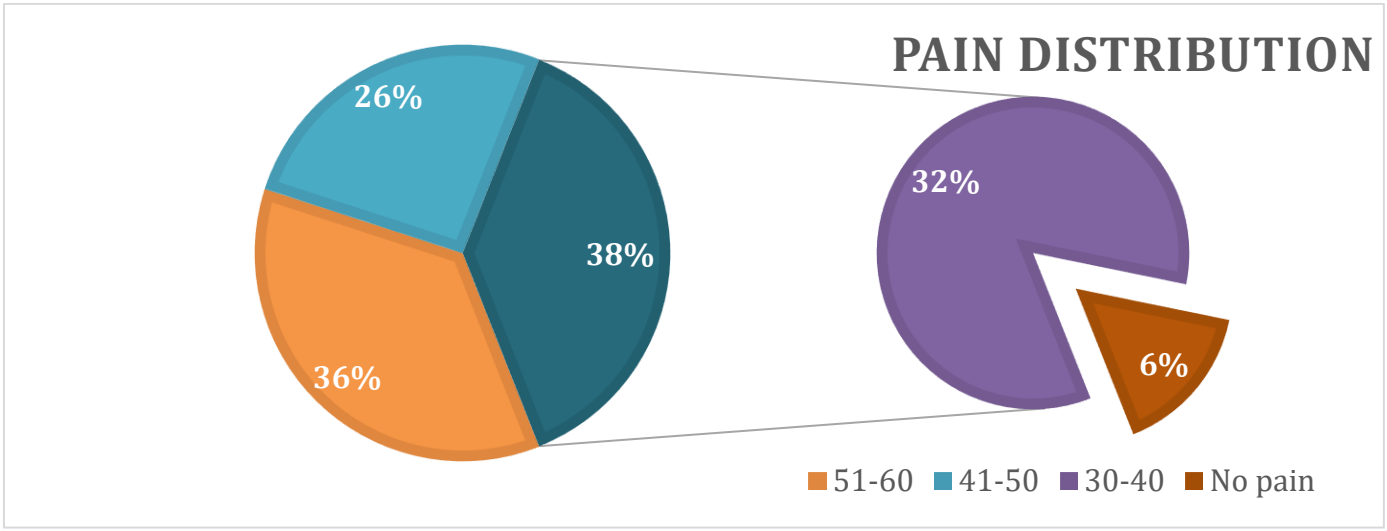


Fig: 2



Out of 100 participants , 38% population was of age group 30-40 , 26% population was of age group 41-50 and 36% population lies under age group 51-60.
6% population had working experience of < 10 years , lies in age group 31-40 reported no pain at all.

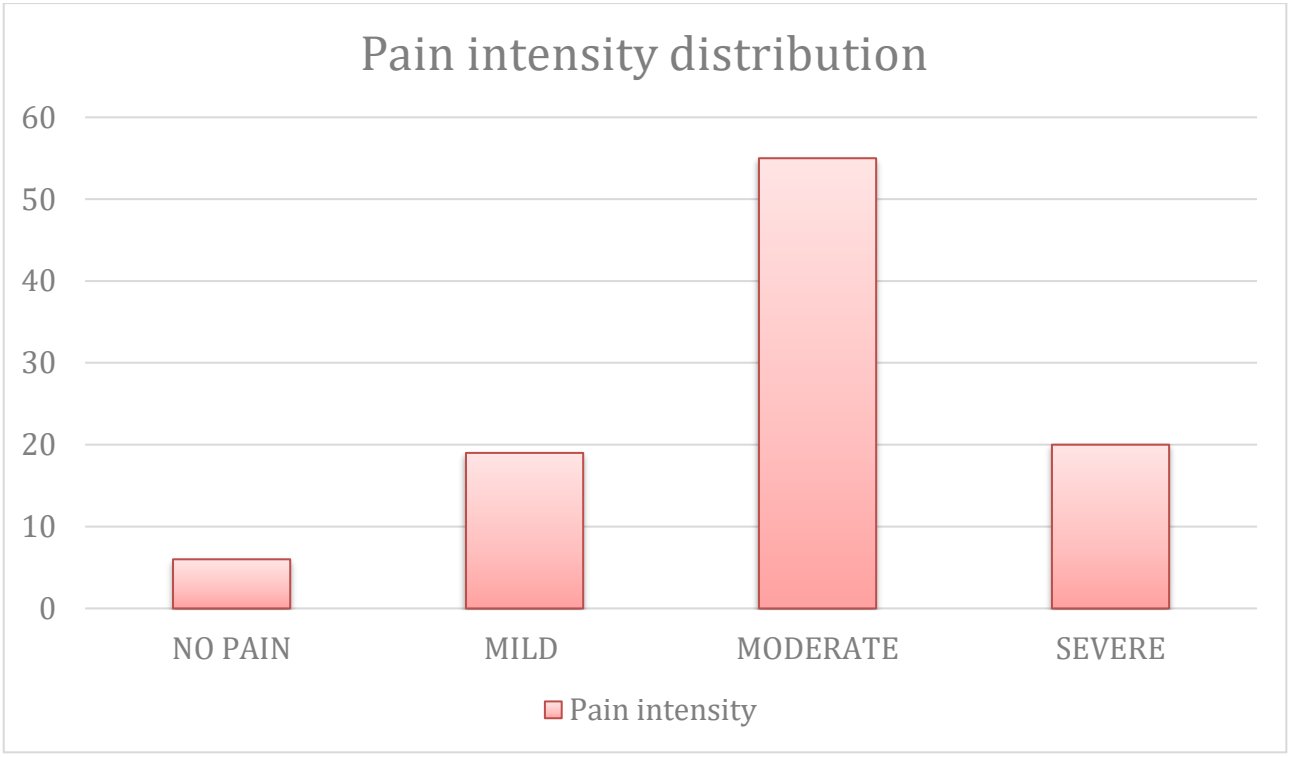


Fig: 3

Out of 100, 6% had no pain at all, 19% had mild, 55% had moderate pain and 20% reported severe pain.

Correlations

		vas
Age (yrs)	Pearson Correlation	.345
	Sig. (2-tailed)	.000
	N	100
Experience (yrs)	Pearson Correlation	.383
	Sig. (2-tailed)	.000
	N	100
Daily working hours	Pearson Correlation	.237
	Sig. (2-tailed)	.018
	N	100

Table: 1 Correlation between factors and pain levels (p<0.05)

DISCUSSION

The present study showed the prevalence of MSDs in one or more body regions among rice farmers during the process of rice cultivation. The highest prevalence for twelve-month MSDs was observed in lower back (42 percent), followed shoulder (41 percent) and upper back (39 percent). Also for last 7 days, highest prevalence of MSDs in Wrist (21%) was observed along with lower back, shoulder and upper back. In addition, most of these body regions were found to be have moderate pain which could possibly lead to long-term problems, including chronic MSDs. As the rice farming activities are distributed throughout the year based on seasonal tasks, presence of MSDs in different study duration might affect prevalence in last

7 days.

Pain intensity distribution amongst study population was 6% had no pain at all, 19% had mild pain, 55% had moderate pain and only 20% had severe pain. Pain intensity assessment might get affected by difference in subjective perception of pain and lack of awareness that pain which they are experiencing is actually result of wrong working posture or methods. The workers suffered from lower back problems might be due to prolonged forward bent posture for a long period during performing reaping, transplantation and uprooting operation. It was noted that during uprooting the workers pull the seedling forcefully, which imposed a jerk in their upper back muscles, which might be the cause of upper back pain among the workers. Frequent movements at shoulder joint was noted during harvesting activities leading to shoulder joint involvement. It was also associated with repetitive movements of arms. Repeatative overhead activities such as carrying or loading can also lead to upper back and neck muscle involvement along with shoulder. The variation on pain intensity in various body regions may be from the difference in the nature of the posture adapted or repetitive movements done by farmers.

For demographic information, the results indicates that age was significantly associated with MSDs. Age was observed as a likely factor increasing the intensity of MSDs in Shoulder, upper back and lower back. From our observation elder farmers believes in traditional practices and adaptes risky working posture which might leads to musculoskeletal disorders. About presence MSDs according to gender distribution in this study which was 53% male and 47% female , there was no significance of pain score and gender and it was similar for both.

For nature of work, duration of farming and total no of years in farming are some factors influencing severity of MSDs in mainly body regions. Most farmers suffered from WRMSDs for a long period of time, this can occur when parts of the body are subjected to the same high workload due to continuous repetitive tasks, high force, jerky movements, without proper treatment and rehabilitation. It appeared from the above results that the types of physical stress, work posture and methods of doing the job were associated with the musculoskeletal disorders.

The findings of the present study highlighted characteristics such as age, workload and working year, affecting MSDS. Whereas, unlike other occupations number of breaks taken in a day does not really affects occerence of WRMSDs in farmers. According to some previous studies due to low educational level farmers were not aware about musculoskeletal problems or risk factors leading to high prevalence of WRMSDs in this occupation . Limitations of study includes : Personal factors of demographic details such as Height, weight and BMI was not included in this study. As this study considers prevalent cases rather than incident cases, result might be influenced by survival factors.

CONCLUSION

The study emphasized that MSDs are significant occupational health problem in rice farmers. Most of rice farmers (N=100) reported MSDs in one or more body regions during last 12 months. Highest prevalence of Lower back (42%) pain and shoulder (41%) pain and are the most common body regions affected by musculoskeletal disorder, followed by Upper back (39%), wrist (27%) and neck(22%).

Work related domains such as work experience and daily working hours influenced the risk of MSDs in farmers. Whereas number of breaks during a day does not really affects occurrence of WRMSDs.

CLINICAL IMPLICATION

- For Implementation of any intervention for WRMSDs in farmers, the evaluation plan should also be

developed.

- Preventive measures of ill effects of adopting awkward postures during farming practices can be taken by suggesting changes and assistive tools.
- Intervention plans to be made based on subjective assessment and needs, including stretches, exercises and postural corrections.
- Importance of ergonomic changes, appropriate working hours and correct working posture was explained at the time of assessment.

LIMITATIONS

- Personal factors of demographic details such as Height, Weight and BMI was not included in this study.
- As this study considers prevalent cases rather than incident cases, results might be influenced by survival factors.

RECOMMENDATIONS AND SUGGESTIONS

- A Specific physical examination test for pain assessment in various regions of body are recommended.
- For further research, comparative study can be done on presence of WRMSDs in manual practices and mechanical tool handlers during farming activities.
- Along with farming activities; risk factors associated with dairy farming and poultry should also be considered.

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