PREVALENCE OF WORK-RELATED MUSCULOSKELETAL DISORDERS AND ASSOCIATED RISK FACTORS AMONG FEMALE FARMERS IN FEW RURAL AREAS OF VADUGAPATI PANCHAYAT, ERODE DISTRICT, TAMIL NADU, INDIA- A CROSS-SECTIONAL SURVEY STUDY

E. Nijanthan1*, P. Selvi1, K. Saranayadevi1, T. Kalaivani1, V. Lalitha2

1 Nandha College of Physiotherapy, Koorapalayam Privu, Perundurai main road, Erode-638052. Tamil Nadu, India.
2 Nandha College of Pharmacy, Koorapalayam Pirivu, Perundurai main road, Erode-638052. Tamil Nadu, India.
*Corresponding Author: Mr. E. Nijanthan, BPT
Department of Orthopaedic, Nandha College of Physiotherapy, Koorapalayam Privu, Perundurai Main Road, Erode 638052. Tamil Nadu, India.
Email id: academic@nandhaphysio.org

ABSTRACT
Background: Agriculture is the traditional occupation of our country. It inclines individual to different health issues including Musculoskeletal Disorders (MSD’S). There is only confined research on female farmers in rural areas of Tamil Nadu, India regarding the extent of WRMSD’s and associated risk factors. AIMS AND OBJECTIVES: To find prevalence, pattern and related risk factors of WRMSD’s among female farmers in rural Erode district, Tamil Nadu, India. Methodology: It was a cross sectional survey study conducted among 71 female farmers in Karumandampalayam, Pachankuttuputhur, Pachakuttai and Pannaikinaru areas of Vadugapatti Panchayat, Erode district. Standard Nordic musculoskeletal questionnaire was used to collect data on prevalence of WRMSD’s and other related information was also collected on educational status, time spent in work per day and entry age of involvement in work. Results and Discussion: There was more predominance of WRMSD’s among female farmers. Low back pain was most prevalent followed by knee pain, neck pain, shoulder pain, ankle/foot pain, wrist/hand pain, hip/thigh pain and least at upper back and elbow region. There was also a strong association between years of working experience and prevalence of MSD’S. The results revealed that they were overburdened with work of farm, home and livestock and get very less time in a day to take rest. Conclusion: Female farmers suffer from WRMSD’s that are all due to occupational risk factors in agriculture including static posture, forward bending, heavy weight lifting, lack of ergonomic awareness, etc. There is a need to increase awareness of MSD’s and associated risk factors among female farmers.

Keywords: Ergonomics, Health, Low Back Pain, Posture, Work Related Musculoskeletal Disorder’s [WRMSD’s].

INTRODUCTION
Agriculture is a customary occupation of our country. Every single individuals needs to rely upon agriculture for their life. Without farmer’s persistent effort, we will not get any sort of food. So, all our precious life depends on agriculture only. In India, human work powers are for the most part utilized for crop creation. Agriculture positions among the most well-known health hazardous industry1. Home members of farming community are also in danger for deadly and non-lethal wounds2. Women are the foundation of farming labour force, however overall her persistent effort has for the most part been neglected. She does the most hard and burdensome undertakings in agriculture, creature farming and homes3. However ranch automation is fostering a ton, ongoing agricultural innovations have not profited farm ladies and they actually do what is principally difficult work. Women still currently utilizing similar conventional rural instruments for doing work. Drawn out job length, nonstop focus, accuracy, distinctive assortment in work, outrageous stances, helpless sustenance apparently show that ranch women are under genuine actual pressure. They are likewise highly stressed during their menses. They lead an exceptionally upsetting life, as they are engaged with various tasks to make their family individuals more agreeable and more joyful.

Musculoskeletal disorders (MSD’s) are injuries and disorders that influence the human body’s movement or musculoskeletal system4. Work Related Musculoskeletal Disorders (WRMSD’s) is defined as work related ailment or illness as
being brought about by, exasperated speed up or exacerbated by working environment exposures, which brings about weakened work capacity\textsuperscript{5}.

A study of 15 European nations demonstrated that agriculture is one of the ventures with most openness to weighty physical loads\textsuperscript{6}. A Swedish report found that chances of revealing musculoskeletal issues were 51\% higher among farmers than non-farmers\textsuperscript{7}. In an overview of southeast Kansas ranchers, almost 60\% of respondents said that they encountered a farm work related musculoskeletal disorder side effects during most recent a year\textsuperscript{8}. A study for work related ailment in Britain (1995) viewed as that 43,000 or 7\% of the agriculture labour force credited MSD’s to their work\textsuperscript{9}. Due to nature of ranch work, ranchers are at more danger for creating musculoskeletal disorders\textsuperscript{10-11}. It influences a great many individuals all over the planet and is the most well known reason for serious long haul torment, physical inability and ailment non-attendance in the farm work. MSD’s are likewise influencing the psychosocial status of the individuals\textsuperscript{12-13}.

Common activities doing in agriculture are: In farm land- Land preparation, Sowing, Planting/ transplanting, Irrigation, Crop protection, Weeding, Harvesting, Threshing, Processing and Storage. In cattle rearing- Grazing the cattle, collecting fodder for cattle, milking and cleaning the cattle living areas. In household chores- Making food for their family members, taking woods or fuels for cooking, Washing the utensils, Brooming the floors both in and out of their home, Winnowing , Cutting the vegetables, Cleaning the floors, Washing clothes and taking care of their children.

Various risk factors in farming includes lifting and carrying heavy loads, working with trunk frequently flexed, uneven walk ways, exposure to vibration from farm vehicles and powered hand tools, repetitive and forceful work, adaptation of awkward and uncomfortable postures, forking and shovelling, sitting in a cramped position, long hours of working, static positioning, kneeling, risk of trips and falls on slippery and hazard of mishaps because of erratic activities of domesticated animals.

Pathology behind this will be tissue irritation to muscles, tendons, ligaments and discs\textrightarrow Micro trauma and small tears in tissues\textrightarrow Production of scar tissue like a blob of super glue\textrightarrow Irritation continues as long as activity continues\textrightarrow Results in decreased flexibility, strength and function\textrightarrow can lead to an injury or disability. Musculoskeletal issues begins as minor throbs however when left unaddressed without mindful of ergonomic consideration of their work task, can bring about genuine injuries that can be forever debilitating. Muscle irritation and other uneasiness with injuries some of the times can likewise happen by utilizing devices of farming. There are likewise other manifestations like tiredness, stress, limb oedema, headaches, debilitated nerve functions, foot and hand ulcers and so forth.

**NEED OF THE STUDY**
- To identify prevalence of WRMSD’s among female farmers.
- To identify work related risk factors for female workers.
- To train and educate the female farmers for bringing about awareness of MSD’s and safety has become imperative so as to improve the quality of life of largest work force of country.
- To use improved agricultural equipment, safe work methods and proper postures can help to reduce risk of many musculoskeletal aches and pains.
- Recommendations can be made for risky prevention strategy.

**AIM OF THE STUDY**
To establish prevalence, pattern, associated risk factors of WRMSD’s among female workers of few rural areas of Vadugapatti Panchayat, Erode district, Tamil Nadu.

**OBJECTIVES OF THE STUDY**
- To establish prevalence of musculoskeletal disorders (MSD’s) among female farmers.
- To identify the most commonly affected body regions.
- To find association between years of working experience and severity of work related musculoskeletal disorders (WRMSD’s).
- To identify the background level of female farmers.

**METHODOLOGY**
Study design: Cross sectional descriptive survey study.
Study setting: Karumandampalayam, Pachankattuputhur, Pachakuttai and Pannaikinaru areas of Vadugapatti Panchayat, Erode district, Tamilnadu, India.
Study population: Female Farmers.
Survey duration: Three months from February 2017 to April 2017.
Population size: 71 people.
Sampling technique: Convenient sampling technique

Criteria:
Inclusion criteria:
- Female farmers only.
- Those who gave consent and participation for interview.
- Minimum 3 years of farm work experience.
- The women who involved in agriculture, household activity and care of livestock only.
- Able to read or understand the Tamil language.

Exclusion criteria:
- Refusal to give informed consent.
- Less than 3 years of farm work experience.
- With the history of trauma to spine or who had known cardiac or neurological problems.
- Bed ridden female farmers

Parameters: Standard Nordic Musculoskeletal Questionnaire

PROCEDURE
This survey was done to note commonness of MSD’s for female peasant of Karumandampalayam, Pachankattuputhur, Pachakuttai and Pannaikinaru areas of Vadugapatti Panchayat, Erode district. Initially the informed consent was obtained from the participants. Then their background information was obtained. It includes name, age, height, weight, BMI, type of work, years of experience, and entry level of age to work, hours of working and educational status. Then evaluation of MSD was done by using standardized Nordic musculoskeletal questionnaire. Interview method (Personal) was used to collect information\(^4\). In easy terms participants were questioned if they had any musculoskeletal issues in any of their joints and also asked due to this discomfort either it restricted them from doing normal routine activities during the previous twelve months or for a little period of seven days or not. Then these data’s were recorded on the sheets and data collections formed.

DATA PRESENTATION AND STATISTICAL ANALYSIS
After data collection, data were presented and statistical analysis was done. For body region wise analysis of prevalence of MSD’s is represented below (See table 1 and chart 1).

Table 1: Analysis of prevalence of MSD’s- body region wise

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Prevalence of MSD’s</th>
<th>Response</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NMQ response</td>
<td>NO</td>
<td>68</td>
<td>95.77%</td>
</tr>
<tr>
<td></td>
<td>Upper back</td>
<td>YES</td>
<td>03</td>
<td>04.225%</td>
</tr>
<tr>
<td>2</td>
<td>NMQ response</td>
<td>NO</td>
<td>40</td>
<td>56.33%</td>
</tr>
<tr>
<td></td>
<td>Lower back</td>
<td>YES</td>
<td>31</td>
<td>43.66%</td>
</tr>
<tr>
<td>3</td>
<td>NMQ response</td>
<td>NO</td>
<td>56</td>
<td>78.87%</td>
</tr>
<tr>
<td></td>
<td>Neck</td>
<td>YES</td>
<td>15</td>
<td>21.12%</td>
</tr>
<tr>
<td>4</td>
<td>NMQ response</td>
<td>NO</td>
<td>57</td>
<td>80.28%</td>
</tr>
<tr>
<td></td>
<td>Shoulders</td>
<td>YES</td>
<td>14</td>
<td>19.71%</td>
</tr>
<tr>
<td>5</td>
<td>NMQ response</td>
<td>NO</td>
<td>68</td>
<td>95.77%</td>
</tr>
<tr>
<td></td>
<td>Elbows</td>
<td>YES</td>
<td>03</td>
<td>04.225%</td>
</tr>
<tr>
<td>6</td>
<td>NMQ response</td>
<td>NO</td>
<td>64</td>
<td>90.14%</td>
</tr>
<tr>
<td></td>
<td>Wrist/Hands</td>
<td>YES</td>
<td>07</td>
<td>09.85%</td>
</tr>
<tr>
<td>7</td>
<td>NMQ response</td>
<td>NO</td>
<td>66</td>
<td>92.95%</td>
</tr>
<tr>
<td></td>
<td>Hips/Thighs</td>
<td>YES</td>
<td>05</td>
<td>07.042%</td>
</tr>
<tr>
<td>8</td>
<td>NMQ response</td>
<td>NO</td>
<td>43</td>
<td>60.56%</td>
</tr>
<tr>
<td></td>
<td>Knees</td>
<td>YES</td>
<td>28</td>
<td>39.43%</td>
</tr>
<tr>
<td>9</td>
<td>NMQ response</td>
<td>NO</td>
<td>58</td>
<td>81.69%</td>
</tr>
<tr>
<td></td>
<td>Ankles/Feet</td>
<td>YES</td>
<td>13</td>
<td>18.30%</td>
</tr>
</tbody>
</table>

Table 2: Age range

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Age range(years)</th>
<th>No of persons</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>≤ 40</td>
<td>15</td>
<td>21.12%</td>
</tr>
</tbody>
</table>
Table 3: Educational status

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Education</th>
<th>No. of persons</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Illiterate</td>
<td>33</td>
<td>46.47%</td>
</tr>
<tr>
<td>2</td>
<td>Primary education</td>
<td>14</td>
<td>19.71%</td>
</tr>
<tr>
<td>3</td>
<td>6th - 12th</td>
<td>23</td>
<td>32.39%</td>
</tr>
<tr>
<td>4</td>
<td>Degree</td>
<td>01</td>
<td>01.40%</td>
</tr>
</tbody>
</table>

Table 4: Entry level age of participants

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Age(years)</th>
<th>No of persons</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>≤10</td>
<td>14</td>
<td>19.71%</td>
</tr>
<tr>
<td>2</td>
<td>11-20</td>
<td>54</td>
<td>76.05%</td>
</tr>
<tr>
<td>3</td>
<td>&gt;20</td>
<td>03</td>
<td>04.22%</td>
</tr>
</tbody>
</table>

Table 5: Physical characteristics of respondents

<table>
<thead>
<tr>
<th>S.No</th>
<th>Variables</th>
<th>Mean±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Age(years)</td>
<td>53.16±10.04</td>
</tr>
<tr>
<td>2</td>
<td>Height(meter)</td>
<td>1.52±0.14</td>
</tr>
<tr>
<td>3</td>
<td>Weight(kg)</td>
<td>51.43±11.42</td>
</tr>
<tr>
<td>4</td>
<td>BMI(kg/m²)</td>
<td>22.12±1.72</td>
</tr>
</tbody>
</table>

Table 6: Association between MSD’s & working year experience

Association between MSD’s and working year experience were represented in table 7

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Working years</th>
<th>≤35 years</th>
<th>&gt;35 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>YES(51)</td>
<td>17</td>
<td>34</td>
</tr>
<tr>
<td>2</td>
<td>NO(20)</td>
<td>13</td>
<td>07</td>
</tr>
</tbody>
</table>

Chi-square = 5.904
P value = (0.02-0.01)
There is strong association between MSD’s & working year experience and not independent.

Chart 1: Analysis of prevalence of MSD’s- body region wise
Table 7: Time spent for work per day

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤40</td>
<td>25.00%</td>
</tr>
<tr>
<td>41 - 50</td>
<td>20.00%</td>
</tr>
<tr>
<td>51 - 60</td>
<td>35.00%</td>
</tr>
<tr>
<td>&gt;60</td>
<td>20.00%</td>
</tr>
</tbody>
</table>

Chart 2: Age range:
Educational status of the population is represented below (See table 3 and chart 3).

Chart 3: Educational Status

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Activities(household, Agriculture &amp; Animal care)</th>
<th>No of persons</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>≤8 hours</td>
<td>9</td>
<td>12.67%</td>
</tr>
<tr>
<td>2</td>
<td>9-10 hours</td>
<td>14</td>
<td>19.71%</td>
</tr>
<tr>
<td>3</td>
<td>11-12hours</td>
<td>16</td>
<td>22.53%</td>
</tr>
<tr>
<td>4</td>
<td>13-14hours</td>
<td>16</td>
<td>22.53%</td>
</tr>
<tr>
<td>5</td>
<td>&gt;14 hours</td>
<td>16</td>
<td>22.53%</td>
</tr>
</tbody>
</table>
Chart 4: Entry level age of participants

Time spent for work is represented below (See table 5 and chart 5)
Table 5: Time spent for work per day
RESULTS AND DISCUSSION

The data analysis on 71 female peasants revealed that the mean age was 53.16 years (SD=10.04), the average height was 1.52m (SD=0.14) the average weight was 51.43kg (SD=11.42) and the BMI mean was 22.12 (SD=1.72). The most commonly experienced MSD as LBP (43.66%) followed by knee pain (39.43%), neck pain (21.12%), shoulder pain (19.71%), ankle/foot pain (18.30%), wrist/hand pain (9.85%), hip/thigh pain (7.04%), and least at upper back and elbow (4.22%) each.

The respondents mean years of working experience was 40.88 years. There is a solid huge affiliation was seen between long periods of work insight and pervasiveness of WRMSD’s (chi square=5.904; p=0.02-0.01).

Farming is truly hard occupation that spots ranch labourers at expected danger of musculoskeletal problems, which has been seen to force a more prominent effect on wellbeing of farm workers. Every movement in farming achieves specific anxiety on bones and muscles prompting to WRMSD’s. Musculoskeletal discomfort can influence practically all pieces of body contingent on the actual development qualities and work arrangement. Present review showed that the most common area affecting the female farmers is lower back with 43.66% followed by knee pain with 39.43%.

In a study done by Meyers et al in 1995 expressed that work related MSD’s may influence muscles, tendons, joints, nerves and related soft tissues anywhere in the body. The lower back and upper limbs including the neck and shoulders are the most common areas. Since rehashed hazard factors openness of a similar muscle, ligament or region might bring about injury and irritation to the impacted region.

Jyotsna et al. in 2005 expressed that during reaping action from morning to evening, females usually adapts crouching stance and they keep on working in this stance for long length without adjusting some other stance because of which they detailed more extreme torment in lower back and knees. About 39.43% women had pain in knees. The aggravation in the knees and thighs other than poor nourishment is related to covering significant distance with head burden and outrageous stances like stooping and squatting for documenting hours at home and ranch.

- Neck and shoulders:
  - Activities causing pain in this area.
    - Planning of Land
    - Planting
    - Relocating plants
    - Watering
    - Processing and Storage
    - Weeding
    - Manure application
    - Reaping
    - Sifting
  - Lifting, intense activity and burden on back is a reason for torment in neck and shoulders
  - Static relaxation during frequent tasks and arching is also related to shoulder pain which recurrent in domiciliary care, cattle care and agricultural activities.
  - Frequent overhead activities leads to swimmer’s shoulders / pitcher’s arm/ rotator cuff syndrome.
Upper arms, elbows and wrists:
- Over work leads to pain.
- Because of same position of hands for long period while carrying load on the head to give support to loaded materials leads to issues of arms and muscles.

✓ Activities causing pain
- Weeding
- Winnowing
- Milking
- Brooming
- These activities require frequent movements so it associates with discomfort in wrist.
- High risk jobs require repeated forceful movement of body parts held at extremes of ROM. For example: milking in static position with frequent bended wrist is one of the causative activities of pain in wrist.

Hand and fingers:
- The task of gripping like working with sickle, peeling vegetables etc., is a reason of tingling sensation and numbness in fingers and palms.
- Carpal tunnel syndrome makes severe discomfort of worker hand.

Upper back region:
- Taking of heavy loads in head is a static work where muscles of neck and cervical spines are under continuous compression. The impact is gradually transferred to lower part of vertebral column. The inactivity of muscles retards blood supply to area and causes deposition of waste resulting in pain extending to thoracic region and even lower back.

Lower back region:
- Lower back pain restricts mobility and interferes with normal functioning.
- Low back pain is the most important health issues due to continuous bending and stooping posture.
- Women repeat this posture many times while doing tasks like: cutting crops, brooming, weeding, collecting fodder and lifting cow dung.
- Incidence of back pain is more common in lower back than upper back because, it bears upper body weight plus any weight carried and twist and bends more than upper back.

Hip regions:
- It gives stability needed to bear weight on legs.
- Bearing of body weight and also excess load carrying on head and back makes it susceptible to arthritis due to excessive pressure and pain in hip may involve injury to muscles, tendons or bursa.

Thighs, knees and legs:
- Covering significant distances day by day with substantial burdens and outrageous stances like stooping and crouching for extended periods of time at farm and home.
- Thighs and lower leg muscles both more identified with strolling and legs bear the heaviness of entire body and furthermore load on head.
- Legs are more inclined to weariness and agony.
- Knee joint is more to get injured due to squatting, bending, prolonged standing also leads to mechanical problems of knees and leads to arthritis, cartilage injury, meniscus injury, ACL injury, PCL injury and LCL injuries, tendonitis and ruptured tendons.

Other problems in knee
- Osgood-schlatter’s disease
- Housemaids knee
- Osteochondritis dissecans
- Plica syndrome
To which ranch ladies will undoubtedly be uncovered because of outrageous postures, lifting heavy loads, extended periods of work and helpless nourishment.

Ankles and foot region:
Walking long distance with load, walking in uneven surfaces, all leads to problems in ankles and foot.

Slipping while walking in the uneven farm surfaces leads to injuries to these regions.

Foot if it got in the hole of the mouse home and if we suddenly make an attempt to withdraw foot from hole leads to ankle and foot injuries.

The results of data collected on educational status are 46.47% which is the maximum percentage which indicate that they are still illiterate. Maximum entry level age of participants is between 11-20 years with 76.05%. Mostly more than 11hrs they spent their work per day and the percentage was about 67.59%. Beginning of work at early age implies more work a very long time throughout everyday life. In small kids, bones and muscles are similarly powerless. In provincial regions the issue is more significant as they don't get great sustenance. Small kids even do work with grown-up gear and perform task intended for grown-ups. Because of absence of sustenance and information on working technique, the assignments lead to drudgery and these children might deal with long haul musculoskeletal problems. Women start being active in family errands from an early age. They regularly assist with the home exercises (For example cleaning, cooking, caring for small children and so forth). They may likewise work in the family, ranch, growing vegetables and raising little animals. Some occupation related exposure in females before conception can lead to problems like menstrual disorders, infertility and changes in genetic material. Accordingly there is a probability of significant degree of obliviousness on right ergonomically strong working methods which may have added to high commonness of MSD’s.

Limitations and recommendations

Limitations

- Done only for female farmers.
- Done only around karumandampalayam, Pachankattuputhur, Pachakuttai and Pannaikinaru areas only.

RECOMMENDATIONS

- Proper Ergonomic advices to reduce risk of many MSD’s aches and pains.
- Safe work methods for preventing MSD’s.
- Improved agricultural equipments for farmers.
- Survey can be exposed to male farmers and other workers also.
- Can be done to other areas also.

SUMMARY AND CONCLUSION

In agricultural work, musculoskeletal issues are more prevalent. They most commonly reported about pain in different parts of the body and many workers reported that they have more pain in low back. The workers are not focussed towards prevention of these problems and they take only homemade remedies for their issues. Government has to take serious steps to promote health of our female farmers of rural Tamil Nadu.

REFERENCES

4. Ergonomics and injury prevention resources from the experts- ErgoPlus.