

Prevalence of Musculoskeletal Disorders and its Correlates among Agricultural Workers in Bhatar Block of Purba Bardhaman District, West Bengal

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Abstract: Background: Agriculture is one of the principal occupations in India in the rural sector. The agricultural workers are exposed constantly to various kinds of hazards making them vulnerable to different musculoskeletal disorders (MSDs). Aims, Settings and Design: Bhatar block in Purba Bardhaman district of West Bengal is agriculture based area. Objectives of the present study were to find out the prevalence and correlates of musculoskeletal disorders among agricultural workers in Bhatar block. Materials and Methods: A community based cross-sectional study was conducted during September to November 2017 with a sample of 210 fulltime agricultural workers. They were selected from the block by multistage random sampling. With prior consent, subjects were interviewed at the household level for all relevant information using a pre-tested schedule. Nordic Musculoskeletal Questionnaire was administered to identify the presence of MSDs during last one year. Analysis was done using software R version 3.4.3. Results: Among 210 study subjects, prevalence of any MSDs was 85.2%. Prevalence of acute stage and chronic stage MSDs were 15.24% and 85.2% respectively. In both acute and chronic stage, low backache was the most common MSD (32.38 % and 34.29% respectively) followed by knee pain (30.95% and 32.38% respectively). Duration of farming activity greater than 20 years had a statistically significant association with MSDs [p-value = 0.0049]. Only 43% of the workers sought medical help for their MSDs. Conclusion: Musculoskeletal disorders among agricultural workers are quite high with various types affecting their routine as well as occupational activities. Appropriate measures may be initiated.

Key Words: Agriculture, Agricultural workers, Musculoskeletal disorders, Purba Bardhaman, West Bengal

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I. Introduction

Musculoskeletal Disorders (MSDs) are a global problem and have a comprehensive impact on health and economy of a country.^[1] MSDs may affect people engaged in almost all the occupations. Musculoskeletal disorders are defined as a group of disorders that affect the musculoskeletal system including the nerves, muscles, tendons and joints and supporting structures such as inter-vertebral discs etc.^[2] Musculoskeletal disorders may result in pain, damage to musculoskeletal structures, poor health as well as poor quality of life and reduced productivity.^[3] They are the most common cause of severe persisting pain and disability, and are currently reported to be affecting hundreds of millions of people across the globe.^[1,4,5] Musculoskeletal disorders often occur in an individual, when the work load exceeds the capacity that his / her locomotor apparatus can bear. There are multiple risk factors related to the occurrence of musculoskeletal disorders. Occupation, as a risk factor of musculoskeletal disorder was recognized in early 18th century.^[6]

Indian economy is primarily agriculture based and agriculture is recognised as one of the most important occupations. It is generally perceived as a healthy outdoor occupation. However numbers of studies have classified agriculture as a risky and hazardous job^[2,6] and agricultural workers are at a particular risk of developing musculoskeletal disorders. The agriculture as an occupation is unique as it is an unorganized sector. The concerned workers may have to adjust to the various uncertainties like environmental changes, physical and psychosocial stress, type of work with respect to the crop, infections associated with the changing weather and changing forms of fertilizers and pesticides, etc.^[7-9] They are exposed to a variety of physical movement hazards; such as, lifting and carrying heavy loads, bending, working with the trunk in prolonged flexion during picking

of crops, risk of falls on slippery and uneven ground, unexpected actions of livestock used in the work and exposure to vibration from farm vehicles, which makes them prone towards musculoskeletal disorders.^[10-12] Work-related musculoskeletal disorders may occur as a result of acute injuries from one-time trauma or multiple traumas such as repetitive motion, excessive force, sustained abnormal postures, prolonged squatting and standing in the course of work.^[10]

Environmental and lifestyle factors for disease prevalence among these workers are likely to vary between countries.^[13] The disorder takes on a more serious dimension when it becomes chronic; nearly 25 percent of the affected adults are identified as having chronic musculoskeletal impairment pain, which is equally prevalent in both developed as well as in developing countries.^[3,14] Studies conducted worldwide to determine the nature of chronic musculoskeletal disorders among farmers, reveal that the most common disorder is low back pain (LBP). The major work-related risk factors associated with LBP have been identified as awkward work postures, bending, lifting and physical strenuous work.^[4,13,14] Based on the International Labour Organization, globally 74% of the agricultural workers live in Asia and Pacific regions.^[15] In India, as 68% of the population live in rural areas, agriculture based activities play a major role in improving the rural economy of the country.^[16,17] Agriculture and its related activities have provided nearly 60% of the employment opportunities in India.^[18] Work related musculoskeletal disorders are found to be associated with absenteeism, loss of productivity and economic loss to the worker, industry and the nation at large.^[19] There are several studies globally showing that the agriculture workers have a higher risk of developing MSDs than any other group of people. The farming activities lead to a number of low back disorders, degenerative disorders of the knee, shoulder disorders and various other cumulative trauma disorders.^[20]

However, there are a scarcity of studies that focus on the country's farming community, which constitutes more than 58 percent of the Indian work force.⁷ Bhatar is a community development block that forms an administrative division in Bardhaman Sadar North subdivision of Purba Bardhaman District in West Bengal.^[21] As per 2011 census of India, it has a total population of 263,064, all of which are rural and approximately 75% of the population are agricultural workers.^[22-24] Presence of musculoskeletal disorders among these agricultural workers will result in reduction in their work capacity which may reflect in reduction in economic contribution from agricultural sector. After a thorough literature search, it had been found that the prevalence of musculoskeletal disorders among farming community in this part of the country is not well documented. Hence, the present study was conducted to find out the prevalence of musculoskeletal disorders among agricultural workers in Bhatar Community Development block as well as the factors associated with occurrence of musculoskeletal disorders among them.

II. Material And Methods

A community based cross-sectional study was conducted from September to November 2017 in the Bhatar community development block situated in Purba Bardhaman district of West Bengal. All adult agricultural workers between the ages of 18 to 60 years residing in the block for at least one year constituted the study population. Part-time farmers (i.e people who were also doing some other jobs besides farming e.g. rickshaw pullers, carpenters, masons, brick kiln workers); subjects with diagnosed congenital skeletal deformities or deformities due to fractures; subjects with any diagnosed psychiatric illness; agricultural workers who were known to have spinal fracture resulting from tumours, infections or any major trauma to the spine or having diagnosed neurological problems were excluded. Unwilling subjects were also excluded.

As after a thorough literature search, the prevalence of musculoskeletal disorders among farmers/agricultural workers in this part of the country could not be found, the sample size was calculated considering prevalence of musculoskeletal disorders as 50%. Taking an absolute allowable error of 10% with 95% confidence interval, the sample size was found to be 97. Considering non-response rate as 5% and design effect as 2 because of multistage sampling, the final sample size was 204.

The sample of study subjects were selected through multistage sampling techniques as follows. Firstly, out of fourteen Gram Panchayats (GP) in Bhatar block, 50% i.e seven were selected by simple random sampling, then from each GP, one village was selected randomly, thus a total of seven villages were identified. From each village, equal number i.e. 30 subjects were taken to reach the desired sample size, thus a total of 210 subjects were finally included.

For sample selection in each village, after reaching the centre of the concerned village with the help of grass-root level health workers, any particular direction was selected randomly and then all the households in that direction were noted on either sides of the road. Then, one particular household from that side was selected randomly. From one household, only one eligible subject was included. Subsequently, other subjects were taken from the consecutive households till the desired sample size was reached. If one village failed to meet the desired target population, deficient population was taken from the adjacent village.

Standard consent forms (in English, Bengali and Hindi) were used in this study. The purpose and the procedure of the study were explained to each subject in-detail, assured about confidentiality and anonymity of

information and informed consent were obtained before data collection. By using a pre-designed, pretested, semi-structured schedule, detailed socio-demographic data were collected. Data relating to behavioural characteristics i.e. addiction and occupational characteristics i.e. duration of work, history of prior injury were also collected. The modified Nordic Musculoskeletal Questionnaire^[25,26] was used in the study for assessment of MSDs. It was translated to Bengali by the subject and linguistic experts in the field and then back translated to English. For assessment of MSDs before application, the tool was validated by the experts.

The questionnaire assessed the problems faced by an individual during last 12 months and 7 days respectively. MSDs present during previous 7 days were considered as acute and during last 12 months as chronic MSDs. For assessment of overall prevalence of MSDs, the presence of any MSDs during last 12 month period, acute and/or chronic, was considered. The questionnaire has been proved to identify significantly more Musculoskeletal Disorders when it is applied at community level. It can be applied quickly to a large number of people.^[27] This tool had already been used in determining the prevalence of MSDs in agricultural workers in rural Tiruchirappalli, Tamilnadu by Hemalatha K, Bharanidharan G et.al in 2016.^[28] Also it had already been used in determining the prevalence of low back pain among non-working adult females in this block in a study by Mitra K, Chatterji S et al in 2015.^[29]

Each of the study participants was interviewed; their medical records were reviewed; and the schedule and Nordic questionnaire were administered. Data were entered in MS- Excel spreadsheet after checking for consistency and completeness and subsequently analysed using software R version 3.4.3. This study was approved by the Institutional Ethics Committee of Burdwan Medical College, West Bengal.

III. Results

The descriptive analysis showed that the mean age of the study subjects was 39.4 years (± 9.22), 143 (68.09%) were males; the majority belonged to the 18 to 40 years of age group (61.9%). Among the study subjects 26.67% were illiterates, 61.9% were Hindus by religion, 83.33% belonged to nuclear family and 70.95% to Socio-economic class IV according to modified BG Prasad scale updated for January 2017. Regarding the addiction pattern in the study subjects, 54.76% were addicted to tobacco smoking, 33.33% to tobacco chewing and 17.62% to alcohol.

Prevalence and Pattern of MSDs:

Out of the 210 study subjects, 179 (85.2%) had any musculoskeletal disorders (MSDs) during a 12 month period thus Overall prevalence of any MSDs was 85.2%. Prevalence of acute and chronic MSDs were 32 (15.24%) and 179 (85.2%) respectively. (Figure 1)

Table 2 shows the distribution of musculoskeletal disorders in different parts of the body in male and female subjects according to Nordic Musculoskeletal questionnaire. The most common MSDs in the acute stage were found to be in the low back (32.38%) followed by knee (30.95%), neck (12.86%), shoulder (12.38%) & upper back (12.38%). The ankle was the least affected (4.29%) region. In the chronic stage, the most common MSDs were in the low back (34.29%) followed by knee (32.38%), upper back (15.71%), hip (15.24%), neck (13.81%) & shoulder (13.33%) respectively. The least affected region was ankle (6.67%). Both in case of males and females, prevalence of acute MSDs was highest in low back area (32.17% & 32.84%) followed by knee (30.77% & 28.36%) respectively. The same pattern was seen in case of the prevalence of chronic MSDs, which was highest in low back (34.27% and 34.33% for males and females respectively) followed by knee (32.17% & 32.84% for males and females respectively).

Further analysis of data revealed that the majority of the workers (55%) did not have any other illness. 23% had Hypertension, 6% Type 2 Diabetes mellitus, 8% Bronchial asthma, 1% COPD & 7% Hypothyroidism respectively.

About 20% of the subjects reported a history of trauma to the affected region during farming activity and 32% of the subjects had to reduce their routine activities for affection of activities caused by MSDs. 78% of affected workers were prevented from doing their work for more than 30 days and 22% for less than 30 days for presence of MSDs. Only 43% of workers consulted a doctor or health care provider for treatment of their MSD problem.

Among the different variables studied, the duration of agricultural activity in years was statistically significantly associated with presence of musculoskeletal disorders. Workers with duration of activity of more than 20 years were found to be having more MSDs of any form than workers with total activity duration of less than 20 years.

The other studied variables i.e Gender, Age groups in years, Socio-economic status, BMI and weekly total hours of agricultural activity were not statistically significantly associated with MSDs. (Table 2)

Table1: Socio-demographic characteristics of the study population (n=210)

| Socio Demographic Factors | Male (n=143) | | Female (n=67) | | Total (n=210) | |
|---|-----------------|---------|------------------|---------|------------------|---------|
| | No. | (%) | No. | (%) | No. | (%) |
| Age in years | | | | | | |
| 18-40 | 78 | (54.55) | 52 | (77.61) | 130 | (61.9) |
| 41-50 | 44 | (30.77) | 13 | (19.4) | 57 | (27.14) |
| 51-60 | 21 | (14.68) | 2 | (2.99) | 23 | (10.96) |
| Education | | | | | | |
| Illiterate | 26 | (18.18) | 30 | (44.78) | 56 | (26.67) |
| Just literate | 21 | (14.69) | 15 | (22.39) | 36 | (17.14) |
| Primary | 37 | (25.87) | 17 | (25.37) | 54 | (25.71) |
| Mid-school | 32 | (22.38) | 2 | (2.99) | 34 | (16.19) |
| Secondary | 16 | (11.19) | 3 | (4.47) | 19 | (9.05) |
| HS & above | 11 | (7.69) | 0 | (0) | 11 | (5.24) |
| Type of Family | | | | | | |
| Nuclear | 117 | (81.82) | 58 | (86.57) | 175 | (83.33) |
| Joint | 26 | (18.18) | 9 | (13.43) | 35 | (16.67) |
| Marital status | | | | | | |
| Married | 134 | (93.71) | 63 | (94.03) | 197 | (93.81) |
| Unmarried | 9 | (6.29) | 4 | (5.97) | 13 | (6.19) |
| Religion | | | | | | |
| Hindu | 88 | (61.54) | 42 | (62.69) | 130 | (61.9) |
| Muslim | 55 | (38.46) | 25 | (37.31) | 80 | (38.1) |
| Socio-economic class (BG Prasad SES) | | | | | | |
| Class II | 2 | (1.4) | 0 | (0) | 2 | (0.95) |
| Class III | 17 | (11.89) | 3 | (4.48) | 20 | (9.52) |
| Class IV | 100 | (69.93) | 49 | (73.13) | 149 | (70.95) |
| Class V | 24 | (16.78) | 15 | (22.39) | 39 | (18.57) |
| BMI | | | | | | |
| <25 kg/m ² | 110 | (76.92) | 63 | (94.02) | 173 | (82.38) |
| ≥25 kg/m ² | 33 | (23.08) | 4 | (5.98) | 37 | (17.62) |
| Addiction pattern* | | | | | | |
| Tobacco chewing | 42 | (29.37) | 28 | (41.79) | 70 | (33.33) |
| Tobacco smoking | 111 | (77.62) | 4 | (5.97) | 115 | (54.76) |
| Alcohol | 37 | (25.87) | 0 | (0) | 37 | (17.62) |

* multiple responses

Table 2: Distribution of acute & chronic musculoskeletal disorders by site of involvement in study subjects

| Site of Musculoskeletal disorders* | Acute MSD (Total 32) | | | | | | Chronic MSD (Total 179) | | | | | |
|------------------------------------|-------------------------------|---------|--------------------------------|---------|---------------|---------|-------------------------------|---------|--------------------------------|---------|---------------|---------|
| | Male (N ₁ =143) | | Female (N ₂ =67) | | Total (N=210) | | Male (N ₁ =143) | | Female (N ₂ =67) | | Total (N=210) | |
| | No. | (%) | No. | (%) | No. | (%) | No. | (%) | No. | (%) | No. | (%) |
| Neck | 19 | (13.29) | 8 | (11.94) | 27 | (12.86) | 19 | (13.29) | 10 | (14.93) | 29 | (13.81) |
| Shoulder | 15 | (10.49) | 11 | (16.41) | 26 | (12.38) | 16 | (11.19) | 12 | (17.91) | 28 | (13.33) |
| Elbow | 11 | (7.69) | 5 | (7.46) | 16 | (7.62) | 14 | (9.79) | 6 | (8.96) | 20 | (9.52) |
| Wrist | 11 | (7.69) | 2 | (2.99) | 13 | (6.19) | 16 | (11.19) | 4 | (5.97) | 20 | (9.52) |
| Upper back | 21 | (14.69) | 5 | (7.46) | 26 | (12.38) | 26 | (18.18) | 7 | (10.45) | 33 | (15.71) |
| Low back | 46 | (32.17) | 22 | (32.84) | 68 | (32.38) | 49 | (34.27) | 23 | (34.33) | 72 | (34.29) |
| Hip | 17 | (11.89) | 2 | (2.99) | 19 | (9.05) | 23 | (16.08) | 9 | (13.43) | 32 | (15.24) |
| Knee | 44 | (30.77) | 19 | (28.36) | 65 | (30.95) | 46 | (32.17) | 22 | (32.84) | 68 | (32.38) |
| Ankle | 9 | (6.29) | 0 | (0) | 9 | (4.29) | 12 | (8.39) | 2 | (2.99) | 14 | (6.67) |

* multiple responses

Figure 1: Bar diagram showing prevalence of musculoskeletal disorders

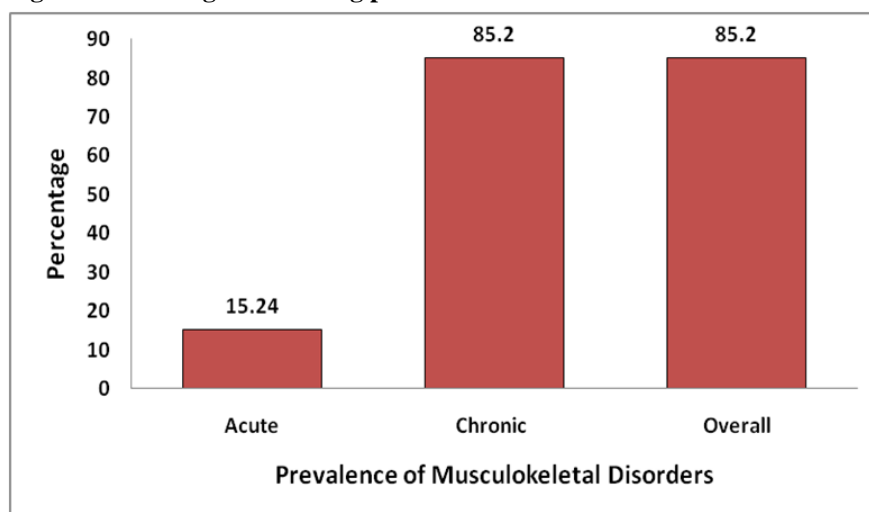


Table 3: Association between certain variables and musculoskeletal disorders (MSDs)

| Variables | MSD | | Statistical tests |
|--|-----------------|----------------|--|
| | Present No. (%) | Absent No. (%) | |
| Gender | | | |
| Male | 118 (82.5) | 25 (17.5) | Odds Ratio 0.47 (0.15-1.24) p=0.14 (Fisher's exact test) |
| Female | 61 (91.0) | 6 (9.0) | |
| Age Groups (years) | | | $\chi^2 = 1.43, df=2$ p= 0.488 (Chi-square test) |
| 18-40 | 108 (83.07) | 22 (16.93) | |
| 41-50 | 50 (87.7) | 7 (12.3) | |
| 51-60 | 21 (91.3) | 2 (8.7) | |
| Socio-economic status (B. G. Prasad's classification) | | | $\chi^2 = 2.58, df=3$ p= 0.461 (Chi-square test) |
| Class II | 1 (50) | 1 (50) | |
| Class III | 16 (80) | 4 (20) | |
| Class IV | 128 (85.9) | 21(14.1) | |
| Class V | 34 (87.2) | 5 (12.8) | |
| BMI (Obesity) | | | Odds Ratio 2.18 (0.61-11.86) p=0.304 (Fisher's exact test) |
| <25 kg/m ² | 145 (83.8) | 28(16.2) | |
| ≥25 kg/m ² | 34(91.9) | 3(8.1) | |
| Duration of agricultural activity (years) | | | Odds Ratio 3.17 (1.35-7.82) p=0.0049,(Fisher's exact test) |
| <20 years | 65 (76.4) | 20 (23.6) | |
| ≥20 years | 114(91.2) | 11 (8.8) | |
| Total hours of agricultural activity in a week | | | Odds Ratio 0.75 (0.31-1.732) p=0.5586 (Fisher's exact test) |
| <60 hours | 82 (87.2) | 12 (12.8) | |
| ≥60 hours | 97(83.6) | 19 (16.4) | |

IV. Discussion

India is traditionally an agricultural country, agriculture being the main occupation providing employment to around 58% of working population.[28] There is existence of several studies that document the prevalence of various musculoskeletal disorders in varied occupation like mine workers, stone cutters, sanitary workers, shoe factory workers, goldsmiths etc..[29] But documentation of musculoskeletal problems in Indian agricultural workers is scanty. As the occupational exposure in agriculture is markedly different from that of other physically demanding occupations, the results of those studies could not be generalised to the agricultural workers, as evident from findings in the present study.

In the present study, prevalence of any MSDs among the agricultural workers was 85.2%. This was higher than the reported prevalence seen in another study by Osborne et al.[10,30] Prevalence of acute stage and chronic stage MSDs were 15.24% and 85.2% respectively. Low Back pain was the most common MSD that has been seen among the participants of the present study. Knee pain was the next common problem identified and these had been corroborated by multiple other studies carried out elsewhere i.e. Osborne et al, Murthty SR et al, Omran A et al. [10,30,31] The Neck and Shoulder pain were the other important MSDs affecting the farmers. The ankle was the region that was least affected among the workers in the study. Again above

mentioned reference studies corroborate these findings. Low backache was present in 34.29% of the people suffering from MSDs.

In the present study, the various procedural components though not studied separately but combined effect of all these might have resulted in overall high prevalence of MSDs. Forward bending, twisting, exposure to vibrations while driving tractors coupled with heavy load carrying predispose them to continued physical stresses that affect the spinal disc making them prone to injury. Modern machinery like tractors, power tillers though may overtly seem to ease the work but actually put the workers to the additional risk of whole body vibrations. Walker-Bone and Palmer in their study on MSDs in agricultural workers concluded that tractor drivers or riders are particularly at risk of low backache for the concerned risk factors. [11,29] Further studies will help identifying specific component activities correlated to MSDs.

The present study also revealed substantial proportion of workers with knee involvement. The cultivators need to assume prolonged squatting positions in the fields that put excessive pressure on knee joints. Activities like squatting involve eccentric contraction of quadriceps muscle group. A study on agriculture health in University of Wisconsin, USA reported that eccentric contraction leads to non-uniform lengthening of sarcomere or other ultra-structural abnormalities. [9,29] These could possibly explain the development of knee pain in these workers.

In the present study we found that the long duration of involvement in farming activities was associated with higher prevalence of MSDs that had been corroborated by studies done by Osborne et al, Omran A et al., Xiao H et al & Sarkar AH et al. [10,31-35] Observation of persistence of pain threw lights on the facts that, once pain in a particular body part developed, it was bound to remain over a long time and became chronic. These could have happened because of negligence or unavailability of proper health care facilities as well as lack of ergonomic education among farmers.

V. Conclusion

The prevalence of Musculoskeletal disorders(MSDs) was high in the farming community with low rate of healthcare utilization for the problems associated with MSDs. Agricultural workers in this area were especially affected in the low back and knee region that interfered with the occupational activities as well as daily routine activities of the workers. Health care system should provide emphasis on provision of necessary support services for the primary and secondary prevention of MSDs in Indian farmers.

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