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Original Article

Functional Disability and Musculoskeletal Disorders Among the Adult Indian Population: A Cross-sectional Study

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Abstract

Background and aims: Musculoskeletal disorders (MSDs) are the second leading cause of disability, which is measured by Years Lived with Disability (YLDs). In India, the prevalence of MSDs is not well documented. The present study aimed to study the prevalence of MSDs and their effect on the physical functional ability of patients.

Methods: The present study is a community-based cross-sectional study undertaken in a village of western Maharashtra, India. A total of 330 subjects were included by systematic random sampling. The study included all adults (>18 years) who were permanent residents of the study area. The interviews with subjects were conducted through a door-to-door survey in the community using a predefined questionnaire. Functional disability was measured using the Health Assessment Questionnaire (HAQ CRD Pune version). Results were analyzed using the Chi-square and *t*-test.

Results: The overall prevalence of MSDs was 33.03%. The development of MSD was more common in patients older than 60 years (56.2%), with female predominance (16.9%). The mean HAQ score in the study population was 13.13 ± 4.429, indicating severe disability. The majority of them had a moderate functional disability (48.62%), and 27.52% had a severe functional disability, which highlights the significant impact of MSDs on functional ability. Among those affected by MSDs, walking was the most commonly affected activity, accounting for 27.52% of patients.

Conclusion: MSDs significantly impact functional ability and interfere with daily living activities. There is an urgent need to emphasize decreasing this functional disability and improving daily living activities among those affected in rural areas.

Keywords: Musculoskeletal disorders, Functional disability, Osteoarthritis, Prevalence of musculoskeletal disorders, Activity limitation

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Introduction

According to the Centers for Disease Control and Prevention(CDC), musculoskeletal disorders (MSDs) are characterized by inflammation of the muscles, joints, cartilage, tendons, and nerves of the neck, upper limbs, lower back, and lower limbs caused by exposure to repetitive motion, force, awkward postures, or vibration.[1] MSDs are categorized into two types: specific and nonspecific MSDs. The most common MSDs include osteoarthritis (OA), rheumatoid arthritis (RA), fibromyalgia, ankylosing spondylitis, gout, and juvenile arthritis.[2] Different risk factors are involved in the development of musculoskeletal disorders, such as age, obesity, force of movement, work postures, movements, and anxiety.[3] These disorders are seen in all age groups, with the majority occurring in the older population.[4] This would lead to increased absenteeism due to illness.[5] Musculoskeletal disorders significantly affect the physical health and routine activities of patients, gradually affecting their functional ability.[6]

In the International Classification of Functioning (ICF), the term "functioning" refers to all body functions, activities people engage in, and their participation.[7] According to the ICF, "disability" refers to any limitations on participation or activities because of impairment.[8]

MSDs diminish the functional capability of people and decrease their ability to work. Those with MSDs also have compromised functional abilities, which in turn affects their quality of life.[9] These conditions are linked to difficulties performing a wide range of everyday activities, including eating, dressing, using the restroom, showering, sitting, standing, walking, maintaining hygiene, gripping, and communicating, in addition to a reduction in the mobility of the affected person.[10] However, depending on several variables, including the degree of pain, the body region involved, and several others, the capacity to carry out these fundamental tasks may also deteriorate as the illness worsens.[11] Chronic pain, diminished physical

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functioning, and poor role performance all contribute to a poor quality of life.[12] In addition to having trouble carrying out everyday tasks, those who are impacted worry about how they look and are afraid of being reliant on others or their family.[13]

In a recent study, the prevalence rate of MSDs was higher in rural areas (19.5%) than in urban areas (11.5%).[14] In a similar study conducted in India, the prevalence of MSDs in urban areas was 14.1% and it was 17.9% in rural areas.[15] One more study by Murthy found the prevalence and impact of MSDs to be higher in farmers.[16] Certain risk factors, such as forward-bending posture during farming, twisting motions, and tractor use that induce prolonged vibratory movements, are associated with the higher prevalence of MSDs in rural settings.[17] The pathophysiology of this condition can be attributed to the stress on the discs and spinal column caused by poor posture and heavy lifting during farming. Both biological and mechanical factors initiate the degenerative processes in the lower discs. The disc may prolapse due to other everyday tasks performed by the farmer, such as prolonged field work, lateral bending, and excessive bending. Few studies have determined the prevalence of MSDs and assessed the functional disability due to MSDs in rural areas of the country.[18] Hence, the present study was carried out to determine the prevalence of MSDs and to describe various sociodemographic factors that could play a role in the occurrence of MSDs. This study could enhance our understanding of how MSDs affect the physical functional ability of those affected.

Objectives of the Study

- To assess the prevalence of selected musculoskeletal disorders in the study population.
- To describe the musculoskeletal disorders associated with selected socio-demographic risk factors in the study population.
- To assess the functional disability due to musculoskeletal disorders in the study population.
- To make suitable recommendations based on the findings of the study.

Materials and Methods

Study Design and Population

The study is a community-based cross-sectional study undertaken in a village in western Maharashtra, India. Informed consent was obtained from all the included patients.

Inclusion Criteria

The study included the entire adult population who were permanent residents of the study area.

Exclusion Criteria

Patients with congenital abnormalities, the pediatric population, and those who were not permanent residents of the village were excluded from the study. Subjects under 18 years of age were excluded from the study due to the very low incidence of MSDs in this age group.

Sample Size Calculation

The prevalence of MSDs in the rural population of India is 18.2%.[19]

The sample size was calculated to estimate a 95% CI for the prevalence of MSD with 5% absolute error margin using the following formula.

$$n = \frac{\left\{\ddot{u}_{(1-\alpha/2)}\right\}^2 \ \text{II}\ (1-\text{II})}{d^2}$$

n = sample size
Z = value of alpha error from the standard normal distribution table
α = level of significance
π = expected proportion (prevalence)
d = error of margin (precision)
expected proportion (π) = 18.2% = 18/100 = 0.182

$$\frac{(1.96)^2\, x0.182x(1-0.182) = 0.572 / 0.0025}{(0.05)^2} = 228.8$$

Substituting the above, the sample size for prevalence was calculated to be 229.

Based on a study by the Indian Council of Medical Research (ICMR), the sample size required to estimate a 95% CI for physical functional disability, with a relative error margin of 10% (mean of 7.26 ± 3.16, using results given in the study), was 60 subjects with MSD. To obtain 60 cases of MSD from the study population, approximately 330 subjects were needed to be examined, which was the sample size for functional disability. Therefore, considering the maximum sample size, the final sample size was determined to be 330.

Sampling Method

The study subjects were selected by systematic random sampling. The total population in a village was 1798 based on a demographic survey study. Hence, 1798 subjects were considered as the sampling frame, and 330 subjects were taken as the sample size. The sampling interval was calculated using the formula k = N/n, where k is the sampling interval, N is the sampling frame, and n is the sample size. The sampling interval was found to be 5.45. The standard systematic random sampling method was used since the value was not an integer. The list of the entire population was prepared, and every fifth subject was considered for the study. The interviews with subjects were conducted through a door-to-door survey in the community. Participants who were unavailable during the initial interview were contacted during subsequent visits.

The following principal outcomes were studied in the

present study:

1. Osteoarthritis (OA)
2. Rheumatoid arthritis (RA)
3. Low back pain (LBA)
4. Post Traumatic MSDs (PT MSDs)
5. Others: all those conditions that did not satisfy the above-mentioned criteria of principal outcome variables.

All these variables were measured on a dichotomous scale, indicating presence or absence, based on the standard case definitions. Standard case definitions for the selected disorders in the study were based on a syndromic approach, as described in a previous study conducted in the rural area of the same district as the present study.[19]

Demographic variables, such as age, gender, education, occupation, type of family, socioeconomic status, marital status, religion, kind of diet, height, weight, body mass index (BMI), nature of work, family history, were recorded. The association of these demographic variables with MSDs was assessed using a Chi-square test. MSDs were diagnosed using a joint evaluation questionnaire. The HAQ is a tool that assists in assessing pain and disability in the patient's preferred language. The effect of the illness or its treatment on quality of life is reflected in HAQ. The functional disability was measured using the Health Assessment Questionnaire (HAQ CRD Pune version) and was categorized into four levels: mild, moderate, severe, and very severe. This was based on the scoring system for each of the 8 activities. The total score of all the activities ranged from 0 to 24. A score of 1-6 was classified as mild, 7-12 as moderate, 13-18 as severe, and 19-24 as very severe.

Data Analysis

The data were collected, compiled, and analyzed using the Chi-square and *t*-test. All these variables were measured on a dichotomous scale as being present or absent, and this was based on the standard case definitions. The relationship between MSDs and functional disability was analyzed using regression analysis. The necessary guidance from the faculty bio-statisticians was also sought.

Results

A total of 330 patients participated in the present study. More than half (54.2%) of the subjects were in the age category of 18-39 years. The mean age of the study population was 40.88 ± 16.97 years. The number of males (55.5%) was higher in the study population than that of females (44.5%). Analysis of the current occupation of the subjects showed that the highest numbers of subjects (57.58%) worked in the unskilled category. More than one-fourth of subjects (26.06%) were unemployed. About one-tenth of the subjects (11.21%) were engaged in either skilled or semi-skilled occupations. Very few subjects (5.15%) were semi-professionals and professionals. It is found that 205 subjects (62.1%) had a normal BMI, 98 subjects (29.7%) were overweight/obese, and 27 subjects (8.2%) were underweight (Table 1).

Out of 330 subjects, 109 had MSDs according to the case definitions used in the study. Hence, the prevalence of MSDs was 33.03 %. The prevalence of OA in the study population was 12.42%. LBA had a prevalence of 6.06%, and post-traumatic stress disorder had a prevalence of 6.36%. The category "others" had a prevalence of 7.58%, and the least common among all was RA, with a prevalence of 0.61%. As seen from Table 2, nearly half (48.63%) of people affected by MSDs had moderate disability, followed by 27.52% who had severe disability. Additionally, 16.51% of those affected had very severe disability, and 7.34% had mild disability. The mean HAQ score in our study population was 13.13 ± 4.429.

Among those affected by LBA, others, and post-traumatic disorders, the majority had moderate functional disability. Among individuals affected with LBA, 65% had moderate and 20% had severe functional disability. Only 5% had a very severe disability. Among others, 56% had moderate and 24% had severe functional disability. Moreover, 16% of the affected individuals had very severe disability. Among those affected by post-traumatic disorders, the majority (38.1%) had moderate

Table 1. Demographic Characteristics of Study Participants

Variable	MSD	No MSD	*P*- value
	N = 109	N = 221	
Age (years)			
18-39	49 (44.9)	130 (58.8)	**0.001 (<0.05)***
40-59	24 (22)	63 (28.5)	
≥60	36 (33)	28 (12.6)	
Gender			
Female	56 (51.3)	91 (41.1)	0.080 (>0.05)
Male	53 (48.6)	130 (58.8)	
Current occupation			
Professional/semi-professional	7 (6.4)	10 (4.5)	**0.015 (<0.05)***
Skilled/semi-skilled	6 (5.5)	31 (14)	
Unemployed	22 (20.1)	64 (28.9)	
Unskilled	74 (67.8)	116 (52.4)	
BMI category			
Underweight	14 (12.8)	13 (5.8)	**0.040 (<0.05)***
Normal	57 (52.2)	148 (66.9)	
Overweight	31 (28.4)	49 (22.1)	
Obese	7 (6.4)	11 (4.9)	

The Chi-square test is used. *Statistically significant.

Table 2. Distribution of the Severity of Functional Disability

HAQ score	Severity of functional disability	Frequency	Percentage
1-6	Mild	8	7.34%
7-12	Moderate	53	48.63%
13-18	Severe	30	27.52%
19-24	Very severe	18	16.51%

disability, and 28.6% had severe disability. Approximately a quarter (23.81%) suffered from very severe functional disability. Among those affected by OA, 48.78% had severe functional disability, and 19.51% suffered from very severe functional disability. All of the subjects affected by RA had severe functional disability (Table 3).

Activity Limitation among Affected

Among those affected by MSDs, the activity that was limited maximally was walking, which accounted for 27.52%. Around 19.27% of the patients had trouble arising from a bed or a sitting position. Other activities, such as keeping hygiene, eating, and dressing, were also limited in 11.01%, 10.09%, and 8.26% of patients (Table 4).

Discussion

In the present study, the majority (32.1%) belonged to the younger age group of 18-29 years, with a mean age of 40 ± 16.97 years. In a recent study conducted on patients with MSDs, the mean age of the study population was found to be 42.44 years, with the majority of subjects falling within the 18-29 age group. The gender distribution in the present study showed that males and females constituted a certain percentage. Banerjee et al found a similar distribution of MSDs in males (52.53%) and females (47.7%).[19] The present study showed that the majority of the study subjects were unskilled (57.58%). The majority of people in this unskilled category were farmers, which is in line with the general finding that in rural areas of India, the majority of the people are engaged in farming as their primary occupation. It was also found that 62.1% of the study subjects had a normal BMI. The prevalence of overweight and obesity was 24.2% and 5.5%, respectively. In a study conducted by Viester et al, a similar distribution was observed, wherein the majority of the study population had a normal BMI (55.6%), followed by overweight (34.5%) and obese (9.9%).[20] In the present study, more than a quarter of the study population had a high BMI. This is the present transition in a country like India, with a high prevalence of overweight and obesity, the reason being changes in lifestyle, diet, sedentary activity, and so on. This change is also seen in rural areas of the country.

The total prevalence of MSDs in the study population was 33.03%. The prevalence of OA in the study population was 12.42%. LBA had a prevalence of 6.06%, post-traumatic MSDs had a prevalence of 6.36%, others had a prevalence of 7.57%, and RA had a prevalence of 0.60%. A study conducted by Chopra et al in developing countries showed an OA prevalence of 6.1% and an RA prevalence of 1%. The remaining disorders together had a prevalence of 3.4%.[21] A study conducted by Alok et al in developing countries showed an OA prevalence of 5.8% and an RA prevalence of 0.55%.[22]

In a study conducted by Bhaskar in rural areas of Kerala, the family history was significantly associated with the knee OA (OR = 1.61).[23] In the present study, the prevalence of all the disorders was higher compared to other studies, especially OA and LBA. This may be because the majority of people affected were unskilled laborers who undertook farming as their primary occupation. Even those involved in other occupations often visit farms in their free time.

It was observed in the present study that most (48.63%) of people affected by MSDs had moderate functional disability, followed by severe disability (27.52%) and a very severe disability (16.51%). Only 7.34% of those affected by MSDs had mild disability. In a study by Kapoor et al on the effect of MSK pain on functional ability using a similar scale, it was found that 23.3% had a mild disability, 20% were moderately affected, 5% were asymptomatic, and 1.7% were severely affected.[24] This is in line with the findings of the present study. The majority of the participants in the present study had moderate functional disability. The reason for this could be that those affected might have altered the nature of their work, such as transitioning to fieldwork, adopting a different posture at home, or changing their job itself, which may not have led to an increase in the severity of their functional disability. However, more than a quarter of those affected by MSDs had severe symptoms. This may be due to the fact that affected individuals who were not aware of the disease and its complications continued to work in the fields and

Table 4. Distribution of Activity Limitations among those Affected

Activity Limitations	Frequency	Percentage
Walking	30	27.52%
Arising	21	19.27%
Activities	14	12.84%
Hygiene	12	11.01%
Eating	11	10.09%
Dressing	9	8.26%
Grip	8	7.34%
Reaching	4	3.67%
Total	109	100.0%

Table 3. Distribution of MSDs according to the Severity of Functional Disability

Severity of functional disability	LBA N (%)	OA N (%)	Others N (%)	Post-traumatic MSDs N (%)	RA N (%)	Total N (%)
Mild	2 (10)	3 (7.32)	1 (4)	2 (9.52)	0 (0.0)	8 (7.34)
Moderate	13 (65)	10 (24.39)	14 (56)	8 (38.10)	0 (0.0)	45 (41.28)
Severe	4 (20)	20 (48.78)	6 (24)	6 (28.57)	2 (100)	38 (34.86)
Very severe	1 (5)	8 (19.51)	4 (16)	5 (23.81)	0 (0.0)	18 (16.52)
Total	20 (100)	41 (100)	25 (100)	21 (100)	2 (100)	109 (100)

spend time in those postures, which increased the severity of the functional disability.

The present study revealed that, among all activities in the HAQ-CRD scale, the order of limitation was as follows: walking, arising, activities such as working in an office/house, running errands/shopping, getting in/out of a bus, hygiene, and eating. In a study by Banerjee et al, the activity that was affected maximally was lifting cup/feeding, followed by dressing, combing hair, and bathing.[19] In the present study, among all MSDs, the majority of people were affected by OA. OA most commonly affects the weight-bearing joints, such as the knee and hip, which in turn results in difficulty with activities like walking, arising from bed, and working in the office or at home. Therefore, the activity of walking being most commonly affected is justifiable. One of the reasons for the increase in functional disability and, therefore, limiting the activities of daily living among those affected by these disorders is the lack of access to treatment facilities in these rural areas. Another concern, especially in rural areas, is that people seek treatment for these disorders through traditional practitioners and home remedies such as applying oil, massaging the affected part, and so on. These kinds of interim interventions provide temporary relief, but the ongoing joint destruction cannot be stopped and will be overlooked. This results in progressive pathology, resulting in disability. The limitation in the daily activities among those affected, in turn, considerably affects the quality of life. Therefore, the need of the hour is to develop long-term plans that will mitigate the impact of MSDs on functional ability and thereby improve their quality of life. This is possible with various interventions, like equipping tertiary care hospitals with facilities to promptly treat these disorders, which are accessible and affordable in rural areas. Training programs, information, education, and the introduction of exercises are the main focuses of person-oriented interventions. These kinds of initiatives seek to promote safe working practices and increase worker knowledge.

However, more community-based and preventative strategies (e.g., ergonomic training, exercise programs, etc.) should be discussed.

Limitations of the Study

One limitation of this study is that it was conducted in one rural area of western Maharashtra, and hence, the findings could not be generalized to all rural areas of the country. Most of the patients were farmers, which is a risk factor for MSDs. Hence, results cannot be generalized due to differences in occupation. The second limitation is the definitive diagnosis, since the diagnosis in this study was based on a syndromic approach. This might result in overdiagnosis/underdiagnosis. Disorders that did not fit the mentioned diagnostic criteria were categorized as others. Using standardized diagnostic criteria would improve the accuracy of MSD classification. The study relies on self-reported data, which may be subject to recall bias. The results of the present study cannot be generalized due to the inclusion of a restricted regional population and the use of an unstandardized diagnostic method for MSD classification. It is a known fact that no study is without limitations. Nonetheless, the present study assessed the impact of these disorders on functional ability, a topic that has been highlighted in very few studies on this issue in India.

Conclusion

The majority of the people affected had moderate functional disability, which highlights a significant impact of MSDs on functional ability. Osteoarthritis and rheumatoid arthritis were common disorders with severe functional disability, which shows that these two disorders have a higher impact on one's physical function as compared to other disorders. The most commonly affected activities of daily living included walking, transitioning from a sitting/sleeping position, and performing other everyday tasks such as working in offices/houses and getting in/out of buses or auto rickshaws. This highlights the impact of MSDs on activities of daily living and hence compromises the quality of life. Awareness about hazardous addictions like smoking and consuming alcohol needs to be created in rural areas through posters. Health education camps can be conducted to educate about the effects of improper posture and unhealthy habits, which can lead to the development of MSDs. Newer technologies, such as webinars and YouTube videos, can be used to educate workers about related risk factors of MSDs. Health promotion measures by the health workers, particularly targeting the younger group in the rural areas, should be implemented.

Authors' Contribution

Conceptualization: Shravan Talkad, Puja Dudeja, Avin B R Alva.
Data curation: Puja Dudeja, Avin B R Alva.
Formal analysis: Shravan Talkad, Puja Dudeja, Avin B R Alva.
Investigation: Shravan Talkad, Puja Dudeja.
Methodology: Shravan Talkad, Puja Dudeja, Avin B R Alva.
Software: Shravan Talkad, Puja Dudeja.
Supervision: Shravan Talkad, Puja Dudeja, Avin B R Alva.
Validation: Shravan Talkad.
Writing–original draft: Shravan Talkad, Puja Dudeja, Avin B R Alva.
Writing–review & editing: Shravan Talkad, Puja Dudeja, Avin B R Alva.

Competing Interests

The authors declare that they have no conflict of interests.

Ethical Approval

Ethical considerations in this study included obtaining permission from the Ethics Committee of AFMS, New Delhi (IEC.S.No:IEC/2025/691).

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