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Original Research Article

Burden of osteoarthritis and associated risk factors in tribal communities of central India

Ishrat Jahan[1], Yasmin Fatima[1]*, Mohammad I. Javed[1], Farah Ahmad[2]

[1]Clinical Research Unit, Burhanpur, Madhya Pradesh, India
[2]Central Council for Research in Unani Medicine, New Delhi, India

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***Correspondence:**
Dr. Yasmin Fatima,
E-mail: yasmin.ccrum@ccrum.res.in

ABSTRACT

Background: Osteoarthritis is a major public health problem among older adults, leading to pain, functional limitation, and disability. Its prevalence increases with age and is higher among women. Rural and tribal populations engaged in physically demanding occupations may be particularly vulnerable due to socioeconomic disadvantage, poor nutrition, and limited access to healthcare. This study aimed to assess the burden of osteoarthritis among the rural tribal population of Burhanpur district, Madhya Pradesh, India.
Methods: A community-based observational study was conducted among patients attending mobile healthcare outpatient services under the Tribal Sub-Plan in five tribal villages of Burhanpur district. A total of 801 patients diagnosed with osteoarthritis were included. Sociodemographic, occupational, nutritional, and clinical details were recorded and analysed using descriptive statistics. Data were analysed using descriptive statistics and are presented as frequencies and percentages.
Results: Osteoarthritis was more prevalent among women and individuals engaged in agricultural labour. The majority of affected patients belonged to Scheduled Tribe communities with low socioeconomic status and poor nutritional profiles. A higher proportion of patients exhibited *Balghami Mizāj* (phlegmatic temperament).
Conclusions: Osteoarthritis constitutes a significant health burden among the rural tribal population of Burhanpur. Female gender, agricultural occupation, low socioeconomic status, poor nutrition, heavy physical workload, and excessive joint use appear to increase vulnerability. Targeted preventive, nutritional, and rehabilitative interventions through tribal health programmes are warranted.

Keywords: Burhanpur, Osteoarthritis, Rural population, Tribal population, Unani medicine

INTRODUCTION

Osteoarthritis is a highly prevalent chronic joint disorder characterized by pain, swelling, stiffness, and progressive loss of joint function. It is a degenerative and progressive condition with a complex aetiology, primarily affecting movable joints and traditionally considered non-inflammatory. Osteoarthritis is characterized by progressive cartilage loss, joint degeneration, and, in advanced stages, marked disruption of joint integrity. It is one of the most common musculoskeletal disorders associated with ageing and represents a significant cause of disability worldwide.[1]

The pathophysiology of osteoarthritis ultimately leads to joint failure. Joints subjected to repetitive mechanical stress and overuse throughout life, such as the knees, cervical spine, lumbar spine, and small joints of the hands, are most commonly affected. Osteoarthritis primarily involves the articular cartilage, a smooth, resilient tissue that covers the ends of bones within synovial joints and functions as a shock absorber. Articular cartilage is composed of a complex extracellular matrix rich in proteoglycans and hyaluronic acid, which is

synthesized and maintained by a limited number of chondrocytes. Although cartilage has a minimal capacity for repair and adaptation, its matrix components undergo continuous turnover throughout life. Degeneration of cartilage in osteoarthritis also affects other joint structures, including the menisci and subchondral bone, leading to bone remodelling and progressive joint deterioration.[2] Osteoarthritis is sometimes referred to as *wear-and-tear arthritis*. It is the most common form of arthritis and the most frequent degenerative joint disorder.[3] Osteoarthritis is the most prevalent type of arthritis and joint disease worldwide, with a reported prevalence ranging from 22% to 39%.[4] In India, it is the second most prevalent joint disorder. Epidemiological estimates indicate that approximately 11% of individuals aged 65 years and above exhibit symptoms of osteoarthritis, whereas only about 1% of individuals in the 25-34-year age group are affected by knee osteoarthritis.[5] Its prevalence increases with age and it generally affects women more frequently than men. Osteoarthritis is strongly associated with ageing and heavy physical occupational activity and is therefore commonly observed among populations living in rural communities of developing countries.[6] It primarily affects weight-bearing joints, particularly the knee and hip joints, with knee osteoarthritis alone accounting for approximately 30-40% of cases.[7] Approximately 25% of individuals with osteoarthritis are unable to perform daily activities normally, and nearly 80% experience some degree of movement restriction. As the disease progresses, an individual's ability to work is significantly impaired, leading to dependency and withdrawal from productive life. Consequently, osteoarthritis is emerging as a major public health concern.[8,9]

Unani concept of osteoarthritis

In Unani literature, osteoarthritis is referred to as *Waja'al-Mafāṣil*, a composite Arabic term derived from two words: *Waja'* and *Mafāṣil*. *Waja'* (plural *Auja'*) is an infinitive noun that denotes pain or ache, while *Mafāṣil* (singular *Mafṣal*) refers to joints or articulations.[10] According to Unani philosophy, all forms of arthritic pain arise due to an imbalance of humours (*Akhlāt*). Morbid matter or toxins are diverted away from vital organs and tend to accumulate in the joints, as these structures possess vacant spaces, are constantly involved in movement and activity, have a relatively cold temperament, and are located far from the heart, the primary source of innate heat. Consequently, when the *Akhlāt* are retained or stagnated, the morbid substances become thick, viscous, and difficult to resolve.[11] According to Unani scholars, the predisposing factors for osteoarthritis include the accumulation of *Ghayr Tābi'i Akhlāt* (abnormal humours), such as the dominance of *Damavī* (sanguine), *Safrāwī* (choleric), *Balghamī* (phlegmatic), or *Sawdāwī* (melancholic) *Khilt* (humour), or a combination of two abnormal humours, as well as *Rīḥ* (gaseous substances).[12] Another important predisposing factor is *Su'-i-Mizāj* (abnormal temperament), which may be either *Su'-i-Mizāj Sāda* (without morbid matter) or *Su'-i-Mizāj Maddī* (with morbid matter). Additional contributing factors described in Unani texts include old age, chronic diseases, congenital weakness of organs, emotional disturbances, alcohol addiction, insomnia, sedentary lifestyle, menstrual irregularities, trauma, hereditary predisposition, and other systemic conditions.[11,12] The causes of osteoarthritis include excessive consumption of stale, cold, or dry foods; prolonged exposure to extremely cold and dry environmental conditions; excessive use of joints; overweight and obesity; joint injuries; hereditary factors; advanced age; biochemical abnormalities that increase mechanical stress on joints; and cellular alterations that result in abnormal cartilage degradation.[13]

The present study was conducted to evaluate the burden of osteoarthritis and to assess its associated risk factors among patients attending Tribal Sub Plan (TSP) camps in five tribal villages of Burhanpur District, Madhya Pradesh, India. These villages were selected because they have a predominantly Scheduled Tribe population residing in remote rural areas with limited access to primary healthcare services. The communities are characterized by low levels of education and health awareness, poor living conditions, low socioeconomic status, and inadequate nutritional status. In Burhanpur district of Madhya Pradesh, such vulnerabilities, combined with physically demanding occupations and limited health infrastructure, make these settings particularly suitable for assessing the burden of osteoarthritis and its associated risk factors. Understanding this burden is essential for planning effective preventive and rehabilitative interventions under public health programmes, including the Tribal Sub Plan. Therefore, the present study was conducted to evaluate the burden of osteoarthritis and to assess its associated risk factors among patients attending Tribal Sub Plan (TSP) camps in five tribal villages of Burhanpur district, Madhya Pradesh, India.

The present study was conducted to evaluate the burden of osteoarthritis and to assess its associated risk factors among patients attending Tribal Sub Plan (TSP) camps in five tribal villages of Burhanpur District, Madhya Pradesh, India.

METHODS

An observational and community-based observational study was conducted among patients attending mobile healthcare outpatient services under the Tribal Sub-Plan in five tribal villages of Burhanpur district. A survey was conducted using a structured close ended questionnaire to collect demographic information, including age, sex, marital status, education, occupation, dietary habits, and addiction history. Clinical details such as presenting symptoms, vital parameters, diagnosis, and management were recorded using standardized case record forms.

A total of 199 field visits were conducted between April 2021 and March 2022. During this period, approximately 6,646 beneficiaries were examined through the Mobile Healthcare Programme. Among them, 801 individuals diagnosed with osteoarthritis constituted the final study sample and were selected for further assessment.

In addition, a routine household survey was conducted through doorstep visits at each designated location. Household members were interviewed face to face using a closed-ended questionnaire to collect comprehensive demographic and health-related information. The data collected included: (i) Village and area-related information; (ii) household characteristics, such as type of housing, ventilation, source of drinking water, water purification methods, sanitation and toilet facilities, vector-borne disease prevention measures, and drainage systems; (iii) socio-demographic details, including age, sex, marital status, education, occupation, dietary habits, and addiction; (iv) personal health information of women, including menstrual history, obstetric history, and contraceptive use; and (v) health-related information of children, including immunization status, school attendance, recurrent childhood infections, and assessment of age-appropriate growth and development.

Study design

This was an observational and community-based cross-sectional survey.

Study area and population

The study was carried out in five tribal villages of Burhanpur District, Madhya Pradesh. These villages were selected due to high percent of Scheduled Tribe (ST) population:

Mohangarh: A remote village located in Khaknar Tehsil, approximately 55 km from Burhanpur, with about 95% Scheduled Tribe (ST) population.

Rangai: Situated about 51 km from Burhanpur District headquarters, with nearly 93% ST population.

Dabalikhurd: Located 36 km from Burhanpur, comprising approximately 69% ST population.

Tajnapur: Situated around 33 km from Burhanpur, with about 82.5% ST population.

Inclusion criteria

Individuals aged 15 years and above attending the Tribal Sub Plan (TSP) mobile healthcare camps during the study period, patients residing in the selected five tribal villages of Burhanpur district, patients clinically diagnosed with osteoarthritis based on history and physical examination, individuals who provided informed consent to participate in the study were included.

Exclusion criteria

Patients with inflammatory joint diseases such as rheumatoid arthritis, gout, ankylosing spondylitis, or septic arthritis, patients with acute traumatic joint injuries or fractures, patients with congenital musculoskeletal deformities affecting joints, patients with severe systemic illnesses (e.g., advanced malignancy, severe cardiac, renal, or neurological disorders) that could confound assessment, individuals unwilling or unable to provide informed consent were excluded.

Ethical considerations

This is a Central Government approved programme implemented across India through various peripheral centres of the Central Council for Research in Unani Medicine (CCRUM), Ministry of AYUSH, Government of India. The programme is aimed at benefiting Scheduled Caste (SC) and Scheduled Tribe (ST) populations by assessing their health status and providing Unani medical care to patients suffering from various illnesses.

The study was conducted in accordance with the ethical principles**.** All participants were informed about the purpose and nature of the study in their local language before enrolment. Informed consent was obtained verbally from each participant prior to data collection.

Confidentiality and privacy of the participants were strictly maintained throughout the study. Personal identifiers were not disclosed, and data were used solely for research purposes. Participation in the study was entirely voluntary, and participants were free to withdraw from the study at any point without any effect on the healthcare services provided to them.

Statistical analysis

Data were collected using a close-ended questionnaire and entered into Microsoft Excel for analysis. Descriptive statistics were used to summarize the study variables. Categorical variables such as age group, sex, marital status, occupation, nutritional status, and Mizāj (temperament) were expressed as frequencies and percentages. Continuous variables were summarized as mean and standard deviation (SD) and presented in tables.

RESULTS

During the study period from 2021-2022, a total of 6,646 individuals from the Scheduled Tribe (ST) population were surveyed over 199 visits across the selected villages. *Waja'al-Mafāṣil* (osteoarthritis) was the most prevalent condition, with 801 cases recorded during the study period. These 801 patients constituted the final sample for further analysis.

Sociodemographic characteristics

The sociodemographic characteristics of patients with osteoarthritis are presented in Table 1. Out of the 801 patients, 432 (53.9%) were females and 369 (46.1%) were males. The highest proportion of patients belonged to the 45-60 years age group (291; 36.3%), followed by the 60-75 years age group (189; 23.5%) and the 30-45 years age group (179; 22.3%).

With respect to marital status, 424 patients (53.0%) were married and 376 (47.0%) were unmarried. Religion-wise distribution showed that 728 patients (91.0%) were Hindus and 73 (9.0%) were Muslims. Caste-wise distribution indicated that 728 patients (91.0%) belonged to the Scheduled Tribe (ST) category, while 73 (9.0%) were from the Other Backward Class (OBC) (Table 1).

Table 1: Sociodemographic characteristics of patients with osteoarthritis (n=801).

Variable	Category	Number of patients	Percentage (%)
Gender	Male	369	46.1
	Female	432	53.9
Age group (years)	15-30	82	10.2
	30-45	179	22.3
	45-60	291	36.3
	60-75	189	23.5
	≥75	60	7.4
Marital status	Unmarried	376	47.0
	Married	424	53.0
Religion	Hindu	728	91.0
	Muslim	73	9.0
Caste	Scheduled Tribe (ST)	728	91.0
	Other Backward Class (OBC)	73	9.0

Nutritional status

The nutritional status of patients is shown in Table 2. A majority of patients were poorly nourished (544; 68.2%), followed by moderately nourished individuals (230; 28.5%). Only 27 patients (3.5%) were adequately nourished (Table 2).

Table 2: Nutritional status of patients with osteoarthritis (n=801).

Dietary habits	Number of patients	Percentage (%)
Poorly nourished	544	68.2
Moderately nourished	230	28.51
Nourished	27	3.46

Occupational distribution

Occupational distribution is presented in Table 3. Agricultural labourers constituted the largest occupational group (416; 52.0%), followed by landholders/farmers (152; 19.0%). Skilled labourers accounted for 80 patients (10.0%), unskilled labourers for 88 patients (11.0%), and other occupations for 65 patients (8.0%) (Table 3).

Table 3: Occupational distribution of patients with osteoarthritis (n=801).

Occupation	Number of Patients	Percentage (%)
Agriculture labour	416	52.0
Unskilled labour	88	11.0
Skilled labour	80	10.0
Land holder/farmer	152	19.0
Other	65	8.0

Mizāj (Temperament) distribution

Table 4 presents the distribution of patients according to *Mizāj* (temperament). *Balghamī Mizāj* was observed in 488 patients (61.0%), followed by *Damwī Mizāj* in 216 patients (27.0%), *Safrāwī Mizāj* in 92 patients (11.5%), and *Sawdāwī Mizāj* in 3 patients (0.5%) (Table 4).

Table 4: Mizaj wise distribution of the patients of osteoarthritis (n=801).

Temperament	Number of patients	Percentage (%)
***Damwi* (Sanguineous)**	216	27..0
***Balghami* (Phlegmatic)**	488	61.0
***Safrawi* (Bilious)**	92	11.5
***Sawdawi* (Black Bile)**	3	0.5

DISCUSSION

The present study demonstrates a high burden of osteoarthritis among the tribal population of Burhanpur district, with women being more commonly affected than men. The observed female predominance is consistent with earlier studies and may be attributed to anatomical differences in bone structure and hormonal factors, particularly the decline in oestrogen levels during the postmenopausal period.[14]

The age-wise distribution revealed that osteoarthritis was most prevalent among individuals aged 45-60 years, with prevalence increasing further in older age groups. Age is a well-established risk factor for osteoarthritis due to progressive degenerative changes in joint tissues. Reduced adaptive capacity of cartilage, cellular senescence, sarcopenia, and increased bone turnover with advancing age contribute to greater susceptibility to mechanical stress and joint degeneration.[15]

The predominance of poorly nourished individuals highlights the role of nutritional deficiencies in the development and progression of osteoarthritis. Deficiencies of vitamins D, K, and C are known to adversely affect cartilage integrity and bone metabolism. Vitamin D deficiency has been linked to disease progression, while low plasma phylloquinone levels are associated with a higher prevalence of osteoarthritis.[16,17] Inadequate vitamin C intake has also been implicated in increased arthritis risk due to its role as an antioxidant.[18]

Occupational analysis revealed that agricultural labourers constituted the majority of affected individuals. Repetitive joint use, frequent squatting and kneeling, heavy lifting, and prolonged mechanical loading are well-documented occupational risk factors for osteoarthritis, particularly of the knee and hip joints.[19,20]

From an Unani perspective, the predominance of *Balghamī Mizāj* among patients supports classical descriptions by *Zakariya Razi* and *Ibn Sina*, who postulated that individuals with *Balghamī Mizāj* are more prone to developing *Waja'al-Mafāṣil* compared with other temperaments.[21,22] Integrating traditional concepts with contemporary biomedical understanding may offer valuable insights into disease susceptibility and culturally acceptable preventive strategies. Future research employing analytical and longitudinal study designs, along with objective assessment of nutritional and occupational exposures, may help elucidate causal pathways and support the development of targeted, community-based interventions for osteoarthritis in tribal populations.

CONCLUSION

The study concludes that the Scheduled Tribe (ST) population of the study area predominantly belongs to a low socioeconomic group and is largely dependent on agriculture and manual labour. A higher proportion of osteoarthritis cases was observed among women, suggesting an increased vulnerability that may be related to heavy physical workload and suboptimal dietary practices.

The burden of osteoarthritis was also greater among older individuals, reflecting age-related degenerative changes in bone and cartilage. Poor nutritional status and occupational factors, particularly agricultural activities involving prolonged squatting, kneeling, and repetitive joint use, appear to contribute to disease occurrence. Additionally, from the perspective of the Unani system of medicine, *Balghamī al-Mizāj* was observed to be predominant among affected individuals. Overall, the findings underscore the multifactorial nature of osteoarthritis in tribal populations and highlight the need for targeted preventive and rehabilitative interventions.

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