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An Observational Study on Prevalence and Risk Factors for OA Knee Joint Among Adult Population Attending the SCSP Camps in Chennai, Tamil Nadu, India

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Abstract

Background: *Osteoarthritis (OA) is a prevalent degenerative condition affecting older individuals, particularly in developing nations. It is commonly linked to aging and various intricate underlying causes. The complex causes of osteoarthritis include confounding factors that significantly increase the risk of its development, many of which can be managed or prevented. Among all joints, knee osteoarthritis is particularly prevalent, especially in women. In rural India, the SC/ST population faces significant health disparities, highlighting the urgent need to address this issue promptly.* ***Aim & Objective:*** *The study aimed to determine the prevalence of osteoarthritis and examine the associated risk factors among patients attending SCSP camps in a rural area of the Chennai district, Tamil Nadu, over a two-year period (April 2021 to March 2023). The primary objective was to evaluate the burden and contributing factors of knee osteoarthritis in the adult population.* ***Methods:*** *A multicenter observational study was conducted by RRIUM, Chennai, in six selected villages or locations associated with the SCSP Camp. The study involved daily visits by a team of medical professionals. Osteoarthritis was diagnosed using the American College of Rheumatology criteria, which were validated and applied in the study area. Around 590 patients presenting with knee joint pain were seen at the mobile outpatient department. The program included patient screening, treatment with Unani formulations, lifestyle modification counseling, referral services, health awareness lectures, and the distribution of information, education, and communication (IEC) materials.* ***Results:*** *A total of 590 patients with Knee joint pain adults attending the mobile OPD of SCSP Camps were examined out of which 30.4% had OA of knee. Age more than 50 years, female gender, Phlegmatic temperament (Balgami Mizaj), tobacco usage, illiteracy, lower socioeconomic class, diabetes, Obesity and hypertension were found to be associated with OA knee.* ***Conclusion:*** *The prevalence of knee osteoarthritis was notably high in these regions, highlighting the potential for significant improvement if early interventions are implemented.*

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INTRODUCTION

Osteoarthritis (OA) is a condition characterized by joint pain, along with the loss of structure and function of the affected joint, primarily due to the degeneration of articular cartilage and the effects of aging. It is a gradually progressing disease marked by pain, swelling, and restricted joint movements, often accompanied by complications. The

prevalence of OA increases with age, as the condition is irreversible. Globally, approximately 9.6% of men and 18.0% of women aged 60 years and above experience symptomatic OA, making it the fourth leading cause of general disability. Studies indicate a higher prevalence in South Asian countries, with notable differences between rural and urban populations. A sedentary lifestyle and specific habits are expected to contribute to a substantial rise in the number of individuals with hip or knee OA in the coming decades. Women over 60 are particularly at risk, with more severe complications, possibly influenced by hormonal changes associated with menopause. However, the factors underlying the increased susceptibility of older women compared to men remain poorly understood.

In Unani literature, osteoarthritis is not explicitly defined but is associated with its characteristic symptoms and signs. Joint disorders, including inflammatory, non-inflammatory, infectious, metabolic, and other musculoskeletal conditions, are broadly categorized under the term Waja-ul-Mafasil in Unani medicine. Additionally, arthritis is often linked to various types of Waja-ul-Mafasil based on similarities in predisposing factors, aggravating elements, and patterns of joint involvement. Waja-ul-Mafasil is derived from Arabic, where "Waja" translates to pain and "Mafasil" to joint. This condition is extensively described in ancient Egyptian, Unani, and Roman classical medical texts and holds a prominent place in Unani classical literature. Arthritis of the knee and hand joints is increasingly common among women, while men exhibit a higher prevalence of hip osteoarthritis. Occupational activities, such as climbing stairs, walking on uneven terrain, prolonged standing, and sitting have shown inconsistent associations with the risk of developing osteoarthritis. Key risk factors for knee joint arthritis include advanced age, obesity, female gender, frequent knee bending, and strenuous physical labor. Diagnosis of knee osteoarthritis is primarily based on clinical evaluation using the criteria established by the American College of Rheumatology.

"Pain in knee and
1. Age >50 years.
2. Morning stiffness.
3. Crepitus in motion.
4. Bony tenderness.
5. Bony enlargement.
6. Absence of palpable warmth.

Of the above criteria pain in the knee should be positive followed by any 3 of the other criteria".

To enhance the health conditions of the rural population, the Government of India has implemented various programs over time. These include initiatives focused on rural health, maternal and child health, family planning, and immunization, as well as the SCSP and TSP programs, along with other disease control efforts, introduced periodically for the welfare of the people.

The Ministry implements the scheduled caste sub-plan (SCSP) under the scheduled castes development bureau, which serves as a comprehensive strategy to ensure that targeted financial and physical benefits flow from all general development sectors to benefit scheduled castes. As part of this approach, States/UTs are required to create and execute special component plans (SCP) for scheduled castes within their annual plans by allocating resources. Currently, 27 States/UTs with significant SC populations are executing the SCSP. The primary goal is to prioritize family-oriented economic development schemes for SCs living below the poverty line by providing resources to address critical gaps and deliver essential inputs, making these programs more impactful. Additionally, the Ministry of AYUSH launched a mobile health care program under the SCSP and TSP to benefit the SC and ST populations [1].

Since 1981, the Central Council for Research in Unani Medicine (CCRUM) has been running a mobile health program to benefit the SC and ST populations. This initiative has since been expanded

and is now known as the mobile healthcare program under the scheduled caste sub-plan (SCSP) and tribal sub-plan (TSP). The Regional Research Institute of Unani Medicine, Chennai, has been organizing SCSP mobile camps in various villages across the Chennai district since 2018. Over time, six villages, primarily inhabited by SC and ST populations, have been adopted for these camps.

From April 2021 to March 2023, the SCSP team adopted six villages/locations in the Chennai district, namely Narvarikuppam, Jaya Nagar, Valsarwakkam, KH Road Ennore, Jay Hind Nagar, and Manali New Town. The program's objectives include screening and examining the health status of the SC and ST populations in the outpatient department (OPD) as well as health camps and providing Unani treatments to patients suffering from various diseases. Additionally, the program aims to raise awareness among the community about preventive, promotive, and curative health through lectures, group meetings, health camps, and the development and distribution of Information, Education, and Communication (IEC) materials in local languages for better outreach and disease prevention and treatment.

ABOUT SCHEDULED CASTE (SC) POPULATION OF TAMIL NADU

Tamil Nadu is a state in India with a population of 72,147,030. It consists of 32 districts, 216 taluks, 15,979 villages, and 1,109 towns. Of the total population, 51.6% (37,227,868) reside in urban areas, while 48.4% (34,919,162) live in rural areas. The scheduled caste (SC) population stands at 14,436,621, making up 20.01% of the total population, which is higher than the national average of 16.6% according to the 2011 census. The scheduled tribe (ST) population is 793,617, accounting for 1.1% of the state's population. The settlement pattern of scheduled castes (SC) in Tamil Nadu is distinct from that in other states of India. Unlike concentrated settlements, most SC individuals live intermixed with other communities in a dispersed manner. Thiruvalluvar district has the highest proportion, with 34%, followed by the Nilgiris, Nagapattinam, Perambalur, Villuppuram, Cuddalore, Kancheepuram, Ariyalur, Tiruvannamalai, and Thiruvallur.

The SC population, which makes up 16.5% of India's total population, faces significant disparities in health compared to others. Their life expectancy is relatively lower, and they experience higher child and adult mortality rates. A considerable number of children are undernourished, and approximately 50% of maternal deaths in the country are attributed to this group.

Studies detailing the prevalence of osteoarthritis (OA) in the knee joint among rural populations in specific areas of Chennai are scarce. Available information is primarily limited to aspects covered in census data and district health surveys. The primary goal of treating patients with Waja-ul-Mafasil is to reduce morbidity and prevent disability. This study focuses on examining the prevalence and risk factors of knee joint osteoarthritis among individuals attending SCSP camps in and around the Chennai district [2].

Details of Six Selected Villages/Spots

According to the 2011 Census, Naravarikuppam has an estimated population of 50,150, comprising 23,910 males and 26,240 females, spread across a total area of 30 km². The scheduled caste (SC) population in this area is 40,579, including 19,650 males and 20,929 females. Similarly, Jaya Nagar has an estimated population of 38,492, with 19,708 males and 18,784 females, occupying a total area of 24 km². The SC population in Jaya Nagar is 20,932, consisting of 10,350 males and 10,582 females.

As per the 2011 Census, Valasaravakkam has an estimated population of 48,735, comprising 25,897 males and 22,838 females, with a total area of 34 km². The scheduled caste (SC) population in this region stands at 27,579, including 14,521 males and 13,058 females. Meanwhile, KH Road Ennore has an estimated population of 63,550, with 33,910 males and 29,640 females, covering a total area of 39 km². The SC population in this area is 41,589, which includes 21,578 males and 20,011 females. According to the 2011 Census, Jay Hind Nagar has a population of approximately 37,850, including

19,035 males and 18,815 females, spread across an area of 16 km². The scheduled caste (SC) population in this region is 19,579, with 10,345 males and 9,234 females. Similarly, Manali New Town has an estimated population of 42,600, comprising 21,980 males and 20,620 females, covering a total area of 20 km². The SC population here is 24,579, which includes 12,789 males and 11,790 females [3].

The residents of these areas primarily speak Tamil, with only a small number familiar with other languages. Rice is a staple in their diet, often accompanied by pulses. Cow's milk is commonly consumed by most households. The public transport system is the primary mode of transportation for the majority. All villages are equipped with education and healthcare facilities [4].

AIMS & OBJECTIVES

The study aimed to assess the prevalence of osteoarthritis and analyze the various risk factors associated with knee joint osteoarthritis among patients attending SCSP camps in a rural region of Chennai district, Tamil Nadu. A review of the literature revealed that limited efforts have been made to explore the prevalence and determinants of osteoarthritis in South India. The study's objectives included raising awareness about disease prevention, particularly lifestyle-related disorders, promoting health and hygiene, emphasizing the importance of nutrition, and encouraging health improvement through behavior change counseling (BCC) supported by IEC materials. It also aimed to promote the use of commonly available medicinal plants, assess nutritional status and anemia, manage these conditions using Unani medicine, and deliver essential healthcare services through a mobile health program [5].

MATERIALS AND METHODS

Study Design

This is an observational study.

Study Setting

For the study, six villages in Chennai district, Tamil Nadu, were selected: Narvarikuppam, Jaya Nagar, Valasarvakkam, KH Road Ennore, Jyothi Nagar, and Manali New Town. These villages were chosen due to their significant scheduled caste (SC) population, exceeding 50% according to the 2011 Census, and their accessibility from the institute, ensuring regular and feasible visits [6].

Time Frame

The study was conducted between April 2021 and March 2023.

Study Population

About 590 patients with joint pain attending the mobile health camp of SCSP of the age group between (18–70 years) belonging to the SC population residing in these areas were selected [7].

Sampling Method

The method used was a convenient sampling data collection method.

Data Collection Method

Before initiating the program, the Ooru Thalivar (Sarpanch), Gram Panchayat members, and local authorities of the selected areas were briefed about the initiative, its intended beneficiaries, benefits, and implementation process. Consent from these authorities was obtained to conduct the camps. Prior to the commencement of the mobile camps, IEC materials and pamphlets were distributed to raise awareness and promote the program among the local population. A dedicated team comprising a Unani doctor (RA/JRF), a compounder, an assistant, and a multi-tasking staff made regular visits to the designated areas [8, 9].

A tour schedule was prepared prior to the commencement of the work, with camps being held every weekday from Monday to Friday. A designated location in each village/area was assigned for the camps. The SCSP team conducts outpatient services (OPD) during the morning hours, with a 5-hour session

each day. Upon arrival at the camps, all patients were initially registered. The registration form was completed, including details of Unani parameters along with general vitals, such as blood pressure, weight, and others. Screenings were conducted on a case-by-case basis, addressing general health, lifestyle disorders, occupational hazards, the emergence of communicable diseases, especially during the monsoon season in slum areas, as well as nutritional status and disease prevention. Unani medicines were distributed as part of the daily activities in the camps. In addition to general OPD services and medicine distribution, various research cases were regularly referred to the RRIUM, Chennai. A household survey was carried out through door-to-door visits in each assigned area. Every household member was interviewed using a close-ended questionnaire for demographic data, while an open-ended questionnaire and ACR guidelines were employed to gather information related to lifestyle and diseases. The collected data includes [9, 10]:

1. Village/area information,
2. House information, such as type of house, ventilation, drinking water source, drinking water purification method, toilet facilities, method of vector-borne disease prevention, drainage facility, etc.,
3. Socio-demographic data, viz., age, sex, marital status, education, occupation, dietary habits, addiction, etc.,
4. Personal health information of women, such as menstrual history, obstetrical history, contraceptive history, and so on, and
5. Health-related information about children, such as immunization status, school-going status, any recurring common childhood infections, and whether growth and development are appropriate for age.

Awareness about Unani medicine and Ilaj bit Tadbeer is being raised among patients through behavior change counseling and the distribution of information, education, and communication (IEC) materials.

After the designated number of visits to the selected areas, patients were advised to visit the institute for additional follow-up and any required health check-ups. A prescription card was provided to each registered patient for this purpose [11, 12].

Study Tools

- Data was collected using structured questionnaires developed by the CCRUM, Ministry of AYUSH, New Delhi, India.
- The ACR clinical criteria for Osteoarthritis were utilized for assessment.

Statistical Method & Data Analysis

A descriptive statistical approach was applied in this observational study, where qualitative data is presented in terms of numbers and percentages.

OBSERVATIONS AND RESULTS

This observational study was conducted among 590 adults attending the SCSP camps in Chennai district to determine the prevalence and risk factors/confounders of osteoarthritis, using ACR clinical criteria through history and physical examination. Of the participants, 351 (59.5%) were over the age of 50, and 359 (60.8%) were females, while 231 (39.2%) were males. Most of the participants were married (497 or 84.2%), while 49 (8.3%) were unmarried and 44 (7.4%) were widowed.

Among the participants, the highest proportion were illiterate, with 237 individuals (40.2%), followed by 113 (19.1%) who had completed high school education. In terms of socio-economic status, the majority belonged to socio-economic class 4 (44.8%), followed by class 3 (31.2%), as per Kuppuswamy's SES scale. The analysis of temperament (Mizaj) revealed that most participants had a Phlegmatic (Balgami) temperament, accounting for 59.2% (349 individuals), followed by those with a Sanguine (Damavi) temperament, which made up 24.6% (145 individuals) [13].

In this study, the prevalence of osteoarthritis in the adult population attending the SCSP camps in Chennai District, as per the ACR clinical criteria, was found to be 30.4%. Approximately 60.2% of the participants had never used any tobacco products, while 30.4% were current users and 9.4% were past users. Regarding alcohol consumption, over three-quarters of the participants (82.8%) reported never consuming alcohol, with 13.4% being current users and 3.7% past users. In terms of dietary habits, the majority (93.4%) followed a mixed diet, while 6.6% were vegetarians [14].

Regarding the nutritional status of the study participants, nearly half (48.4%) had a normal BMI, while 27.4% were classified as overweight. Less than half (42.8%) of the participants engaged in moderate physical activity regularly, and 32.9% participated in light physical activity. Additionally, 10.3% of the participants (61 individuals) had a history of being previously diagnosed with knee joint osteoarthritis.

The most prevalent chronic condition among the study population was backache, affecting 42.9% (253 individuals), followed by diabetes at 19.8% (117 individuals), hypertension at 13.7% (81 individuals), asthma at 11.7% (69 individuals), Taenia infections (Qooba) at 6.6% (39 individuals), and hypothyroidism at 5.3% (31 individuals) [15].

After adjusting for confounders, factors, such as age above 50 years, female gender, illiteracy, Phlegmatic (Balgami) temperament, tobacco use, hypertension, diabetes, and body mass index were identified as individual risk factors for knee joint osteoarthritis. Additionally, physical activity, phlegmatic temperament, dietary habits, and diabetes were found to be confounders [16]. The distribution of study participants based on the socio-demographical factors is depicted in Table 1 and the distribution of various risk factors among the study participants is depicted in Figure 1.

Table 1. Distribution of study participants based on the socio-demographical factors.

Factors		**Frequency**
Age group	<50	239 (41.5%)
	>50	351 (59.5%)
Gender	Male	231 (39.2%)
	Female	359 (60.8%)
Marital status	Married	497 (84.2%)
	Unmarried	49 (8.3%)
	Widower	44 (7.4%)
Educational qualification	Illiterate	237 (40.2%)
	Primary	98 (16.6%)
	Middle	78 (13.2%)
	Secondary	113 (19.1%)
	Higher secondary	30 (5.1%)
	Graduate and above	34 (5.8%)
Occupation	Professional	7 (1.2)
	Semi-professional	9 (1.6)
	Clerical and shop owner	14 (2.4)
	Skilled	146 (24.8)
	Semiskilled	168 (28.4)
	Unskilled	50 (8.4)
	Unemployed	45 (7.6)
	Dependents	151 (25.6)
Socio economic status	Class 1	8 (1.3%)
	Class 2	23 (3.9%)
	Class 3	184 (31.2%)
	Class 4	264 (44.8%)
	Class 5	111 (18.8%)

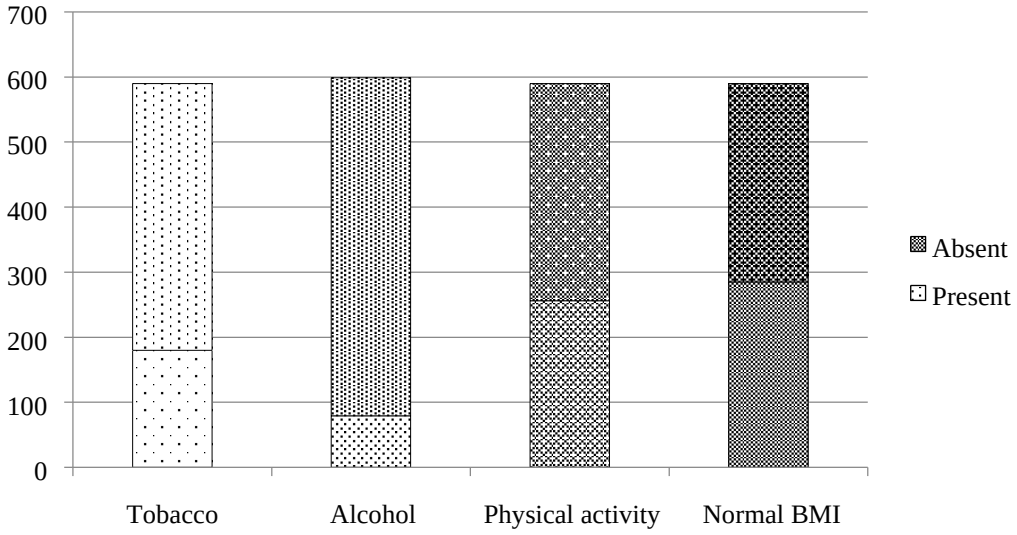

Figure 1. Distribution of various risk factors among the study participants (N = 590).

DISCUSSION

The primary goal of the study was to determine the prevalence and risk factors of osteoarthritis within the healthcare delivery system using Unani Medicine. This aimed to reduce early onset and prevent the chronic progression of the disease through the scheduled caste sub-plan (SCSP) project of RRIUM, Chennai. Early intervention with Unani formulations could potentially lead to significant improvements in the condition. The data from this study indicated that the prevalence of osteoarthritis in the outskirts of Chennai, including Narvarikuppam, Jaya Nagar, Valasarvakkam, KH Road Ennore, Jay Hind Nagar, and Manali New Town, was 30.4% according to the ACR clinical criteria. This finding is comparable to a study by Pal, Chandra Prakash et al., which reported a prevalence of 28.7% for knee joint osteoarthritis among an adult rural population aged 18 years and above across five sites in India (N = 5000). Another study on osteoarthritis in Southeast Asia found a prevalence of 29.5% for knee joint OA among individuals aged 25 years and older. The higher prevalence observed in our study may be due to the higher proportion of females (60.8%) in the sample and the predominance of agriculture as the primary occupation in the rural population [17].

This study recorded a higher prevalence of osteoarthritis in the elderly, particularly among individuals aged above 50 years. This finding aligns with a review article by Felson et al., which stated that 50% of individuals over the age of 65 have arthritis in at least one joint, and more than 80% of those over 75 years of age have arthritis in at least one joint [18].

The increase in the prevalence of osteoarthritis with age can be attributed to the cumulative effects of various risk factors and life changes that occur as individuals age. These changes may weaken the joint's ability to withstand stress, including factors, like cartilage thinning, reduced muscle strength, impaired kinesthetic sense, and oxidative damage [19].

In this study, osteoarthritis was observed in 60.8% of females and 39.2% of males, which is consistent with the findings of Yuqing Zhang and Joanne M. Jordan in their meta-analysis. Their research indicated that women are more likely to develop osteoarthritis. While men have a higher prevalence of osteoarthritis under the age of 45, the trend reverses after the age of 55, with more women affected than men. However, overall, men have a significantly lower risk of knee osteoarthritis [20, 21].

The findings from this study revealed a clear association between tobacco use and osteoarthritis. Those who consumed tobacco had a significantly higher risk of developing osteoarthritis, with smokers

being 3.5 times more likely to be affected compared to non-smokers. Although the results were statistically insignificant, alcohol users appeared to have a lower risk of developing osteoarthritis than non-users. Similar findings were reported by Huidekoer et al. in their study on arthritis and alcohol, which showed that arthritis patients consumed less alcohol than the general population. This suggests that alcohol may have a protective effect against arthritis or that there could be an inverse relationship, although this hypothesis lacks biological support [22].

In this study, osteoarthritis was found to be more prevalent among overweight and obese individuals (27.4%) compared to those with a normal weight. Similar findings were reported by Paans N et al., who identified a significant association between knee osteoarthritis and obesity. They also found that long-term obesity was present in individuals with asymptomatic knee osteoarthritis. These results highlight obesity as one of the strongest risk factors for osteoarthritis. A survey conducted by the United States National Health and Nutrition Examination found that obesity was linked to both bilateral and unilateral knee osteoarthritis among 3,905 adults aged 45 to 74. However, these findings do not support a direct metabolic link between obesity and knee osteoarthritis. In the present study, most patients (59.2%) with osteoarthritis were found to have a Phlegmatic (Balgami) temperament. No similar studies have been conducted to establish a correlation, but various articles suggest the involvement of phlegmatic matter in conditions, like Waja-ul-Mafasil (joint pain/arthritis) [23, 24].

These findings indicate that knee osteoarthritis is linked to long-term physical disability, and the presence of other chronic diseases may exacerbate the degree of long-term disability associated with knee osteoarthritis.

Despite the larger sample size, there are inherent limitations in surveys conducted through the mobile healthcare program, such as insufficient variables or data in the predesigned format/questionnaire, limited manpower, and ethical considerations. These factors need to be assessed and redesigned effectively to reach accurate statistical conclusions. These factors need to be evaluated and redesigned to ensure accurate statistical conclusions. As an observational study, it was not possible to demonstrate the strength of the association between the disease and its risk factors and contacting all adults aged 18 and above was not feasible. The ACR criteria for osteoarthritis, which rely solely on history and physical examination, are well-established, but other criteria could not be applied.

Despite these limitations, the study highlighted a higher prevalence of osteoarthritis among the rural population in the Chennai district attending the SCSP Camps, with significant associations with various risk factors. Future research is recommended to conduct a thorough analysis of osteoarthritis risk factors, preferably through a prospective longitudinal study, to better understand the true risk factors involved.

CONCLUSIONS

Mobile healthcare programs, like the SCSP represent an innovative model for delivering healthcare that can improve health outcomes for vulnerable populations, particularly those with chronic conditions. Musculoskeletal disorders are a significant burden on individuals, healthcare systems, and social services, with indirect economic impacts. The increasing prevalence of non-communicable diseases, along with the risk factors for osteoarthritis, poses a major challenge for developing countries, often overlooked. Osteoarthritis, a leading cause of poor quality of life among older adults, requires attention and action to address its risk factors, ensuring that future generations lead productive lives and contribute to the nation's workforce. In this region, knee osteoarthritis is particularly prevalent, with risk factors including age over 50, female gender, tobacco use, illiteracy, lower socioeconomic status, diabetes, and hypertension being associated with the condition.

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