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# Prevalence of inflammatory back pain and radiographic axial spondyloarthritis in a semi-urban community of Lahore, Pakistan

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## Abstract

**Aims:** To determine the prevalence of inflammatory back pain (IBP) and radiographic axial spondyloarthritis (SpA) in a semi-urban community of Lahore, Pakistan.

**Methods:** This cross-sectional household survey was designed as per the Community Oriented Program for the Control of Rheumatic Diseases (COPCORD) model. In Phase 1, the subjects were interviewed for musculoskeletal (MSK) pain in the last 7 days by clinical assistants. In Phase 2, physiotherapists identified subjects with spinal/back pain and interviewed for Assessment in Spondyloarthritis International Working Group (ASAS) criteria for IBP. In Phase 3 subjects having IBP or chronic back pain (CBP) with an age at onset ≤45 years, were assessed and further investigated.

**Results:** A total of 4922 subjects with a mean age of 35.3 ± 14.5 years, including 2770 (56%) women were surveyed in Phase 1. MSK pain in last 7 days was reported by 1407 (28.6%) of whom 1034 (21%) had spinal pain. The ASAS criteria for IBP were met in 329 (6.7%, 95% CI 6.0-7.0). In Phase 3, 222 with IBP and 83 having CBP with age at onset ≤45 years were evaluated. Out of this total of 305, 144 (2.9%) were confirmed to have IBP by rheumatologists as per at least 1 of the 3 criteria. ASAS criteria were met in 107 (2.2%, 95% CI 1.8-2.6). ASAS criteria for radiographic axial SpA were met in 47 (1%, 95% CI 0.7-1.3) of the surveyed population.

**Conclusion:** Inflammatory back pain was reported in 6.7% by physiotherapists, confirmed in 3% by rheumatologists. The prevalence of radiographic axial SpA was 1%.

KEYWORDS

ankylosing spondylitis, community survey, COPCORD, epidemiology, inflammatory back pain

## 1 | INTRODUCTION

Inflammatory back pain (IBP) is the hallmark symptom of ankylosing spondylitis (AS) and other related diseases grouped as spondyloarthritis (SpA), afflicting young individuals leading to a lot of disability.[1,2] AS has been historically diagnosed as per modified New York criteria, which requires the presence of radiographic sacroiliitis.[3] Due to the advent of magnetic resonance imaging (MRI) and better insight into the course of AS, it has been classified by Assessment of Spondylo-Arthritis international Society (ASAS) into radiographic

axial SpA and non-radiographic axial SpA mandating newer studies for determining the prevalence.[4] The term radiographic axial SpA has been used interchangeably with AS in the literature as well as in clinical practice.[5]

Various IBP criteria have been used in a primary care setting as screening tools for early referral, but their utility in community-based surveys for case identification has not been widely studied.[6] In population-based estimates from the US National Health and Nutrition Examination Survey, the prevalence of IBP is 6% by applying Calin criteria.[7] While, IBP in the UK primary care population has been reported to be 1.7%, 3.0%, and 3.4% as per ASAS, Calin, and Berlin criteria respectively.[8]

Community Oriented Program for Control of Rheumatic Disorders (COPCORD) is a WHO-International League Against Rheumatism (ILAR) joint initiative that started in 1983 for generating epidemiological data.[9] Several stage 1 surveys from developing countries have been completed reporting back pain as one of the commonest self-reported symptoms but data on IBP are scarce.[10,11] A COPCORD study from Mexico reported IBP in 3%.[12] The worldwide prevalence of AS is around 0.5% to 1%.[13] However, COPCORD surveys from Pakistan, India, and Bangladesh have reported a very low prevalence of AS and other SpA (0.03%-0.1%), in that studies' focus was not on specifically identifying subjects with inflammatory back pain (IBP), and the diagnosis was ascertained mostly on clinical assessment alone.[10,14,15]

There is a lack of data on the prevalence of rheumatic diseases in general and especially of SpA spectrum diseases in Pakistan. The last COPCORD study in Pakistan was conducted more than 2 decades ago by Farooqi et al.[14]

This study aimed to determine the prevalence of IBP and radiographic axial SpA as per ASAS criteria in a semi-urban community of Lahore, Pakistan.

## 2 | METHODS

This was a cross-sectional, household survey, conducted by the Department of Rheumatology, FMH College of Medicine and Dentistry (FMHCM&D), in a semi-urban community of Nain Sukh, Sheikupura District, Lahore Division, Punjab, Pakistan, which is situated 15 km outside Lahore city on the bank of River Ravi. It was conducted from November 2018 to April 2019. The estimated population of Nain Sukh and its surroundings was around 40 000. The base camp of the household survey was the Primary Healthcare Center (PHC) of Nain Sukh, run by the Department of Family Medicine, FMHCM&D in collaboration with the district government.

This study was designed as per WHO-ILAR, COPCORD model having 3 phases. The original COPCORD Core Questionnaires (CCQ) of Phases 1 and 2, were translated from English to Urdu by a rheumatologist. The Urdu version was translated back to English by another rheumatologist, who was unaware of the original English questionnaire, both were not directly part of this research project. There was no significant difference between the CCQ and the back-translated version. The final version of the questionnaire was validated in a pilot study involving 50 Nain Sukh subjects.

The surveyed population included men and women older than 16 years who had been living at their place of residence for at least 6 months. Subjects were excluded if they were visiting Nain Sukh, were unable or unwilling to give informed consent, or not willing to give a blood sample.

Formal ethical approval was obtained from the FMHCM&D's Institutional Review Board. Verbal informed consent was taken from all participants.

### 2.1 | Selection and training of the COPCORD survey team

For Phases 1 and 2 of the household survey, 10 clinical assistants with matriculation and formal paramedic training and 8 physiotherapists were selected. The clinical assistants, physiotherapists, and 2 rheumatology fellows participated in class and field workshops to ensure the accuracy and uniformity of the questionnaire application.

### 2.2 | Measures taken to enhance the co-operation of the community

The Principal Investigator and the team arranged pre-survey meetings with the religious leaders, elected union council members, and the family physicians of the outreach program of the Family Medicine Department of FMHCM&D. Posters and banners were displayed highlighting the objectives and benefits of the survey and information leaflets were distributed in the houses a week before the survey. Announcements were made before and during the survey from the loudspeakers of the mosques and in Friday prayers congregation.

### 2.3 | Data collection in Phases 1 and 2

Phases 1 and 2 were conducted simultaneously. Phase 3 was started 4 weeks after the completion of Phase 2. The PHC of Nain Sukh was made the base camp. For Phase 1, random walk and quota sampling technique was used.'[16] Eight teams of clinical assistants and physiotherapists went from door to door to administer CCQs for data collection via interview in Phases 1 and 2 from household members of both genders aged 16 years and above. Each team was assigned a minimum interview quota of 600 for Phase 1.

The geographic map of Nain Sukh was divided into various areas. The principal investigator identified a focal point at the crossing in each specified geographical area of Nain Sukh. The next step was selecting the street randomly which was done by spinning a water bottle on the ground as used in vaccination surveys by WHO's Extended Program of Immunization.[17] The survey was started from the first house on the right in the street to which the bottle had pointed.[17]

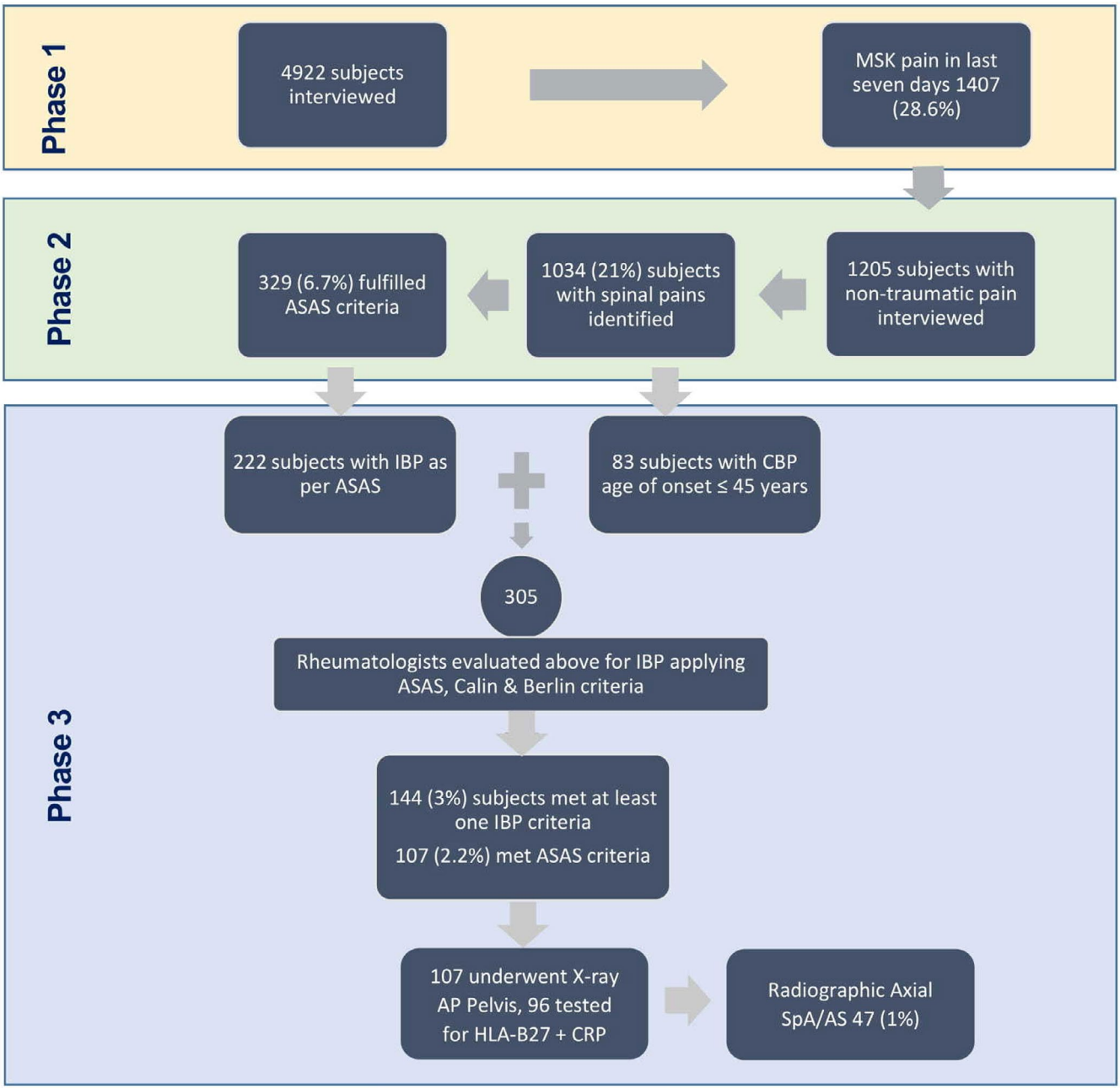


**FIGURE 1** COPCORD study flow chart

The interviewers in each team interviewed each house beginning from their right. If the interviewer encountered any sidewalk, he or she continued to interview the house on the right hand and the same applied for the crossing street. In this way, the household survey continued until a predetermined quota of 600 subjects for each team had been achieved. Repeated call backs were done at different times of the day at the convenience of households to reduce the non-response rate.

Positive respondents were defined as those having body aches and joint pains during the last 7 days, not attributable to trauma. They were enrolled for Phase 2 through a purposive sampling. Subjects were asked to point to areas of pain, swelling, stiffness, and/or limitation, on a drawing of a mannequin, which they experienced in the last 7 days or prior. The subjects rated their pain on a Likert scale. Data on their health-seeking behaviors were also recorded. The impact of musculoskeletal (MSK) pain on functional disability was assessed by the Modified Health Assessment Questionnaire (MHAQ), administered via interview.[18] In addition to the CCQ for Phase 2 all participants were specifically asked for the presence of spinal/back pain defined as the history of pain, stiffness, and limitation of movement in neck, upper, lower back, and painful stiffness in shoulder and pelvic girdle muscles. They were further interviewed for individual items of ASAS criteria. Positive respondents of Phase 2 were those who fulfilled ASAS criteria for IBP or had chronic back pain (CBP) defined as back pain of 3 months or more with an age at onset ≤45 years.

### 2.4 | Phase 3

This phase was started 4 weeks after Phase 2. In the first round, all subjects with back pain fulfilling the ASAS criteria for IBP in Phase 2 were invited to visit the rheumatology clinic for evaluation. In the second round, the lead investigator scrutinized Phase 2 forms to identify individuals who had CBP with an age of onset ≤45 years for clinical assessment by the rheumatology team. Each subject was asked specific questions about the presence of IBP as per ASAS, Calin, and Berlin criteria to validate information collected by physiotherapists.[4] Subjects who did not meet any of the 3 criteria for IBP were labeled as non-inflammatory back pain (see Figure 1). A complete medical history with a focus on all SpA associated features defined by ASAS classification criteria for axial SpA like family history, history suggestive of inflammatory arthritis, enthesitis, uveitis, dactylitis, psoriasis, Inflammatory bowel disease, and good response to non-steroidal anti-inflammatory drugs were taken from each participant.[3] They were thoroughly examined including tests for spinal mobility like modified Schober's, finger-to-floor distance, chest expansion, tragus to the wall, and occiput to wall distance.[4] The examination also involved tender and swollen joint count, enthesis and especially looking for nail and skin psoriasis.[19] All subjects enrolled in Phase 3 also rated their back pain on a numeric scale.

The subjects fulfilling any of the IBP criteria were tested for human leukocyte antigen (HLA)-B 27 and C-reactive protein (CRP). Testing for HLA-B 27 was done on Clonit HLA-B27 allele real-time polymerase chain reaction assay, in a College of American Pathologists 2016 certified lab. Subjects with IBP present or prior, as per any of the 3 criteria also underwent anteroposterior (AP) pelvis X-ray in a nearby health facility. Each X-ray was scored as per New York criteria for grading of sacroiliitis, independently by a radiologist and the PI.[20] X-rays reported as bilateral grade 2, unilateral grade 3 or above were considered meeting the criteria for radiographic axial SpA or AS. In case of any discordance in reporting, a mutual agreement was reached after discussion.

For patients who had predominantly inflammatory arthritis with a present or prior history of IBP, were classified as having peripheral SpA as per ASAS criteria for peripheral SpA.[19,21]

Since this was a prevalence estimation study, recognizing the importance of accurate data collection, every effort was made to have detailed rheumatologic assessments on all selected subjects. Patients fulfilling modified New York criteria for AS were not subjected to further imaging. Subjects having IBP as per any of the criteria with X-ray AP pelvis either normal or inconclusive were offered MRI of the sacroiliac joints at the discretion of the PI, to look for active sacroiliitis defined as per ASAS.[22]

Those subjects who could not get an MRI because of cost or other logistical issues were labeled as unclassified IBP.

### 2.5 | Quality control and monitoring

A pilot study on 50 subjects of the same semi-urban community was undertaken to assess the training level of interviewers and the reliability of the Urdu translated versions of CCQs. A separate log of all subjects' demographic and contact details was also maintained. The PI used to regularly visit the base camp and the field. At each visit, all the filled CCQs of Phases 1 and 2 were scrutinized for any missing details which were later rectified through contacting the subject personally or by phone.

### 2.6 | Statistical analysis

The pre-test of the Urdu version of CCQ Phase 1 and Phase 2 was done to assess the feasibility and reliability in 50 subjects of Nain Sukh. To determine the reliability, Cronbach's alpha was calculated and the score was 0.87. These subjects were later included in the total count of 4922 subjects surveyed. At the end of the household survey, the data from the completed questionnaires were analyzed using SPSS software version 25. Proportions were calculated for all qualitative variables and all quantitative variables were presented as mean and standard deviation. One-way analysis of variance was applied for comparisons of means among different groups. For comparison of categorical variables between different sub-groups of diagnosis, a Chi-square test was applied. The level of significance was set at 95% ($P$ value ≤.05). For calculating the relative risk (RR), Pearson's Chi-square test was applied. Prevalence figures were represented with a 95% confidence interval calculated by Wilson score.

## 3 | RESULTS

### 3.1 | Demography of the surveyed population

A total of 4922 subjects were interviewed in Phase 1. The mean age of the surveyed population was 35.3 ± 14.5 years (95% CI 34.9-35.7). Out of 4922 subjects, 2770 (56.3%) were female. For the sociodemographic characteristics of the participants refer to Table 1.

### 3.2 | Data on non-traumatic musculoskeletal pain

In the surveyed households, the point prevalence of MSK pain in the last 7 days was 1407 (28.6%; 95% CI 27.3-29.9). The regional distribution of MSK pain is shown in Table 2. Out of these 1407, 1205 (24.5%) of the surveyed population participants were enrolled for Phase 2 of the survey, having non-traumatic MSK pain. Most of the subjects who dropped out were those who were non-contactable or not available on the subsequent visit or withdrew their consent.

### 3.3 | Data on spinal/back pain

Lower back pain (755; 15.3%, 95% CI 14.4-16.4), was the most commonly reported MSK symptom within the last 7 days followed by neck pain in 420 (8.5%, 95% CI 8.5-7.8). There were 1034 (21%, 95% CI 19.8-22.2) subjects who reported having spinal pain, who were

**TABLE 1** Sociodemographic characteristics of the surveyed population (N = 4922)

| | |
|---|---|
| Age in y, mean ± SD | 35.33 ± 14.47 |
| | 95% CI 34.9-35.7 |
| Female n (%) | 2770 (56.3) |
| Age group n (%) | |
| 25 or less | 1537 (31.2) |
| 26-35 | 1391 (28.3) |
| 36-45 | 1004 (20.4) |
| 46-56 | 520 (10.6) |
| 56 and older | 470 (9.5) |
| Marital status n (%) | |
| Married | 3711 (75.4) |
| Single | 1003 (20.4) |
| Widowed | 184 (3.7) |
| Divorced | 16 (0.3) |
| Separated | 8 (0.2) |
| Family size, mean ± SD | 7.12 ± 3.80 |
| Literacy level n (%) | |
| Read-only | 384 (7.8) |
| Read and write | 2439 (49.6) |
| Illiterate | 2099 (42.6) |
| Y in school n (%) | |
| Primary | 368 (7.5) |
| Secondary | 419 (8.5) |
| Matric | 767 (15.6) |
| Intermediate | 243 (4.9) |
| Graduation | 254 (5.2) |
| Masters | 40 (0.8) |
| Non-formal education | 2831 (57.6) |
| Smoking n (%) | 449 (9.1) |
| Alcoholism n (%) | 8 (0.2) |
| Current occupation n (%) | |
| Student | 317 (6.4) |
| Farm work | 148 (3.0) |
| Desk job | 6 (0.1) |
| Fieldwork | 938 (19.1) |
| Shop business | 548 (11.1) |
| Household work | 2526 (51.3) |
| Housemaid | 59 (1.2) |
| Professional | 71 (1.4) |
| Military | 1 (0.0) |
| Retired | 128 (2.6) |
| Unemployed | 174 (3.5) |
| Monthly income n (%) | |
| Less than PKR 15 000 (USD 112) | 2006 (40.8) |
| More than PKR 15 000 (USD 112) | 2916 (59.2) |

then interviewed for ASAS criteria for IBP, and 329 (6.7%, 95% CI 6.0-7.4) of these subjects fulfilled the criteria, administered by physiotherapists during Phase 2 of the survey. Subjects who had IBP were younger as compared to the ones with non-inflammatory back pain (34.8 ± 10.2 vs 41.4 ± 14.3, $P < .000$). There were 250 (76%) females out of total 329 subjects with IBP. In addition, 83 subjects were identified having CBP with age at onset ≤45 years.

In the first round of Phase 3, out of 329 with IBP as per ASAS, 222 subjects came for rheumatological examination; the rest either withdrew their consent or were non-contactable. However, ASAS criteria was confirmed in 86 (38.7%). Out of 83 subjects with CBP with age at onset ≤45 years identified from Phase 2, 21 (25.3%) met ASAS criteria. Finally, out of 305 subjects enrolled for Phase 3, 144 (2.9%, 95% CI 2.5-3.4) subjects were classified as confirmed IBP by a rheumatologist as per any of the above 3 criteria. IBP present or in the past was confirmed by a rheumatologist as per ASAS, Calin, or Berlin criteria in 107 (2.2%, 95% CI 1.8-2.6), 102 (2.1%, 95% CI 1.7-2.5), and 87 (1.8%, 95% CI 1.4-2.2), respectively (Figure 1, COPCORD survey flow chart).

One hundred and seven subjects underwent X-ray AP pelvis and 97 patients were tested for HLA-B 27 and CRP levels. ASAS criteria for radiographic axial SpA was met in 47 (1%, 95% CI 0.7-1.3) of the surveyed population and 15.4% of the subjects evaluated in Phase 3. MRI of sacroiliac joints was done in 5 patients with IBP and active sacroiliitis was found to be present in 3 patients as per the ASAS definition of active sacroiliitis. Thus, 53 subjects were finally found to have axial SpA as per ASAS criteria, yielding a prevalence estimate of 1.1% (95% CI 0.8-1.4). The rest of the patients with IBP were labeled as unclassified IBP (47; 1.0%). Around 10 (0.2%) patients fulfilled the ASAS criteria for peripheral SpA (Table 3).

Out of 53 patients fulfilling the ASAS criteria for axial SpA, 32 (60.4%) were females and 21 (39.6%) males. However, the percentages out of the total of the same gender were 60 for males (21/35) and 42.7 for females (32/75) resulting in a RR of 1.41 (95% CI 0.96-2.05). HLA-B27 was reported to be positive in 7 (7.2%) out of 97 tested. Out of these 7 patients, 3 met the New York criteria, and the rest fulfilled the ASAS criteria for axial SpA clinical arm. In the rest of the subjects with CBP and age at onset ≤45 years with or without joint pains, the commonest diagnosis was non-inflammatory lower back pain (LBP) in 141 (2.9%), followed by fibromyalgia in 33 (0.7%), and inflammatory arthritis in 12 (0.2%) (Table 3).

Patients with axial SpA or unclassified IBP had a lower age at onset of back pain as compared to subjects with non-inflammatory back pain ($P = .002$). Subjects with non-inflammatory pain had higher body mass index as compared to patients with axial SpA and unclassified IBP ($P = .000$). Subjects with axial SpA had significantly lower lumbar flexion on modified Schober's test and higher pain on visual analog scale as compared to the subgroup comprising of non-IBP (Table 4).

## 4 | DISCUSSION

Since its inception, COPCORD has generated a wealth of data on MSK symptoms and rheumatic diseases from the developing world.

**TABLE 2** Regional distribution of musculoskeletal pain in the surveyed population (N = **4922)**

| Region/joint area | n (%) |
|---|---|
| Neck | 420 (8.5) |
| Upper back | 88 (1.8) |
| Lower back | 752 (15.3) |
| Shoulder joint | 209 (4.2) |
| Elbow joint | 71 (1.4) |
| Hand | 96 (1.9) |
| Wrist joint | 85 (1.7) |
| Hip joint | 50 (1.0) |
| Knee joint | 402 (8.2) |
| Calf pain | 110 (2.2) |
| Ankle joint | 108 (2.2) |
| Feet | 54 (1.1) |

**TABLE 3** Prevalence of different rheumatic diseases in the semi-urban community of Nain Sukh (N = 4922)

| Diagnosis | n (%; 95% CI) |
|---|---|
| Radiographic axial SpA/AS | 47 (1; 1.0-1.3) |
| Non-radiographic axial SpA | 6 (0.1; 0.04-0.26) |
| Unclassified inflammatory back pain | 48 (1.0; 1.0-1.3) |
| Peripheral SpA | 10 (0.2; 0.1-0.4) |
| Undifferentiated inflammatory arthritis | 12 (0.2; 0.1-0.4) |
| Osteomalacia | 1 (0) |
| Fibromyalgia | 33 (0.7; 0.48-0.94) |
| Soft tissue rheumatism | 5 (0.1) |
| Generalized benign hypermobility | 2 (0) |
| Non-inflammatory back pain | 141 (2.9; 2.4-3.4) |

Abbreviations: AS, ankylosing spondylitis; SpA, spondyloarthritis.

The majority of the COPCORD surveys had reported back pain as one of the commonest symptoms. Despite the fact that the concept of IBP is more than 4 decades old, the prevalence of IBP has not been reported in most of these surveys. This survey is the first to the best of our knowledge which has applied ASAS criteria of IBP as a screening tool in the community for case identification and ascertaining the diagnosis of axial SpA.

The current survey had highlighted that every 4th person in the surveyed community had MSK pain (in the last 7 days) and spinal pain was reported in almost two-thirds of the positive respondents of Phase 1. The frequency of MSK pain in the last 7 days (point prevalence) in our survey had been almost double that of the previous survey from the north of Pakistan (28.6% vs 14.7%).[14] The COPCORD investigators from the neighboring country India in various COPCORD studies had reported MSK pain in 6.3%-23.7%.[15] Data from Iran showed a much higher point prevalence (44.7%) of MSK pain. Interestingly, they reported back pain (23.7%) as the second commonest reported symptom, which was close to our figure of 21% of subjects suffering from spinal pain.[23] In our survey, LBP was reported in 15.3% of the subjects. COPCORD surveys from across the globe had reported frequency of back pain around 11.5%-35%, which was closer to our figure.[24] In a Brazilian Study the point prevalence of MSK pain (26.9%) was almost the same as our reported figure with spinal pain as the most commonly reported symptom in almost two-thirds of positive respondents.[25] Nearly similar statistics on MSK pain (28.4% to 36.5%) were published a few years back from other parts of South America, in a female predominant surveyed population like ours.[26,27]

In this study, we used ASAS criteria for IBP as a screening tool for identifying patients with axial SpA. The utility of IBP in primary care for screening patients for early referral to rheumatologists is well established.[28] Its utility as a screening tool in community-based studies has been not well recognized.[29] Various algorithms had been developed over time but again they were applicable in a primary care setting and not in a community.[30] We found that almost 1 in every 3 persons with spinal pain had IBP (6.7% of the total population). A study from Mexico reported back pain in 8% while 3% had IBP, which was around 37% of the subjects with back pain which was close to our figure of 32%.[12] Weisman et al reported the prevalence rates of IBP to be 6% in a US population, which was close to our findings of 6.7%, as per ASAS criteria administered by physiotherapists.[31] This was noteworthy that they used Berlin criteria which were administered by trained interviewers, which was not verified by rheumatologists. There was a discordance of observation between physiotherapists and rheumatologists as out of 222 seen by the rheumatologist in Phase 3, with physiotherapist-diagnosed IBP, only 144 (64.8%) were confirmed to fulfill at least one IBP criterion. This discrepancy may be explained by different levels of expertise and settings.

The frequency of AS or radiographic SpA in the current study was 1%, which was higher than those reported in earlier COPCORD studies (0.07% to 0.26%) but almost the same as reported in Western literature.[13,32] A study from Mexico using the COPCORD model showed that the prevalence of IBP, SpA, and AS were 1.3%, 0.6%, and 0.1% respectively which is lower than our figure.[33] It is noteworthy that the investigators used Berlin criteria for IBP and European Spondyloarthropathy Study Group (ESSG) criteria for SpA. Studies from India had consistently reported very low standardized prevalence rates for AS and other SpA by clinical diagnosis.[15] A meta-analysis by Stolwijk et al[34] showed that the prevalence of AS was higher in studies that used ASAS or New York criteria for case ascertainment as compared to the clinical diagnosis. A recent study on university students from southern China used ASAS criteria for diagnosis and found a prevalence of axial SpA of 0.34%. This study like ours reported that IBP was more common in females but males and IBP more likely to be diagnosed with axial SpA.[35] Furthermore, this low prevalence reported in most COPCORD studies might be because early diagnosis of AS requires MRI and expensive tests like HLA-B27, while COPCORD

**TABLE 4** Univariate comparison of demography and clinical characteristics of subjects with axial SpA, unclassified IBP, non-IBP and subgroup comprising of miscellaneous diagnosis

| Variables | Axial SpA (n = 53) | Unclassified IBP (n = 48) | Non-IBP (n = 141) | Miscellaneous diagnosis[a] (n = 63) | *P* value |
|---|---|---|---|---|---|
| Age in y, mean ± SD | 33.3 ± 7.0 | 33.5 ± 8.8 | 37.2 ± 8.8 | 33.8 ± 9.0 | .293 |
| Age at onset of back pain, mean ± SD | 28.9 ± 6.7 | 28.9 ± 8.4 | 32.7 ± 7.5 | 29.1 ± 7.9 | .002* |
| Female, n (%) | 32 (60.4) | 37 (77.1) | 106 (75.2) | 52 (82.5) | .048* |
| BMI, mean ± SD | 27.4 ± 6.4 | 27.1 ± 6.9 | 28.2 ± 9.9 | 28.8 ± 7.8 | .000* |
| Modified Schober's in cm, mean ± SD | 14.8 ± 1.3 | 14.9 ± 1.2 | 15.4 ± 1.1 | 15.4 ± 1.4 | .003* |
| Finger-to-floor distance in cm, mean ± SD | 4.8 ± 9.1 | 5.5 ± 8.9 | 3.2 ± 7.4 | 5.4 ± 9.3 | .206 |
| Chest expansion in cm, mean ± SD | 3.5 ± 1.1 | 3.9 ± 1.1 | 3.8 ± 0.9 | 3.4 ± 1.5 | .093 |
| Tragus to the wall in cm, mean ± SD | 10.6 ± 2.7 | 10.5 ± 2.2 | 10.2 ± 1.6 | 9.7 ± 2.8 | .182 |
| Pain VAS numeric, mean ± SD | 5.0 ± 2.7 | 4.8 ± 2.3 | 3.9 ± 2.2 | 4.9 ± 2.9 | .004* |
| HAQ score, mean ± SD | 0.8 ± 0.5 | 0.6 ± 0.4 | 0.7 ± 0.4 | 0.8 ± 0.5 | .461 |

Abbreviations: BP, inflammatory back pain; HAQ, Health Assessment Questionnaire; ISpA, spondyloarthritis VAS, visual analog scale.

[a]Other diagnoses include patients with peripheral SpA, fibromyalgia, and inflammatory arthritis, etc (for detail see Table 3).

*P value significant at ≤.05.

studies have been historically low-cost low infrastructure, ascertaining diagnosis mostly on clinical grounds. Further, adding items addressing specifically IBP in the CCQ might have increased its sensitivity for the diagnosis of axial SpA. This needs to be validated further to suggest incorporating IBP individual item questions in Phase 2 CCQ.

In our study, 35% of the subjects enrolled in Phase 3 with CBP with an age at onset ≤45 years met ASAS criteria for IBP, and almost half of these subjects were classified as radiographic axial SpA or AS. Burgos-Vargas et al in their multi-centric study also reported that 38.7% of patients with chronic LBP had IBP of whom 53.7% met criteria for AS.[36]

In the current survey, the sensitivity of HLA-B27 was around 16% which was much lower than Western data.[37] There is a lack of data on the prevalence of HLA-B27 in the general population in Pakistan; however, an earlier study on prospective donors and recipients of renal transplant reported prevalence of HLA-B 27 in 5.5%.[38] Otsuka et al[39] from Japan reported a very low frequency of HLA-B27 (5.4%) in their SpA cohort with higher frequency of other HLA-B gene alleles. Studies from the Arab world had also reported prevalence of HLA-B27 to be as low as 13.87% from Lebanon to around 70% in Kuwait and Saudi Arabia.[40-42] Moreover, several other genes have been implicated in the pathogenesis of SpA that might be the case in our population and needs to be explored in future studies.[43] Because of the lower positivity rate of HLA-B27 in our cohort of IBP patients, we might not have been able to delineate the significance of the clinical arm of ASAS criteria for axial SpA in ascertaining the diagnosis which was in contrast to a study done in a population with a high prevalence of HLA-B27.[44]

One of the limitations of our study was high attrition rate (30%) from Phase 2 to Phase 3. The reasons for this might be the relatively younger population with IBP, the majority being women engaged in household work, while men being daily wage-earners found it difficult to come for clinical examination and imaging to a tertiary care hospital. However, dropouts for the clinical examination can be avoided in future surveys by using a fast track model as adopted by Chopra et al in their Bhigwan COPCORD project.[45] Second, our surveyed population was predominantly female which can be

addressed in the future by using controlled sampling. Moreover, the reason for higher prevalence of AS in our study might be because of over-reporting of the grade of sacroiliitis as both the rheumatologist as well as the radiologist were aware of the clinical history of IBP. Interestingly, in the follow-up of the previously described cohort developed for ASAS classification, Sepriano et al explained that subtle radiographic changes were amenable to measurement errors.[46] Another limitation of our study was that we were not able to get the MRI of sacroiliac joints on all patients with IBP who were not fulfilling ASAS criteria for radiographic axial SpA, because of logistical and budgetary constraints. Hence, the prevalence of non-radiographic axial SpA might have been higher than reported in this study. Data on disease activity and functional status were not available on all subjects so were not reported. We highly recommend a future COPCORD study using a randomized sampling technique with age and gender standardization to confirm our findings.

## 5 | CONCLUSIONS

In summary, ASAS criteria for IBP can be applied in community surveys to estimate the prevalence of axial SpA. The estimated prevalence of IBP in the semi-urban community of Nain Sukh was 6.7% as per ASAS criteria administered via interview by physiotherapists. IBP as per at least 1 of the 3 validated criteria was confirmed in 3% by the rheumatologist. The estimated prevalence of AS or radiographic axial SpA in this survey was around 1% which is higher than reported in previous COPCORD surveys but almost the same as reported in Western studies.

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### CONFLICT OF INTERESTS

The authors declare there is no conflict of interest regarding the publication of this paper.

### AUTHOR CONTRIBUTIONS

All authors were involved in the conceptualizing of the study. Data acquisition was done by MAS, MF, ZA. Data entry, analysis, and interpretation were done by MAS and HA. The manuscript was drafted by MAS and HA. The remaining authors gave their intellectual input and approved the final draft for submission.

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