

# Is There an Urban-Rural Divide? Population Surveys of Rheumatic Musculoskeletal Disorders in the Pune Region of India Using the COPCORD Bhigwan Model

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**ABSTRACT.** *Objective.* To estimate urban prevalence of rheumatic musculoskeletal (MSK) disorders and compare to an earlier rural regional study.

*Methods.* We screened 8145 adults from a preselected urban locality in Pune, India, for MSK pain in a cross-sectional house-to-house survey (Stage I) over 20 weeks. The World Health Organization-International League of Associations for Rheumatology (WHO-ILAR) Community Oriented Program for Control of Rheumatic Diseases (COPCORD) Bhigwan model was used. Thirty trained community volunteers completed Phases I and II questionnaires, concurrent with rheumatology evaluation (Phase III). Clinical diagnosis was based on standard diagnosis/classification criteria. Point prevalence rates from our survey and the earlier Bhigwan village (Pune district) survey were standardized (adjusted age-sex to India population census 2001) and are reported for osteoarthritis (OA), rheumatoid arthritis (RA), seronegative spondyloarthritis (SSA), and inflammatory arthritis (IA).

*Results.* One thousand one hundred fifty-two urban cases (65% women) were identified (14.1%, 95% confidence interval 13.4, 14.9). The self-reported pain sites (Phase II) were hip (0.4), knees (6.3), ankle (1.9), feet (0.7), shoulders (2), hands (1.3), wrist (1.2), neck (1.9), upper back (1.7), low back (5.5), thigh (1.5), calf (1.4), and sole (0.8); corresponding rural sites being hip (1.1), knees (13.7), ankle (7), feet (1.6), shoulders (7.9), hands (6.3), wrist (6.9), neck (6.8), upper back (8.4), low back (12.6), thigh (4.8), calf (7.1) and sole (2.2). OA disorders, soft tissue rheumatism (STR) and ill-defined aches and pains were predominant in both surveys; < 10% reported IA. The major disorders among urban cases were OA (4), STR (1.2), RA (0.2, ACR criteria 1988), undifferentiated IA (0.3), SSA (0.3), and gout (0.06); corresponding rates in Bhigwan were OA (6.3), STR (3.8), RA (0.5), undifferentiated IA (0.8), SSA (0.3), and gout (0.1). Infections were conspicuously absent.

*Conclusion.* While similar in spectrum, standardized prevalence rates of self-reported pain sites and rheumatic MSK disorders were significantly lower in the urban (current Pune COPCORD surveys) versus rural (Bhigwan) community, and in both communities aches and pains that are poorly understood by modern science were predominant. (First Release Feb 1 2009; J Rheumatol 2009; 36:614–22; doi:10.3899/jrheum.080675)

## Key Indexing Terms:

EPIDEMIOLOGY  
COMMUNITY ORIENTED PROGRAM FOR CONTROL OF RHEUMATIC DISEASES  
PREVALENCE

RHEUMATIC MUSCULOSKELETAL DISORDERS  
URBAN-RURAL DIVIDE

Several World Health Organization-International League of Associations for Rheumatology (WHO-ILAR) Community Oriented Program for Control of Rheumatic Diseases (COPCORD) population surveys<sup>1-17</sup> and recently published reviews<sup>18,19</sup> have reported the extent and burden of rheumatic musculoskeletal disorders (MSK) in Asia. The COPCORD was designed to acquire data on pain and disability

(rather than disorders and syndromes) primarily in developing rural economies, using a low cost model. COPCORD was broadly framed<sup>20</sup> to collect population data (Stage I), educate the community and identify risk factors (Stage II), and implement control and preventive strategies (Stage III).

The initial India COPCORD population survey<sup>7,8</sup> was carried out in the village of Bhigwan (Pune District, State of Maharashtra, West India) in 1996, and the program is ongoing. The Bhigwan survey established an innovative fast track survey model for acquiring population data<sup>21</sup>. The Bone and Joint Decade (BJD) India included “measure of the national burden of rheumatic MSK” in its founding charter<sup>22,23</sup> and adopted the Bhigwan COPCORD model to carry out population surveys at different sites in India.

We report the prevalence data from the first BJD India population survey completed in Pune city, and compare this with the earlier COPCORD survey in Bhigwan village.

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## MATERIALS AND METHODS

**Location.** The Pune metropolis, with a population of about 5 million, is situated in the West India state of Maharashtra, close to the coastal city of Mumbai. At an altitude of 598 meters, Pune enjoys a moderate winter, hot summer, and mid-year heavy rains. In conjunction with the Health Department and Municipal Corporation and local doctors, we selected a centrally located ancient but popular residential area (Narayan Peth) in Pune city for the survey. The geography of the area was well defined. The locality was congested and known for old-structure residential buildings (often > 150 yrs old and called "Wada" in local dialect) in which families (with known lineage of several generations) continue to live, with several siblings sharing residence with parents and other relatives. This was a conservative part of the city, known for a non-migrant population. The residents, predominantly of middle socioeconomic status, are known to lead an orthodox austere lifestyle and are predominantly Maharashtra Hindu (the state ethnic group). The predominant occupations were clerical office work, shopkeeping, and small businesses; almost one-fifth of men were found to be retired. In addition to household work, several women worked in home-based small scale trades.

We used a local corporation school and an adjacent municipal dispensary (mostly used for national vaccination/immunization programs) to examine cases, collect blood samples, hold meetings, and keep survey records.

**Pre-survey.** A week prior to the survey, our medical team and the community health worker volunteers carried out a public rally in the COPCORD locality to announce the program. Information handouts were distributed to sensitize the community towards our mission. Hand-held banners displayed messages on "bone and joint health." A special meeting was held for the local general practitioners to explain the program and seek support.

**Survey.** The adult population (age > 16 yrs) was surveyed house-to-house from May-Sept 2004. We were guided by an electoral voter list based on the Indian population census 2001. Thirty college student volunteers (16 women) were trained as health workers in a 2-day pre-survey workshop. Five teams of health workers worked concurrently in well-defined sectors of the survey area, per a pre-determined schedule. An external coordinator (GR) ensured that the minimum daily survey target (Phases 1 and 2 screening) was met before disbursing honorariums to the health workers. The rheumatology team consisted of rheumatologists (AC, VLJ), screening doctors (EC, VK, HA, JP), coordinators (MS, GR) and laboratory personnel (AV, RG) from CRD, Pune. The screening doctors were rheumatology associates with > 2 years work experience. Several members (AC, JP, MS, AV) had earlier participated in the Bhigwan COPCORD survey. The doctors made house visits to examine the very sick and the disabled. When clinically indicated, whole blood was collected at the survey site and quickly transported to the CRD laboratory (about 4 km away). A nearby missionary dispensary provided facilities for taking radiographs. All survey evaluations, including laboratory investigations, were carried out free of charge to the respondents.

**Questionnaire.** The COPCORD core questionnaire permits a certain degree of adaptation and modification to suit regional requirements. The Bhigwan COPCORD survey and its questionnaire [using a human manikin and an Indian version of the modified Stanford Health Assessment Questionnaire (HAQ)] was designed to capture pain and disability rapidly, and the methods have been published<sup>8,24</sup>. The Bhigwan questionnaire was further modified and updated by one of the investigators (AC) to improve standardization for better global comparisons, and include some of the BJD objectives, especially those of trauma<sup>25</sup>. However, the Indian version was discussed and finalized by a BJD India COPCORD core team in a 1-day workshop. By and large, the basic methods of screening, recording pain and function remained unchanged from those used by the Bhigwan survey. The new version was found to be easily comprehensible and feasible in a pilot study using a randomly chosen group of 40 healthy people and 60 referral patients (equally divided between urban and rural residents) attending

CRD, Pune. This version was adopted by BJD India and used to carry out the 3 initial population surveys [Jammu (North India), Chennai (South India), and Pune (West-Central India)] (results of Jammu and Chennai surveys are not published).

The screening question was "Have you suffered from pain/swelling/stiffness in the joints or musculoskeletal soft tissues within the last 7 days (considered current) or sometime in the past?" If the response was positive, a case was identified for further evaluation in phases II and III. Health workers completed questionnaires (regional language) in a face to face interview. In Phase II, each respondent recorded pain on a human manikin and completed a validated and modified Indian<sup>8,26,27</sup> version of the Stanford HAQ. In Phase III, a standard rheumatology case record form was completed. Patients were screened by a medical graduate and later examined by a rheumatologist.

**Investigations.** Due to financial constraints, only a limited number of respondents could be investigated and this was based on high index of clinical suspicion. Hematological investigations [routine hemogram, serum rheumatoid factor, serum uric acid, serum antinuclear antibody, serum anti-streptozyme antibody, anti-cyclic citrullinated peptide (CCP) antibody, and other specialized antibodies and metabolic and renal measures] and urinalysis were carried out in CRD. Patients suspected to suffer from inflammatory arthritis (IA) were investigated in detail.

Serum was aseptically preserved at -80°C in CRD for future testing (as in the case of anti-CCP antibodies, which were tested a year later when additional funds were procured).

**Nonrespondents.** An individual was declared a nonrespondent (for Phases I and III) after 3 failed attempts (on different days) to make contact. We found 98% of the Phase I nonrespondents to have migrated for education, work, and marriage, and from relatives or friends' reports they did not appear to have any significant form of MSK. Ninety-three Phase III nonrespondents refused further evaluation because they felt that their ailment was too mild to deserve any serious medical investigation.

**Diagnosis and classification.** The diagnosis was essentially clinical. However, standard classification criteria of the American College of Rheumatology (ACR)<sup>28</sup> were used for disorders rheumatoid arthritis (RA), osteoarthritis (OA), fibromyalgia, and seronegative spondyloarthritis (SSA), among others. Patients with ill defined and poorly localized aches and pains (soft tissues and/or joints) and without any objective signs were labeled as "unclassified ill defined aches and pains" (IDS). These were akin to the cases labeled as "symptom related" in the Bhigwan survey<sup>7,24</sup> and included nonspecific arthralgias (NSA). Patients with predominant soft tissue aches and pains and local tenderness with/without swelling, were broadly classified into soft tissue rheumatism (STR). The latter could coexist with nonspecific arthralgias and/or any other forms of arthritis. Patients with generalized STR were specifically examined for fibromyalgia tender points<sup>29</sup>. All forms of enthesitis, tendonitis, tenosynovitis, fasciitis, and non-inflammatory well localized regional pain/tenderness were classified as regional forms of STR. We were guided by the ACR clinical criteria for classifying knee and hip OA. Regional axial pain and stiffness, aggravated by work and motion (often limited) in an individual > 50 years of age led to suspected spine OA. A detailed clinical neurological examination was carried out in the latter to identify neurogenic sequel. Only a limited number of radiographs could be carried out.

**Data and statistics.** The data were entered using an indigenously created software program using Visual Basic (for Windows) on a Microsoft Windows platform. Crude point prevalence rates were calculated along with 95% confidence intervals (CI) by an exact binomial method (using Epi Info 6 version 6.04 d-Jan. 2001, Stat Software). The latter were standardized<sup>30</sup> by adjusting for age and sex distribution in the standard India census population of 2001<sup>31</sup>. Data extracted from the COPCORD Bhigwan database (adult population sample size = 4092) was also adjusted for age and sex as described above. Standardized urban and rural point prevalence rates were compared between Pune (urban) and Bhigwan (rural).

## RESULTS

Figure 1 compares the population distribution in Pune and Bhigwan to that of the India Census 2001. Table 1 shows the age-sex distribution of the population and identified cases from urban Pune. Of the respondents, 14.1% (95% CI 13.4, 14.9) reported “painful rheumatic MSK,” which was the single most predominant ailment in the urban community (Figure 2) as compared to other self-reported ailments in the Phase I questionnaire. None of the subjects reported a painless MSK.

Table 2 shows crude and standardized prevalence (frequency) of pain sites in the urban and rural community. A female preponderance was demonstrated at all sites. Similar to several COPCORD surveys from Asia<sup>1-13</sup>, knee and back were the commonest pain sites (> 5% of the populations). Interestingly, the ranking of pain (frequency) in Table 2 was almost identical in both communities. Pain sites in the lower limb ranked higher than the upper limb. The standardized frequency of each pain site, in both men and women, was found to be much less in the urban community. The adjusted rural pain rates were found to be 4-6, 3-5, and 4-5 times that of the urban community in upper limb, lower limb, and back region, respectively. This may be connected with their lifestyle type being “on the feet” all the time. The difference in the lower limb pain sites is unlikely to be due to any difference in the terrain or type of footwear used.

Figure 3 shows the distribution pattern of those with rheumatic MSK in urban and rural communities. A third of cases in both the surveys had IDS. A predominant 45.7% of urban cases suffered from some form of OA. Less than 10% of cases from each of the surveys had IA. Although the crude prevalence of OA appeared higher in urban Pune, the adjusted prevalence (Table 3) was found to be lower than the rural rate. All disorders were found more prevalent in the rural Bhigwan community (Table 3).

*Rheumatoid arthritis.* Thirty-seven cases (26 women, 11 men) were identified during the urban survey. Twenty-three patients (62%) were seropositive for rheumatoid factor (nephelometry; cutoff value = 40 IU/ml). All 37 patients tested seropositive for anti-CCP antibodies (second generation ELISA; cutoff value = 5 RU/ml). Twenty-six (70%) patients demonstrated radiological erosions and/or typical articular deformity.

*Seronegative spondyloarthritis.* Twenty-two cases were identified. Ankylosing spondylitis, psoriatic arthritis, and undifferentiated forms were diagnosed in 5, 5, and 12 cases respectively. However, reactive arthritis was not diagnosed in any of the cases.

*Undifferentiated inflammatory arthritis.* In the absence of clinical sacroiliitis, enthesitis, and history of preceding urogenital/bowel infections, 30 patients with IA could be best

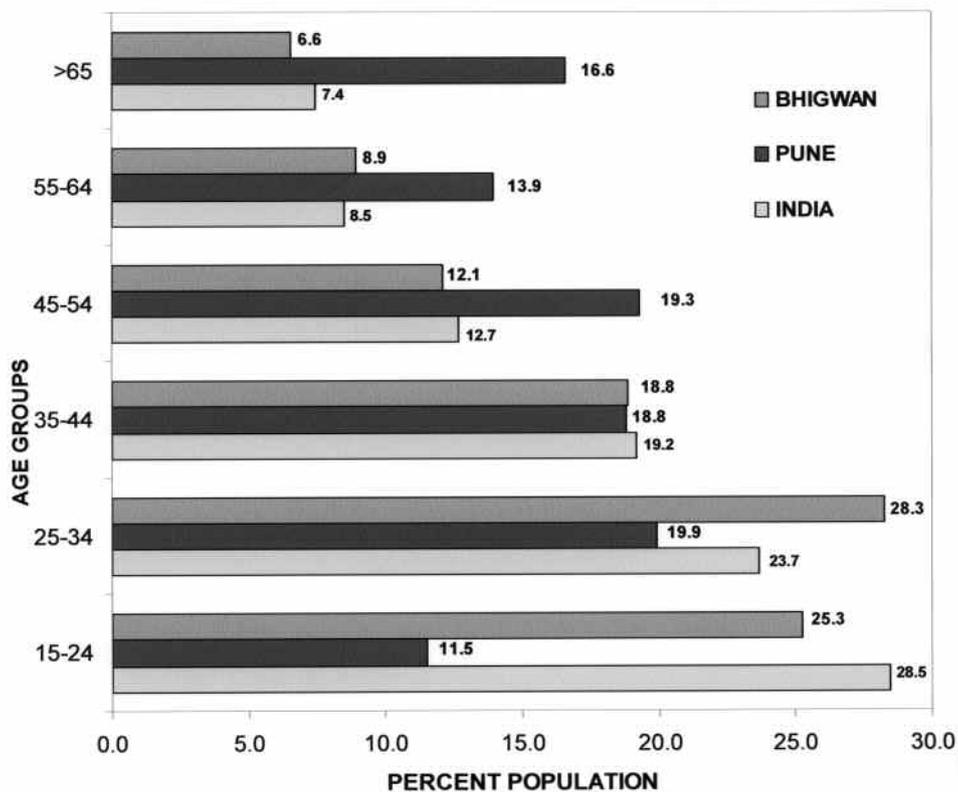


Figure 1. Distribution (%) of the Pune and Bhigwan Survey populations and the Indian National Census Population (2001) for selected age groups.

Table 1. Age-sex distribution (percent) of urban sample population (Phase I) and identified cases (Phase II) in Pune Urban Survey.

Age Groups	Population			Cases		
	Male (n = 4010)	Female (n = 4135)	Total (n = 8145)	Male (n = 402)	Female (n = 750)	Total (n = 1152)
15-24	11.8	11.2	11.5	2.7	3.5	3.2
25-34	19.8	20.1	19.9	10.7	10.1	10.3
35-44	18.3	19.4	18.8	16.9	21.3	19.8
45-54	19.3	19.3	19.3	23.1	23.6	23.4
55-64	14.0	13.8	13.9	19.4	18.8	19.0
65+	16.8	16.3	16.6	27.1	22.7	24.2

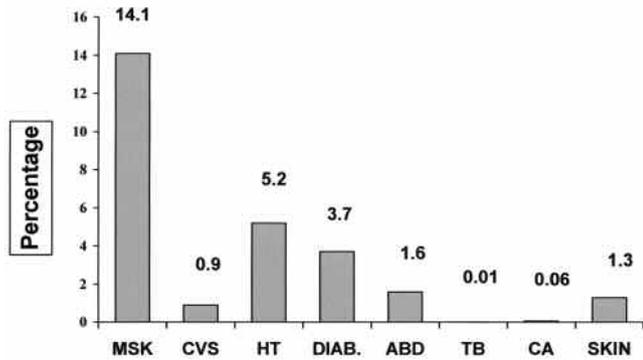


Figure 2. Prevalence of self-reported rheumatic MSK disorders and other diseases in the selected Pune urban community (Stage I, Phase I).

classified as undifferentiated seronegative arthritis (polyarticular = 24 cases, oligoarticular = 4, monoarticular = 2). *Osteoarthritis*. Symptomatic clinical OA was suspected in

526 cases. Knee OA was found to be the predominant condition in 322 cases (220 women). Symptomatic hip OA was suspected in only 4 cases. Lumbar spine, cervical spine, and primary generalized OA were diagnosed in 194, 72, and 32 cases, respectively. Standard radiographs of knees and/or spine were available for only 76 patients and the findings were consistent with the diagnosis of OA.

*Soft tissue rheumatism*. There were 56 cases (prevalence 0.69%, 95% CI 0.52, 0.89) with generalized forms of STR. In these, classical fibromyalgia (ACR) was diagnosed in only 4 cases (prevalence 0.05%, 95% CI 0.01, 0.13). Fifty cases (prevalence 0.61%, 95% CI 0.46, 0.81) were diagnosed as regional forms of STR, common sites being heel, Achilles tendon, and sole.

*Other*. Gout was diagnosed in 6 cases (all men) and none had polyarticular and/or tophaceous gout. Although an occasional case was suspected, none provided a typical history or tested positive for Hansen, HIV, or syphilis. One elderly

Table 2. Standardized\* prevalence (percentage) of current pain at various sites (indicated on a human manikin) in patients from Pune Urban Survey and a comparison with Bhigwan Rural Survey<sup>8</sup>.

Category	Pune, n = 8145 (95% CI)		Bhigwan n = 4092 (95% CI)	
	Crude	Adjusted#	Crude	Adjusted#
Pain any site	14.1 (13.39, 14.92)	11.5 (11.03, 11.92)	18.8 (17.59, 20.04)	19.5 (18.97, 20.07)
Neck	2.2 (1.89, 2.54)	1.9 (1.77, 2.05)	6.7 (5.94, 7.52)	6.8 (6.48, 7.19)
Low back	5.5 (4.99, 5.99)	4.6 (2.08, 2.50)	12.1 (11.14, 13.20)	12.6 (12.14, 13.06)
Shoulder	2.5 (2.21, 2.91)	2.0 (1.83, 2.23)	7.6 (6.83, 8.50)	7.9 (7.49, 8.24)
Elbow	1.7 (1.39, 1.96)	1.3 (1.18, 1.50)	6.0 (5.32, 6.83)	6.3 (5.99, 6.67)
Hand	1.6 (1.36, 1.92)	1.3 (1.05, 1.42)	6.0 (5.32, 6.83)	6.3 (5.98, 6.66)
Wrist	1.4 (1.14, 1.67)	1.2 (1.03, 1.33)	6.6 (5.87, 7.44)	6.9 (6.57, 7.28)
Knee	8.1 (7.52, 8.72)	6.0 (5.07, 6.37)	13.0 (11.99, 14.11)	13.7 (13.26, 14.22)
Ankle	2.5 (2.19, 2.88)	1.9 (1.72, 2.10)	6.8 (5.99, 7.58)	7.0 (6.67, 7.38)
Feet	0.9 (0.68, 1.10)	0.7 (0.57, 0.80)	1.5 (1.18, 1.97)	1.6 (1.45, 1.81)
Hip	0.5 (0.32, 0.63)	0.4 (0.28, 0.45)	1.1 (0.76, 1.43)	1.1 (0.97, 1.27)
Upper back	2.1 (1.78, 2.05)	1.7 (1.50, 1.86)	8.11 (7.28, 9.00)	8.4 (7.99, 8.77)
Calf	1.7 (1.47, 2.05)	1.4 (1.22, 1.55)	6.9 (6.08, 7.68)	7.1 (6.76, 7.47)
Heel	1.2 (1.00, 1.49)	1.0 (0.84, 1.12)	2.9 (2.37, 3.44)	3.0 (2.77, 3.25)
Thigh	1.8 (1.52, 2.10)	1.5 (1.32, 1.66)	4.6 (3.95, 5.28)	4.8 (4.45, 5.04)
Sole	1.0 (0.82, 1.28)	0.8 (0.65, 0.90)	2.2 (1.76, 2.70)	2.3 (2.13, 2.55)
Chest	0.1 (0.04, 0.19)	0.1 (0.03, 0.10)	1.6 (1.27, 2.08)	1.7 (1.51, 1.87)

\* Prevalence adjusted for age-sex distribution with Indian population census 2001. CI: confidence interval.

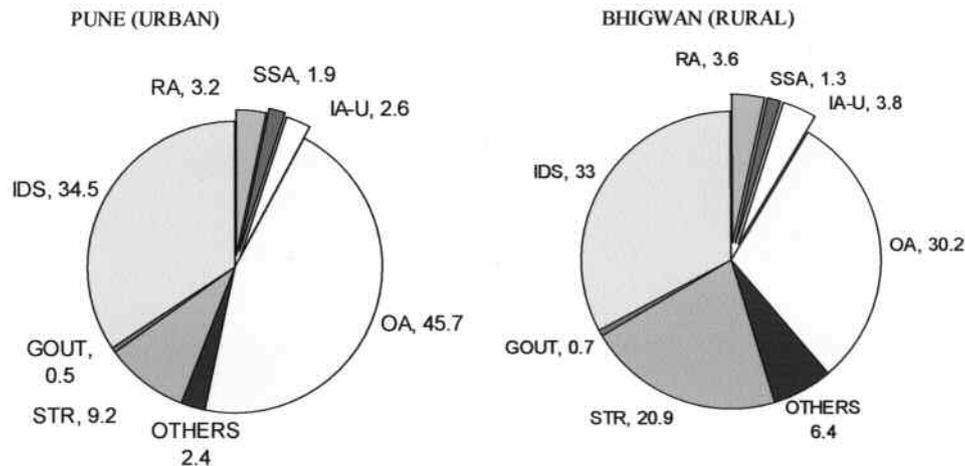


Figure 3. Distribution (%) of rheumatic MSK disorders in urban Pune and rural Bhigwan<sup>8</sup> Community Survey.

Table 3. Point prevalence rate of rheumatic musculoskeletal disorders in Pune Urban Survey and a comparison with Bhigwan Rural Survey<sup>8</sup>.

Diagnostic Category	Pune, n = 8145 (95% CI)		Bhigwan n = 4092 (95% CI)	
	Crude	Adjusted <sup>#</sup>	Crude	Adjusted <sup>#</sup>
RA	0.45 (0.32, 0.63)	0.32 (0.24, 0.40)	0.68 (0.45, 0.99)	0.67 (0.57, 0.79)
RA (ACR)	0.28 (0.18, 0.42)	0.19 (0.13, 0.26)	0.55 (0.35, 0.84)	0.54 (0.45, 0.66)
IA-U	0.37 (0.25, 0.53)	0.32 (0.25, 0.41)	0.73 (0.49, 1.05)	0.76 (0.64, 0.89)
SSA	0.27 (0.17, 0.41)	0.27 (0.20, 0.35)	0.25 (0.12, 0.46)	0.30 (0.23, 0.39)
AS	0.06 (0.02, 0.14)	0.07 (0.04, 0.12)	0.10 (0.03, 0.26)	0.10 (0.06, 0.15)
Psoriatic Arthritis	0.05 (0.01, 0.13)	0.04 (0.02, 0.09)	ND	ND
*OA	6.46 (5.93, 7.01)	4.01 (3.74, 4.29)	5.59 (4.90, 6.35)	6.25 (5.92, 6.60)
*OA knee	5.54 (5.05, 6.06)	3.41 (3.16, 3.67)	3.9 (3.32, 4.55)	4.42 (4.14, 4.71)
*OA cervical	0.88 (0.69, 1.11)	0.60 (0.50, 0.72)	1.71 (1.33, 2.17)	1.98 (1.80, 2.19)
Spine				
*OA Lumbar spine	2.38 (2.06, 2.74)	1.52 (1.35, 1.70)	2.70 (2.21, 3.25)	3.07 (2.84, 3.32)
*PGOA	0.39 (0.27, 0.55)	0.22 (0.16, 0.30)	1.11 (0.81, 1.49)	1.19 (1.04, 1.35)
*OA hip	0.05 (0.01, 0.13)	0.03 (0.00, 0.06)	ND	ND
STR	1.30 (1.07, 1.57)	1.20 (1.05, 1.36)	3.93 (3.35, 4.58)	3.77 (3.51, 4.05)
IDS	4.87 (4.42, 5.36)	5.01 (4.71, 5.33)	6.20 (5.46, 6.99)	6.25 (5.29, 6.59)
Gout	0.07 (0.03, 0.16)	0.06 (0.03, 0.10)	0.13 (0.04, 0.29)	0.13 (0.08, 0.19)

\* Clinically symptomatic disease (radiographs in few cases only); <sup>#</sup> The rates were standardized by adjusting age-sex distribution to the standard India Census population, 2001. CI: confidence interval. RA: rheumatoid arthritis; IA-U: unclassifiable inflammatory arthritis; SSA: seronegative spondyloarthritis; AS: ankylosing spondylitis; OA: osteoarthritis; PGOA: primary generalized osteoarthritis; STR: soft tissue rheumatism; IDS: unclassifiable ill-defined aches and pains (akin to 'symptom related'); ACR: American College of Rheumatology 1988 classification criteria for RA; ND: not detected.

woman with NSA and moderately severe painful kyphoscoliosis was found to have had surgery for Pott's spine several years before. A 40-year-old woman with history of chronic parotid region swelling, non-deforming inflammatory polyarthritis (seronegative for rheumatoid factor), oral dryness (seropositive for SSB autoantibody), and Raynaud's phenomenon (seropositive for antinuclear antibody) was finally diagnosed with an undifferentiated overlap connective tissue disorder, with a predominant Sjögren's syndrome. Henoch-Schonlein purpura was diagnosed in one young man.

## DISCUSSION

The spectrum of rheumatic MSK (Figure 3) found in the current Pune urban survey was similar to that of the earlier reported Bhigwan rural survey<sup>7,8</sup>. But the standardized point prevalence rates in the urban community were surprisingly much lower. Both surveys indicated a comprehensive diagnostic true-to-life classification divide. This finding has not been reported by other COPCORD studies using the same basic approach. It was also obvious that both the communities predominantly had ill defined aches and pains and OA

disorders rather than inflammatory disorders. Tables 4 and 5 show the urban and rural prevalence data from selected recent Asian COPCORD. Except for Bangladesh, the urban and rural survey sites in other COPCORD survey countries were far apart. Strict comparisons between COPCORD studies are complicated by differences in core questionnaire and related methods, time frame, and approach towards diagnosis and classification.

It would be prudent to recapitulate some of the essential features of COPCORD Pune and Bhigwan surveys before attempting urban-rural comparison. Bhigwan village is situated 100 km southeast of Pune city and is in a thriving agricultural zone of Pune district. Overall, we used similar methods and some of us had earlier worked in the Bhigwan survey. Both the surveys were completed expeditiously by motivated community health worker volunteers. Important population features of stable (least migration) residence, religion and ethnicity (> 70% Hindus and Maharashtrians), and lifestyles (traditional eating and living conditions) were almost identical. Although lacking precise supporting data, both communities were considered middle class socioeconomically. However, our impression was of more poverty in the Bhigwan community. Unlike the predominant occupation of labor/farming in Bhigwan, the residents in the urban Pune community were mostly doing sedentary jobs (clerks and traders). Unlike urban Pune, in Bhigwan we found eld-

erly men and women physically engaged in fields or homes. Bhigwan lacked a safe drinking water supply and proper sanitation-sewage system. The majority of villagers defecated in the fields. It is likely that some of the above differences have contributed to the observed differences in the prevalence of rheumatic MSK between the communities. Prior to beginning Bhigwan COPCORD, we had believed (as is often said by our community and doctors) that arthritis and rheumatism would be seen less in the villages. We were surprised by the Bhigwan results. But we did not expect to find important and glaring differences between urban and rural Pune.

Despite an interval of 7-8 years, important lessons can be learned by comparing the Pune urban and Bhigwan rural surveys. Although modernization is sweeping across the Indian rural scene, large stretches remain underdeveloped. Despite growing awareness and need, several resist change largely due to deep-rooted cultural beliefs and traditions. Since the inception of Bhigwan COPCORD 12 years earlier, we have been supported by a village medical team that includes a senior village doctor (HST). Our rheumatology team from Pune visits Bhigwan every 3-4 weeks to conduct a rheumatology clinic per a predetermined yearly schedule. Bhigwan is changing, albeit at a very slow pace. There is a visible modest change in housing pattern and trade. Modern gadgets like mobile phones are in widespread use, but the basic infrastructure remains outdated and inadequate. A

Table 4. Prevalence of rheumatic musculoskeletal disorders in selected recent WHO ILAR COPCORD rural population surveys in Asia.

	India Bhigwan <sup>7</sup>	Indonesia <sup>4</sup>	Thailand <sup>6</sup>	Bangladesh <sup>12</sup>	Malaysia <sup>15</sup>	Iran <sup>14</sup>
Sample size	4100	4683	2463	2635	1267	2502
RA	0.55	0.2	0.12	0.7	0.3	0.32
AS	0.1	NA	0.12	ND	0	0.23*
Knee OA (symptomatic)	5.8	5.1	11.3	7.5	3.2	16.1**
STR (general)	3.2	15	6.3	2.6	—	6.4
Gout	0.1	1.7	0.16	ND	0.1	0.28
FM	—	—	—	4.4	0.5	

COPCORD: Community Oriented Program for Control of Rheumatic Diseases; ILAR: International League of Associations for Rheumatology; RA: rheumatoid arthritis; AS: ankylosing spondylitis; OA: osteoarthritis; STR: soft tissue rheumatism; FM: fibromyalgia. STR (general): generalized soft tissue rheumatism; ND: not detected. \* pertains to spondyloarthropathy; \*\* pertains to OA.

Table 5. Prevalence of rheumatic musculoskeletal disorders in selected recent WHO-ILAR COPCORD urban population surveys in Asia.

	India Pune (current)	Indonesia <sup>4</sup>	China <sup>9</sup>	Vietnam <sup>10</sup>	Bangladesh <sup>12</sup>	Kuwait <sup>11</sup>	Iran <sup>17</sup>
Sample size	8145	1071	6584	2119	1259	359	10,291
RA	0.28	0.3	0.4	0.28	0.2	0.7	0.33
AS	0.06	NA	0.12	0.28	NA	0.7	0.23
Knee OA (symptomatic)	6.46	NA	4.1	4.1	10.6	29	16.6
STR (general)	0.68	NA	3.4	2.3	3.3	45.6	4.6
Gout	0.07	4.8	0.33	0.14	NA	0.7	0.13

RA: rheumatoid arthritis; AS: ankylosing spondylitis; OA: osteoarthritis; STR (general): generalized soft tissue rheumatism; NA: data not available in reviewed literature.

piped water supply is now in use. The majority continue to live in crowded small houses and defecate in the fields. Although farmers have begun to use tractors and fertilizers, the basic occupation techniques and neglect of related health matters (to avoid overuse syndromes) remain unchanged. We have earlier reported a strikingly high use of oral tobacco in the Bhigwan community<sup>8</sup>. Despite our advocacy to shun oral tobacco use, the use and sales of oral tobacco remain rampant. But continuous and excellent community support and rapport up to now encourage us to continue the Bhigwan COPCORD. On a different but important note, our rural colleagues also do not report any obvious reduction in the occurrence of infectious diseases in their clinical practice. A limited resurvey (in the poorer locality) of Bhigwan in 2000 (unpublished) did not show any important differences from the 1996 survey<sup>27</sup>. We continue to acquire community data. We have recently reported the incidence of RA in Bhigwan<sup>16</sup> and continue to diagnose 2-3 new cases every year. Therefore, we feel compelled to compare the community data from the urban and rural surveys in this report. The findings of the latter can be a basis of better control and preventive strategies (COPCORD Stage II and III).

There are other limitations. Because the survey sites in Bhigwan and Pune were not selected at random (see above), observations and conclusions are probably limited in their application. We did not record body mass index and details (in terms of time and intensity) of occupation. The age structure of both the populations (Figure 1) showed important differences, and therefore we proceeded to standardize the prevalence data by adjusting age-sex distribution to the standard India population (Tables 2 and 3).

COPCORD surveys have repeatedly demonstrated the predominant ailment of soft tissue aches and pains and NSA in the community<sup>32</sup>. We have labeled this entity as IDS. These afflictions, comprehended medically, do trouble the community and affect their lives as demonstrated by Bhigwan COPCORD<sup>8</sup>. That study recorded a high HAQ disability (> 1.5 index) in 14% of STR and 11% of IDS groups (unpublished). Almost 33% of the community cases, both in Pune and Bhigwan, had IDS (Figure 3). Altogether, 54% of the rural community cases in Bhigwan had IDS and/or some form of STR as compared to 44% of urban cases in Pune. These were predominantly women.

We would like to believe that the majority of cases with IDS and STR are a continuous spectrum with varying shades (of intensity and localization) of MSK pain expression that are perhaps connected with labor intensive jobs and occupation overuse. However, we observed several cases, especially in the urban community, who were unduly anxious and/or depressed. Poor socioeconomic factors often force women in our community to overwork. Several housewives in Bhigwan worked in the farming fields. In Pune, we found several housewives engaged in home-based small trades (tailoring, cooking, packaging, etc).

OA was the most common disorder in the urban community. This was probably due to the increasing proportion of the elderly population in Pune as compared to Bhigwan. Interestingly, when we adjusted the data for age and sex distribution, the point prevalence of OA emerged much higher in rural Bhigwan (6% vs 4% in urban Pune). Table 3 also records the point prevalence of several symptomatic clinical subsets of OA that have been sparsely reported by other COPCORD studies. All subsets had a higher prevalence in the rural community. Interestingly, and as observed earlier by other studies of Asian populations<sup>33</sup>, although pains in the hip region were self-reported by 0.5-1 % of the community (Table 2), hip OA was uncommonly diagnosed in the urban community and not detected in the rural community. Sitting cross-legged on the floor and frequent squatting (for several daily chores and routine) may be protective for the hip (though it does not seem to be so in the case of the knee, which was a frequent pain site). We did not record asymptomatic OA and could not carry out radiographs in a large number of cases suspected of OA.

Eight to nine percent of community cases in both the Pune and Bhigwan communities suffered from some form of IA. A significant proportion remained undifferentiated. The diagnosis of SSA essentially rested on demonstration of clinical sacroiliitis and/or enthesitis. Infections are rampant in our urban and rural community and are often believed to remain occult. While we found a higher prevalence of undifferentiated IA in Bhigwan, intriguingly, we could not elicit a clear cut history of a predisposing infection in these patients. Neither have we ever found a typical post-infective arthritis or reactive arthritis in a 12-year followup of the Bhigwan community up to now (unpublished). We are also not aware of any large case series of post-infective arthritis ever reported from India. Several Indian investigators have speculated on the role of occult infections in cases of undifferentiated IA and further described them to be incomplete forms of SSA<sup>34,35</sup>. Surprisingly, very few data on undifferentiated forms of IA can be found in the other Asian COPCORD studies.

The urban-rural difference was most striking in the case of RA (Table 3). Bhigwan COPCORD published an unusually high rural prevalence of RA and the majority of cases satisfied the ACR 1987 criteria. Later, Bangladesh COPCORD<sup>11</sup> published a similar trend, although serology and radiology of their RA cohort were not described. Even when adjusted for age and sex, the point prevalence of clinical RA in rural Bhigwan (0.67%) remained twice that of urban Pune (0.3%).

Is there a true urban-rural divide in the occurrence of rheumatic MSK? Our current report certainly supports the likelihood of such a phenomenon, which is often suspected but poorly recorded in the literature<sup>12,36-38</sup>. This divide may be less distinct now in the developed world. India, however, continues to show a distinct demarcation between urban and

rural areas. Early exposure to infections has been recorded to protect against IA<sup>39</sup>, which at least does not seem to be the case in village Bhigwan. A preceding history of trauma in the village was common and believed by the patients to have contributed to their MSK illness<sup>8</sup>. One can safely assume that microtrauma to MSK tissues due to occupational overuse and misuse in the village would be a bigger problem. We reported a lack of association between HLA DRB1\* alleles and RA in the Bhigwan patients<sup>40</sup>. However, a separate report will address the risk factors.

What about the rest of COPCORD Asia? Recently, 2 COPCORD reviews were published<sup>18,19</sup>. There are very few regional studies with an urban and a neighboring rural component (Tables 4 and 5). In an age standardized urban rural comparison, the Indonesian COPCORD reported 31.6% and 23.6% of the urban and rural community, respectively, to have pain in the joints, back, or neck, but there was no further analysis<sup>4</sup>. In a relatively small sample urban-rural comparison, Bangladesh COPCORD<sup>12</sup> recorded a higher prevalence of OA and a lower prevalence of RA in the urban community; the prevalence of STR and fibromyalgia, otherwise high, was similar in both communities. The situation is far from clear in China. A non-COPCORD population survey from Taiwan reported rheumatic complaints in 26.3% of the urban and 24.3% of the rural community<sup>36</sup>. COPCORD studies in the Chengai region (China) showed a higher prevalence of RA and lumbar pain in the rural region and a higher prevalence of knee and neck pain in the urban region; AS was almost the same<sup>9</sup>. On the other hand, Wigley reviewed the rheumatic MSK data (standardized for age/sex to total population) from 10 population surveys (mostly COPCORD) in Han Chinese<sup>41</sup> and concluded that the mean prevalence of RA for urban studies was much higher at 0.59% as compared to the rural 0.19%. In Wigley's analysis, the mean prevalence for AS in the Chinese COPCORD surveys was 0.22% for urban studies and 0.29% for rural studies. A recent report<sup>17</sup> from Iran COPCORD did not find any important differences for the prevalence of various MSK symptoms and disorders (clinical diagnosis) between the urban study (10,291 population survey completed in 2004-05) and the rural study (2,502 population survey completed in 1993). In this report, the prevalence of OA was 16.6 and 16.1 in the urban and rural community, respectively; the corresponding value for RA was 0.33 and 0.32.

We have presented an important spectrum and extent of rheumatic MSK from an Indian (Asian) urban community using the WHO ILAR COPCORD Bhigwan model. We were surprised to find a much lower prevalence of self-reported pain sites and rheumatic disorders (except SSA) in the Pune urban community as compared to the neighboring Bhigwan rural community, suggesting an urban-rural divide. This divide has several etiopathological and preventive connotations, but would need validation in similar surveys from the region. The results from ongoing

population surveys (currently 16 sites all over India and each with a population sample > 5,000) using the current Bhigwan COPCORD model under the aegis of BJD India and the Indian Council of Medical Research (Government of India) are awaited. Hopefully, this will lay a foundation for a national program for measure, control, and prevention of rheumatic MSK disorders.

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