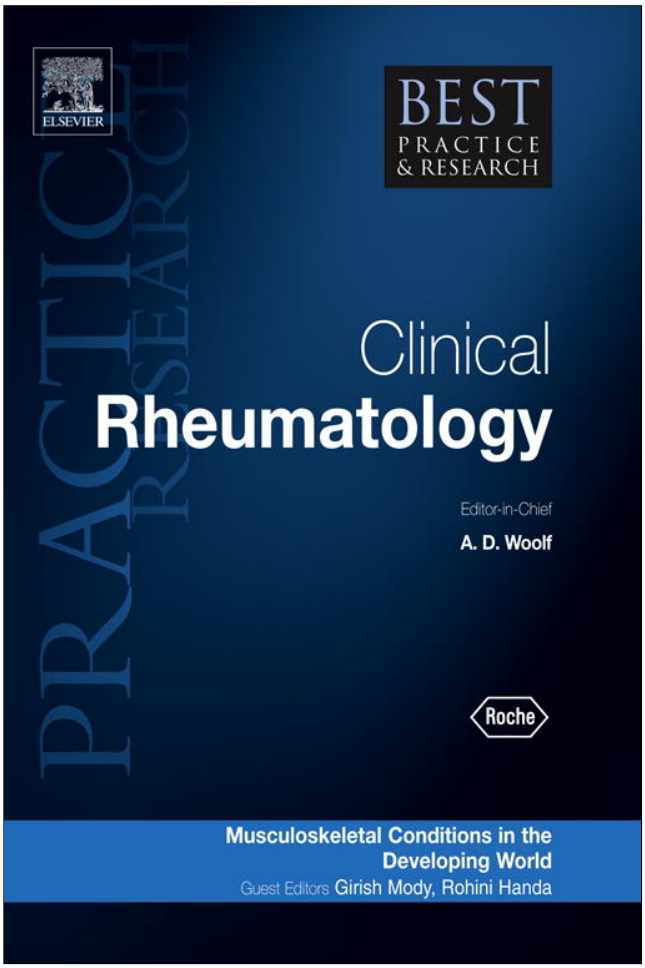

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Epidemiology of rheumatic musculoskeletal disorders in the developing world

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The epidemiology of rheumatic musculoskeletal (MSK) disorders in the developing world is much less well known than it is in the developed world. We expect ethnicity, traditions, socio-economics and lifestyles to have an impact, but overall data are sparse. This report focuses on the WHO-ILAR COPCORD (community-oriented programme for control of rheumatic diseases). COPCORD was designed to collect community data on pain and disability in the developing economies. Several countries in Asia-Pacific and Central South America have completed COPCORD surveys. Despite some limitations in methodology, COPCORD provides a fair estimate of the spectrum and extent of rheumatic MSK disorders. We digress from a general overview to highlight the scenario for rheumatoid arthritis, and draw a few parallels with known statistics from the developed world. Overall, the emerging spectrum and severity are not very different, but in the developing countries the burden of disease, worsened by dismal rheumatology services, is likely to be staggering.

Key words: WHO-ILAR COPCORD; rheumatic musculoskeletal disorders; rheumatology; epidemiology; developing countries.

People all over the world suffer from the pain and disability caused by rheumatic musculoskeletal (MSK) disorders, more popularly known as 'arthritis and rheumatism'.[1] Environmental and immunogenetic factors play a leading role in these multi-causal and often autoimmune disorders. Several amongst them are lifestyle disorders.

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Although the frequency of neck pain in the village of Bhigwan (India) and the city of Melbourne (Australia) was found to be similar in community surveys, the aetiology, risk factors and impact are bound to differ.[2] The burden of MSK disorders, in terms of spectrum and extent, is likely to vary in different parts of the world. Plainly speaking, the geo-ethnic diversity is a global phenomenon and not always driven by socioeconomic disparities of the developing countries. While modernization has bulldozed the Western world into more or less similar lifestyles, it has not yet sufficiently transformed the cultural and traditional picture of Asia, Africa, and several regions of South America. In the broad sense of the modern-day context, health and disease are influenced by socioeconomics. All these complex factors are bound to influence MSK disorders and the ability to bear, adapt, and manage pain and disability.

But how does this relate to the 'developing countries'? According to a recent report, MSK disorders contributed 3.4% and 1.7% towards the total disease burden in the developed and developing world respectively, with osteoarthritis being the single largest contributor.[3] However, the burden of MSK disorders in terms of DALY (disability-adjusted life years) in the developing world (21 076 000) was estimated to be almost 2.5 times that of the developed world (8 723 000).[3] We do believe that the latter figures underestimate the scenario in the developing world as the population data are still insufficient.

The current review is primarily based on the World Health Organization/International League of Associations for Rheumatology community-oriented programme for control of rheumatic diseases (WHO-ILAR COPCORD). In the first part of the vreview we focus on pain, soft-tissue rheumatism, and degenerative arthritis, which are by far the commonest forms of MSK disorder identified in COPCORD studies. In the second part we review the prevalence of rheumatoid arthritis (RA) and other inflammatory arthritides (excluding infective forms) in developing countries. We describe the limitations of COPCORD so that the reader can make more meaningful observations and comparisons. A few non-COPCORD studies, in particular to cover RA, are also included.

Finally, we have tried to review a large amount of published data on MSK disorders, some of which are disparate, from several developing countries in Asia, Africa and Central/South America. We have also added our own field experience, in particular from COPCORD. It is likely that we have inadvertently missed certain important domains and resources. We look forward to learning about this from readers.

WHO-ILAR COPCORD MODEL

Background

While much was known about the epidemiology of MSK disorders in the Western world by the early second half of the 20th century, there were few data from the developing world.[4] A joint meeting of the ILAR and WHO was held in Geneva in 1981 to initiate a global programme.[5,6] This programme was called COPCORD. The aim was to fill the large gaps in knowledge on the burden of MSK disorders in the developing world, especially in rural economies. This would lead to health education of the community and better health and medical care, and eventually reduce the disease burden. Governments were not involved. The investigators needed to be identified at the grass-roots level. Begun in the Philippines[7], COPCORD has come a long way[8] in demonstrating the rheumatic MSK burden in several countries from Asia and South and Central America, and more recently Egypt.

However, with the development of the WHO-ILAR-COPCORD project in 1981, there was vast improvement in methodology and standardization of diagnosis for population-based epidemiological studies. COPCORD studies have taught us several lessons on how to conduct epidemiological studies. The appeal lies in its socioeconomic merit and community base. And importantly, COPCORD has inspired many rheumatologists and epidemiologists to sacrifice the comfortable confines of their clinic and allot time, energy, expertise, and sometimes money to explore the true-to-life picture of rheumatic MSK disorders in the community. This overall effort has led to a better estimate of the prevalence of RA and other MSK disorders, which otherwise is highly variable, in the myriad ethnically distinct communities that reside in the developing world.

Description and evolution[9]

COPCORD was designed as a low-cost low-infrastructure community programme which was to be driven by local resources. The emphasis in population surveys was to record symptoms (in particular pain and disability) rather than diseases and syndromes. Clinical and field epidemiological skills rather than elaborate investigation was the basis of the diagnostic approach. Fairly uniform protocols, questionnaires and methodology for assessment of rheumatic diseases were to be used. The primary rheumatic diseases were diagnosed according to validated criteria. However, investigators were encouraged to incorporate regional issues in their methods and diagnostic approach. Overall, despite its flexibility and versatility, the COPCORD core questionnaire (CCQ) insisted on a basic template that ensured fair standardization and comparability between studies conducted in different parts of the world.

In the parent COPCORD model, population data (stage I) were collected through three successive phases: house-to-house survey by a local health worker to identify cases (phase I), interview-based questionnaires by the community nurse to capture pain and disability (phase II), and a standard medical evaluation by a doctor with some training in rheumatology (phase III). A validated CCQ, developed initially by ILAR[6], could be modified to suit the local requirements. The initial CCQ was based on very early preliminary experience.[10,11] Later, it was made less cumbersome.[12] The survey screening question was generally meant to detect 'pain/swelling/stiffness and restricted motion in joints and/or musculoskeletal soft tissues in the last 7 days (current) and/or any time in the past'. Later, in the Bhigwan (India) COPCORD a fast-track model was devised wherein all three phases of stage I were conducted in parallel.[13]

COPCORD also advocates education of the community and health-care providers and identification of risk factors (stage II). Based on community data, it also encourages investigators to plan, execute, and maintain improved health care through preventive and control strategies (stage III). However, at this point of time, very few COPCORD projects have continued beyond the initial survey. In addition, the Bhigwan COPCORD follow-up programme (stages II and III)[8,13] also provided free-of-cost rheumatology services and is currently in its 12th year. The Bangladesh COPCORD was continued further to evaluate low-back pain and knee pains (unpublished). The finding of the Indonesian COPCORD survey of significant gout in the community led to several long-term initiatives.[14,15] The Chinese COPCORD programmes have pursued several population studies on knee pains and osteoarthritis to identify risk factors.[16,17]

Limitations

The population selection in COPCORD has generally been non-random. However, some randomization techniques were used in China (Shanghai, Shantou)[18–20], Peru[21], Brazil, Chile and Mexico[22], and Kuwait.[23] Data collection personnel (doctors, nurses, health workers, volunteers, etc) have varied. CCQ has undergone changes over time, but the basic screening question and data recording has remained more or less unchanged. Pain was predominantly captured, but methods of recording pain differed. COPCORD surveys in India[2,24], Malaysia[25], Peru[21], and Australian Aborigines[26] used a human mannequin to record pain. Some of the earlier COPCORD surveys – Beijing and Shantou ILAR China[11], Pakistan[27], Indonesia[28] – have published a prevalence rate of MSK disorders without much differentiation between joint pain, rheumatic disorder and rheumatism. Patients with a history of trauma prior to chronic MSK disorder were excluded from the prevalence data of MSK disorders in some surveys (China, Peru, Brazil[29], Iran[30], and Kuwait). Most of the surveys have recorded disability using an individual item (e.g. climbing stairs etc, described further below), but several COPCORD surveys used a validated modified Stanford Health Assessment Questionnaire (HAQ).[2,21,24,26,31]

The COPCORD sample size (Tables 1–4) has varied considerably in different surveys, but has generally been in the range 2000–5000+. However, the small sample size in some surveys is probably more appropriate for estimating frequency of MSK pain and disability rather than precise disorders like rheumatoid arthritis. The latter is also of concern in surveys that have used population subsets (urban, rural, slum etc) from their total population number (otherwise sufficient) to publish prevalence data. COPCORD was not meant to measure uncommon disorders like lupus which would require large sample sizes. Some of the earlier COPCORD surveys took long periods for completion. Overall, the response rate in surveys has exceeded 80%. Some initial population surveys combined phases I and II of stage I.[18,19,28] Though the central emphasis in COPCORD is on symptoms (pain and disability), some COPCORD surveys published reports that were more disorder-centric.[27,29,31] Very few surveys have tried to publish the diagnostic breakdown of all the survey respondents, as was done in the case of COPCORD Bhigwan.[2]

Table 1. Prevalence (%) of selected disorders in WHO-ILAR COPCORD rural population surveys.

	India[32]	Indonesia[28]	China[11]	Thailand[33]	Bangladesh[34]	Malaysia[25]	Australia[26]	Taiwan[84]	Egypt[35]
Sample size	4100	4683	4192	2463	2635	1267	847	2998	5120
RA (ACR)	0.55	0.2	0.34	0.12	0.7	0.3	0	0.26	0.29
AS	0.1	NA	0.26	0.12	NA	0	0.5	0.5	0.09
OA knee (symptomatic)	5.8	5.1	9.6	11.3	7.5	3.2	NA	NA	8.5
STR (G)	3.2	15	NA	6.3	2.6	NA	7.4	NA	6.6
Gout	0.1	1.7	NA	0.16	NA	0.1	4	0.67	
Fibromyalgia	NA	NA	NA	NA	4.4	0.5	NA	NA	1.3

ILAR, International League of Associations for Rheumatology; COPCORD, Community-Oriented Programme for Control of Rheumatic Diseases; RA, rheumatoid arthritis; ACR, American College of Rheumatology; AS, ankylosing spondylitis; OA, osteoarthritis; STR, soft tissue rheumatism; G, general; NA, not available.

Table 2. Frequency (%) of pain sites in WHO-ILAR COPCORD rural population surveys.

	India[32]	Indonesia[28]	Thailand[33]	Bangladesh[34]	Malaysia[25]	Philippines[6]	Australia[26]	Egypt[35]
Sample size	4092	4683	2463	2635	1267	846	847	5120
Pain any site	17.9	24.0	36.2	26.9	23	14.5	33	16.2
Neck	6.5	5	5	10.8	3.6	7.3	3	2.1
Low back	11.9	15.1	4	20.1	7	11.3	NA	4.9
Shoulder	7.4	11.0	NA	11.5	4	NA	9	<1.0
Elbow	5.9	10.0	NA	6.7	2.7	NA	4	1.1
Hand	6.1	NA	NA	5.8	NA	NA	5	1.8
Wrist	6.4	NA	NA	6	NA	NA	6	NA
Knee	12.7	12.2	12.5	14	11	7	11.2	9.1
Ankle/feet	8	NA	NA	2.1	NA	NA	7	<1.0
Hip	1	NA	6.5	13	NA	NA	2	NA
Heel	2.7	NA	NA	7.7	NA	NA	NA	NA

ILAR, International League of Associations for Rheumatology; COPCORD, Community-Oriented Programme for Control of Rheumatic Diseases; NA, not available.

PREVALENCE DATA

The prevalence rates of common pain sites/symptoms and rheumatic disorders from urban and rural surveys are shown in Tables 1–4. Wherever possible, unadjusted crude prevalence rates are shown. COPCORD pilot survey studies from Iran[30] and Cuba[39] are also included. The data from an Australian aborigines COPCORD survey is included to show the likely picture of rheumatic MSK disorders in similar tribal regions in the Asia-Pacific rim. COPCORD regional surveys in South China (Shantou region), Indonesia, India (Pune–Bhigwan region) and Bangladesh have included a rural and not-too-distant urban component.

The self-reported questionnaire data from the Bhigwan (India) COPCORD[2] survey demonstrated rheumatic MSK disorders to be predominant community ailment (as compared to other reported ailments such as hypertension, diabetes, etc). Figure 1 shows the distribution of major classification categories of rheumatic MSK disorders in the rural[10] and urban[24] surveys from the Pune (India) COPCORD surveys . Ill-defined symptoms (non-specific aches and pains), soft-tissue rheumatism, and osteoarthritis disorders were the commonest community ailments. Inflammatory arthritis comprised less than 10% of the rheumatic MSK disorders in the community. The pilot urban population COPCORD survey from Iran[30] did not record any inflammatory arthritis.

Pain

Predominantly, the data pertain to painful symptoms lasting for more than 7 days, and in a large majority this is likely to exceed 3 months. The prevalence of painful rheumatic MSK disorders in the community has varied from 12% (Vietnam) to 47% (Peru) in urban surveys and from 12% (Shantou, China) to 55% (Australian Aborigines) in rural surveys. In all the surveys, females have outnumbered males at all pain sites. Knee, low back, neck and shoulder were the most frequent pain sites. In the Bangladesh and Iran surveys 7–10% of respondents reported pain in the hip region, which

Table 3. Prevalence (%) of selected disorders in WHO-ILAR COPCORD urban population surveys.

	India[24]	Indonesia[28]	China[18]	China[20]	Vietna[36]	Pakistan[27]	Bangladesh[34]	Mexico[37]	Philippines[38]	Peru[21]	Brazil[29]	Kuwait[23]	Taiwan[84]
Sample size	8145	1071	2010	6584	2119	2090	1259	2500	3006	1965	3038	359	3000
RA (ACR)	0.28	0.3	0.2	0.4	0.28	0.55	0.2	0.3	0.2	0.5	0.5	0.7	0.9
AS	0.06	NA	0.2	0.12	0.28	0.1	NA	NA	0	0.4	NA	0.7	0.4
OA knee (symptomatic)	6.46	NA	7.9	4.1	4.1	3.7	10.6	2.3	4.1	5.5	NA	29	NA
STR(G)	0.68	NA	NA	3.4	2.3	1.9	3.3	NA	3.8	12	NA	45.6	NA
Gout	0.07	4.8	0.19	0.33	0.14	0.14	NA	0.3	0.1	NA	NA	0.7	0.7
Fibromyalgia	NA	NA	NA	NA	NA	2.1	3	1.4	0.2	NA	2.5	NA	NA

ILAR, International League of Associations for Rheumatology; COPCORD, Community-Oriented Programme for Control of Rheumatic Diseases; RA, rheumatoid arthritis; ACR, American College of Rheumatology; AS, ankylosing spondylitis; OA, osteoarthritis; STR, soft tissue rheumatism; G, general; NA, not available.

Table 4. Frequency (%) of pain sites in WHO-ILAR COPCORD urban population surveys.

	India[24]	Indonesia[28]	China[18]	China[20]	China[17]	Vietnam[36]	Bangladesh[34]	Mexico[37]	Peru[21]	Iran[30]
Sample size	8145	1071	2010	6584	2040	2119	1259	2500	1965	2502
Pain any site	14.1	32	24.33	21.2	18.1	11.9	27.9	37	47	48
Neck	2.8	12	3.5	3.5	4.6	6.6	10.2	1.4	NA	14
Low back	7.6	23.3	10.2	8	11.5	11.2	18.4	6.3	35	22
Shoulder	3	NA	4.8	7	5	NA	9.3	NA	NA	18
Elbow	2.3	NA	0.6	1.9	2.6	NA	6.2	NA	NA	NA
Hand	2.8	NA	8.6	2.6	2.1	NA	6.4	NA	35	15
Wrist	NA	NA	NA	1.4	1.5	NA	6.9	NA	NA	13
Knee	9.2	14.8	10.9	10.2	7.5	17.4	15.8	12.3	41	18
Ankle	4.3	NA	0.6	1.2	2.3	NA	3.3	NA	NA	13
Feet	NA	NA	NA	NA	1.1	NA	NA	NA	NA	NA
Hip	NA	NA	0.7	1.3	1.8	NA	7	NA	NA	10.2

ILAR, International League of Associations for Rheumatology; COPCORD, Community-Oriented Programme for Control of Rheumatic Diseases; NA, not available.

otherwise was uncommon. Significant differences between the frequency of knee pains in North and South China surveys[11] led to several COPCORD China surveys.[16,17,19] The frequency of neck pains was much lower than that of low-back aches.

Interestingly, the Australian investigators[26] classified 81 (9.6%) of their respondents with rheumatic MSK disorders as 'normal' because a reasonable diagnosis could not be provided after rheumatology examination. This perhaps reflects a major deficiency in our clinical practice. Several ill-defined MSK pains/disorders are considered to be a nuisance because doctors are unable to understand or diagnose or treat them. But they do occupy an important niche in the realm of 'rheumatism' that ought to be taken more seriously by physicians and rheumatologists in particular.

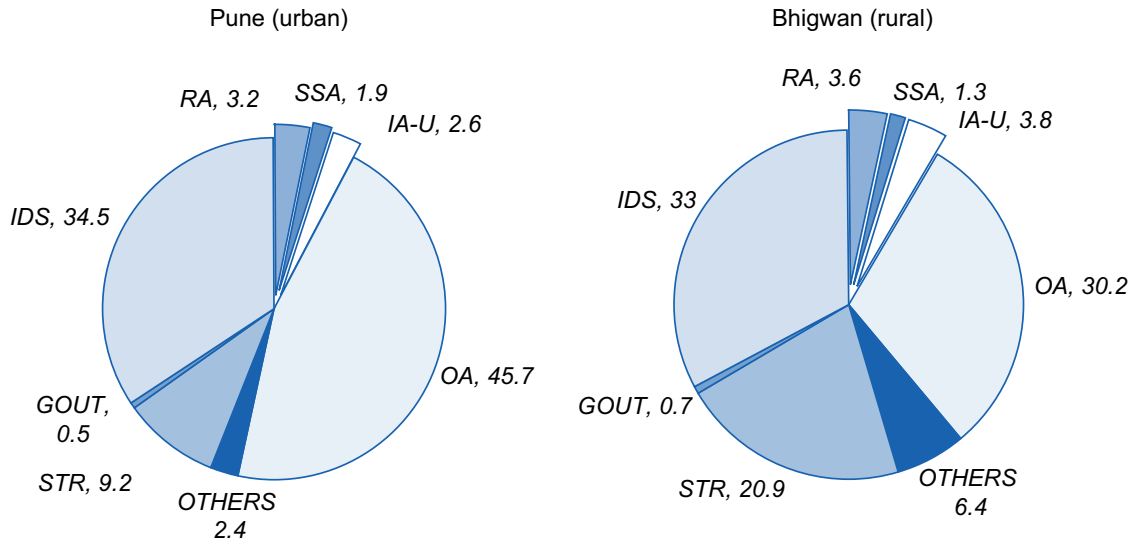

Figure 1. Distribution of rheumatic musculoskeletal disorders in WHO-ILAR COPCORD (Community-Oriented Programme for Control of Rheumatic Diseases) Bhigwan (rural) and Pune (urban) population surveys. RA, rheumatoid arthritis; SSA, seronegative spondyloarthritis; IA-U, unclassifiable inflammatory arthritis; OA, osteoarthritis; STR, soft-tissue rheumatism; IDS, ill-defined (symptom-related).

Bhigwan (India) COPCORD[2] also recorded several other pain sites (coccyx 4.1%, occipital 1.6%, temporomandibular 0.4%, scapular 3.15%, chest 1.5%, costal 1.1%, forearm 2%, thigh 4.4%, calf 6.6%, sole 2.1% and foot 1.4%) that are known to be commonly affected in the community but neglected in practice and infrequently reported.

Low-back ache (LBA)

In the rural and urban COPCORD surveys 4–20% and 6–35% of population reported LBA respectively. The frequency of LBA was generally higher compared to knee pain in all COPCORD surveys except the Indian COPCORD series. The latter may be related to a higher degree of knee usage (during work, leisure, prayers and ADL) in the Indian community. An unidentified cause of the high prevalence of LBA, as well as non-specific bone and joint pains, in developing countries may be vitamin D deficiency due to limited sun exposure and multiparity.[39] Despite the sunny climate in many Asian, Arab and African countries, there is a high prevalence of vitamin D deficiency in countries such as China, India, Bangladesh, Turkey, Iran, Saudi Arabia, Lebanon, Egypt and Tunisia, which is related to avoidance of sun exposure due to cultural beliefs, conservative dress, excessive heat, and an aesthetic preference for fair skin over a healthy sun tan in those communities.[39]

A few COPCORD surveys (Bangladesh, Iran) have attempted to clinically describe 'sciatica' and 'spondylosis' in the context of low-back pain. In the Bangladesh COPCORD the prevalence of lumbar spondylosis ranged from 2% (urban slum) to 5% (rural).

Soft-tissue rheumatism (STR)

A few surveys have reported explicit descriptions of STR, including fibromyalgia.[2,34,40,41] The high prevalence of FM[34] reported by Bangladesh COPCORD[34], both rural and urban, is indeed intriguing. COPCORD India reported the prevalence (Pune 0.6%, Bhigwan 2.3%) of regional STR (inclusive of enthesitis, fascitis, heel pains, etc) and further speculated on the role of occupations and trauma in their aetiology. Iran COPCORD[30] reported a prevalence of 0.7%, 0.7% and 1.1% for tennis elbow, shoulder tenosynovitis and other tendonitis/tenosynovitis respectively. Bangladesh COPCORD recorded frozen shoulder in 0.5% and 1.1% in the urban slum and rural survey respectively.[34]

Osteoarthritis (OA)

Osteoarthritis was found to be the second most common rheumatological problem in the community (Figure 1). The diagnosis was predominantly clinical, and symptomatic OA of the spine and knee were the commonest conditions. Few COPCORD surveys[16,29,35] used x-rays to classify OA.[42,43] Both symptomatic and radiographic knee OA in females (>60 years of age) were reported to be significantly higher in Chinese (15% and 42.8%) as compared to American whites (11.6% and 34.8%).[44] Generalized OA, often nodular in the hands, was found to be a common community ailment in the Philippines[38] and among Australian aborigines.[26]

OA of the hip joints is considered to be uncommon in oriental communities. The prevalence of radiographic osteoarthritic hips in the elderly (60–89 years of age) was much lower in Chinese (males 1.1%, females 0.9%) as compared to American whites (3.8–5.5%) in a randomized population-based study[45]; only one female patient was symptomatic in the Chinese cohort.

Rheumatoid arthritis (RA)

The worldwide prevalence of clinical RA is believed to be about 1%. However, there is ample evidence that RA is a variable disease in time and place.[46,47] Paleopathology showed RA in skeletal remains of North American Indians thousands of years old[48], but there is no evidence that the disease existed in Europe before 1800 or in Africa before 1900.[46] The classic Ayurvedic (Indian ethnic medicinal system) texts dating back to pre-biblical times bear explicit descriptions of several forms of arthritis, some of which were painful deforming polyarthritides similar to the current descriptions of RA.[49] There is great variation in the prevalence of RA based on population studies. While the prevalence was almost nil in the case of rural West African[50] and Australian Aboriginal[26] communities, the prevalence was found to be strikingly high in a North American Indian community.[51] More intriguing is the evidence that the incidence of RA has fallen over recent decades in Europe and America, especially in females, with a shift of peak onset to older age groups[52,53], while the disease seems to be on the rise in developing countries, with peak onset in child-bearing females.[1,46,54]

The prevalence of RA in industrialized countries and the developing world is shown in Tables 5 and 6 respectively. Historically, the studies reporting the prevalence of RA can be classified into four temporal stages. In the first stage, true European and American population surveys reported RA.[87] Next, computerized data or hospital records were used in the latter populations to derive estimates of the occurrence of RA ('desktop epidemiology' instead of conducting field studies). Next came the era of the COPCORD population surveys from the developing countries. And finally, with the emergence of newer classification criteria, some recently published European studies on prevalence of RA[58,59,61,66,69] seem to have reverted back to the community (a post-COPCORD stage in the developed world). Needless to add, several developing countries continue to initiate COPCORD surveys. A recent publication[53] on the epidemiology of rheumatic MSK disorders in US (2008) acknowledged the methodological limitations of previous American studies and observed that 'estimates for many specific rheumatic conditions rely on a few, small studies of uncertain generalizability to the US population'. But the latter authors, using the unpublished update data from Rochester, reported a prevalence of 0.6% RA in American adults (18+). The authors concluded that their study 'provides the best available prevalence estimates for the US', but acknowledged the need for more studies generalizable to US population.

Most of the published prevalence of RA from the developing countries is based on true population studies (Table 6). A minimum sample size of 2000 was recommended earlier to determine the prevalence of RA in the community[50], but this was based on an estimated prevalence of RA of 0.5–0.1%. However, in communities with a lower expected prevalence, the minimum sample size required was about 5000[35], which some studies could not accomplish. This may have been the case in South African rural[75] and Australian Aboriginal[26] surveys. Interestingly, a larger sample size population survey from West Africa[50] could not find any RA either, and aptly concluded that the disease was extremely rare in Sub-Saharan Africa.

It is no surprise that COPCORD has demonstrated varying prevalence rates of RA (Tables 2, 4 and 6). Despite limited laboratory and radiological investigations, COPCORD investigators have tried to apply standard classification criteria for global comparisons: American College of Rheumatology (ACR) or sometimes the earlier American Rheumatology Association (ARA) criteria.[88] In China, the prevalence varied

Table 5. Prevalence (%) of rheumatoid arthritis (RA) in industrialized countries (Europe and USA).

Country/population	Type of study	Criteria	Sample size	Age	Prevalence (%)
Europe:					
Denmark (1973)[55]	Population-based	1958 (C & D)	19100	15+	0.9
Finland (1989)[56]	Population-based	Clinical arthritis	8000	30+	1.9
France, 7 areas (2007)[57]	Telephone sampling, 64% response	1987 ACR	9395	Adult	0.3
Greece, 7 communities (2006)[58]	Population-based	1987 ACR	8740	19+	0.68
Hungary, Transdanubia (2005)[59]	Population-based	1987 ACR	10000	14+	0.37
Ireland, Dublin (1999)[60]	Electoral register sample	1987 ACR	1227	18+	0.5
Italy, Chaiavari (1998)[61]	Population-based	1987 ACR	3294	16+	0.33
Lithuania, Vilnius and Kaunas (2008)[62]	Telephone interviews, 63% response	1987 ACR	6542	Adult	0.55
Netherlands, Rotterdam (1968)[63]	Hospital-based (community ascertainment)	1958 (C & D)	19647	15+	0.9
Netherlands, Zoetermeer (1979)[64]	Population-based	1958 (C & D)	6584	20+	1.1
Norway, Troms (2000)[65]	Hospital-based (retrospective record review)	1987 ACR	County	Adult	0.4
Spain, 20 municipalities (2002)[66]	Population-based	1987 ACR	2192	Adult	0.5
Sweden, different areas (1970)[67]	Population-based	1958 (C & D)	39418	15+	0.9
UK, Leigh and Wensleydale (1961)[68]	Population-based	1958 ARA (C & D)	3000	15+	1.1
UK, Norfolk (2002)[52]	Population-based	1987 ACR	7050	16+	0.8
Yugoslavia, Belgrade (1998)[69]	Poll sample	1987 ACR	2184	20+	0.18
USA:					
USA, Pima Indians, Arizona (1989)[51]	Population-based	1958 ARA (C & D)	1740	20+	5.3
USA, Sudbury, Massachusetts (1970)[70]	Population-based	1958 ARA (D & P)	4552	15+	0.9
USA, Tecumseh, Michigan (1967)[71]	Population-based	1958 ARA (C & D)	6000	16+	0.5
USA, Rochester, Minnesota (1980)[72]	Hospital-based (retrospective record review)	1958 ARA (D & P)	County	15+	1.0
USA, population estimate (1966)[73]	Stratified multi-stage US population study	1958 ARA (C & D)	6672	18+	1.0
USA, population estimate (2008)[53]	Computer-based (unpublished data and census)	Unknown	US population	18+	0.6

C, classic RA; D, definitive RA; P, probable RA; ACR, American College of Rheumatology; ARA, Australian Rheumatology Association.

Table 6. Prevalence (%) of rheumatoid arthritis (RA) in developing countries (African, Arab, Middle Eastern, Asian and Latin American).

Country/population/year of publication	Type of study	Criteria	Sample size	Age	Prevalence (%)
Africa (sub-Saharan):					
Lesotho (1986)[74]	Population-based	Clinical diagnosis	1070	15+	0.3
Nigeria (1993)[50]	Population-based rural	1987 ACR	1994	15+	0
South Africa (1975)[75,76]	Population-based rural/urban studies	Modified Rome	543/964	18/15	0/0.9
Arab and Middle Eastern countries:					
Egypt, Minia (2004)[35]	Population-based (COPCORD) rural, home interviews	1987 ACR	5120	15+	0.29
Iran, Tehran (2008)[77]	Population-based (COPCORD) urban	1987 ACR	10291	15+	0.33
Iraq (1978)[78]	Population-based	1958 ARA (C & D)	6999	16+	1.0
Kuwait (2004)[23]	Population-based (COPCORD)	1987 ACR	7670	15+	0.7
Oman (1991)[79]	Population-based	1987 ACR	1927	16+	0.36
Saudi Arabia, Qassim (1994)[80]	Population-based (house interviews)	1987 ACR	5891	16+	0.22
Turkey, Antalya (2005)[81]	Population-based (urban)	1987 ACR	3173	16+	0.38
Turkey, Izmir (2004)[82]	Population-based (urban)	1987 ACR	2887	20+	0.49
Asia-Pacific					
Australia, Queensland (2004)[26]	Population-based (COPCORD) aboriginal community	1987 ACR	847	15+	0
Bangladesh (2005)[34]	Population-based (COPCORD) rural/urban	1987 ACR	2635/1295	15+	0.7/0.2
China, (several studies)[11,18–20]	Population-based (several rural/urban studies)	1987 ACR	2010–9249	16+	0.2–0.4
India (Northern), Delhi (1993)[83]	Population-based (rural)	1987 ACR	39826	16+	0.75
India (Western) 2 studies[32,24]	Population-based (COPCORD) rural/urban	1987 ACR	4100/8147	16+	0.55/0.28

(*continued on next page*)

Table 6. (*continued*)

Country/population/year of publication	Type of study	Criteria	Sample size	Age	Prevalence (%)
Indonesia, 2 areas (1992)[28]	Population-based (COPCORD) rural/urban	1958 ARA (C & D)	4683/1071	15+	0.2/0.3
Malaysia (2007)[25]	Population-based (COPCORD) rural	1987 ACR	2594	15+	0.3
Pakistan, 3 northern areas (1998)[27]	Population (COPCORD) mixed	1987 ACR	1997	15+	0.55
Philippines, Manila (1997)[38]	Population-based (COPCORD) urban	1987 ACR	3006	15+	0.17
Taiwan, 3 areas (1994)[84]	Population (COPCORD) rural/ suburban/urban	1987 ACR	2998/3000/3000	20+	(0.3/0.8/0.9)
Thailand (1998)[33]	Population-based (COPCORD) rural	1987 ACR	2463	15+	0.12
Vietnam, Hanoi (2003)[36]	Population-based (COPCORD) urban	1987 ACR	2119	16+	0.28
Latin America:					
Argentina, Tucuman (2002)[85]	Hospital-based (retrospective record review)	1987 ACR	Whole population	16+	0.2
Brazil, Montes Claros (1993)[29]	Population-based (COPCORD)	1987 ACR	3038	16+	0.46
Colombia, Bogota (1986)[86]	Population-based (urban)	1958 ARA (C & D)	2987	0+	0.1
Mexico, Mexico City (2002)[37]	Population-based (COPCORD) suburban	1987 ACR	3000	15+	0.3
Peru (2007)[21]	Population-based (COPCORD) urban, home interviews	1987 ACR	1965	15+	0.5

C, classic RA; D, definitive RA; ACR, American College of Rheumatology; ARA, Australian Rheumatology Association.

from 0.2% in rural areas of the mainland to 0.93% in urban Taiwan.[89] Wigley (2003) reviewed the data on MSK disorders (standardized for age/sex to total population of the surveys) from 10 Chinese population surveys[90], mostly COPCORD, and concluded that the mean prevalences of RA for urban and rural studies were 0.59% and 0.19% respectively. The rural prevalence in Bhigwan (India) and Bangladesh COPCORD was strikingly high. In the Indian subcontinent, the reverse situation is seen, with RA being more prevalent in rural than urban populations of India[24,32], Pakistan[27] and Bangladesh.[34] The prevalence of RA in the earlier population surveys in India[91,92] ranged from 0.3 to 0.7%, with descriptions of lower frequency of extra-articular features, rheumatoid factor and rheumatoid nodules.[93] The Bhigwan (India) COPCORD survey also recorded the highest prevalence of RA in young women (age range 24–44 years) as compared to several other population studies from all over the world.[1] If this observation is validated, it would be a matter of great concern. After a 10-year COPCORD follow-up, the period prevalence and incidence of RA was 1.17% and 0.044% (44/100,000) respectively in village Bhigwan (unpublished). In rest of Southeast Asia, the prevalence is generally lower, ranging from 0.1% in rural Thailand[33] to 0.3% in urban Indonesia[28], with prevalence rates between 0.1 and 0.3% in Malaysia, the Philippines and Vietnam.[25,36,38]

In Turkey and Iran the prevalence was close to that in the neighbouring Arab countries, such as Oman, Egypt and Saudi Arabia, with a prevalence of 0.2–0.5% in the Middle East. An earlier study from Iraq[78] and a recent study from Kuwait[20] have reported higher prevalences of 1% and 0.7% respectively. In Latin America, the prevalence ranged from 0.1% in Colombia[86] to 0.5% in Peru.[21] However, the Colombian study, which was not a COPCORD study, included the whole population (not just adults), so that the figure of 0.1% is an underestimate.

Other inflammatory arthritides

Early inflammatory arthritis (IA) is often undifferentiated and may persist. While several of these belong to the undifferentiated seronegative spondyloarthropathy (SSA) group[94], the remainder are best classified as poly-/pauci-/mono-inflammatory arthritis. Although infections are rampant in several of the developing countries, very little COPCORD data have been reported on the extent of post-infective/reactive arthritis. Undifferentiated IA (including SSA types) was the single largest component in the total IA group in the Indian COPCORD surveys.[24,32] Although several patients were classified as having undifferentiated IA (that could possibly include reactive arthritis), the Bhigwan COPCORD did not find a single classical case of Reiter's or even post-infective arthritis. The prevalences of undifferentiated IA (SSA excluded on clinical grounds) were 0.9% and 0.4% in the Bhigwan and Pune survey populations respectively.[24,32] The spectrum of SSA, especially with reference to undifferentiated IA, AS and HLA-B27, has been described by several Indian studies.[95,96]

The prevalence of ankylosing spondylitis (AS) has been generally lower than 0.3% in most of the COPCORD surveys (Tables 1 and 3), the exception being Kuwait. The mean prevalence for AS in the Chinese COPCORD surveys were 0.22% for urban studies and 0.29% for rural studies.[90]

Four patients (0.5%) in the Aboriginal Australian COPCORD survey[26] were diagnosed as having psoriatic arthritis, which had not otherwise been reported by other COPCORD surveys. During the 10-year follow-up of about 5000 of the adult

population in the Bhigwan COPCORD, two cases (both males) of psoriatic arthritis were diagnosed (Arvind Chopra, unpublished).

DISABILITY

The CCQ has invariably recorded single-item disability or a modified HAQ. About 25% and 2% of the population (rural/slum/affluent) in the Bangladesh COPCORD[34] respectively reported partial or complete inability to perform one of the common ten tasks (lifting usual domestic/occupation-connected weights, squatting, bending, staircase-climbing, walking, bathing, dressing, travelling, lifting glass to mouth, getting in and out of bed) that have been uniformly listed in the CCQ. In the Peru COPCORD, 2% of the cases had stopped working.[21] Based on HAQ, the Bhigwan study[2,97] reported mild, moderate and severe grades of disability in 74%, 15% and 6% of the MSK subjects respectively; the main difficult activities in these rural subjects were walking, occupation, and hygiene care (squatting for ablution). Several communities in the developing countries traditionally squat and/or sit cross legged on floor for several daily activities/chores, and several MSK disorders interfere with the latter, causing immense suffering and frustration. Despite severe pain and disability, people do not easily give up such traditional and cultural life styles.

TREATMENT RESOURCES AND ACCESS

Both traditional ethnic medicinal systems and modern medicine are now available all over the world. Affordability/socioeconomics and community concepts are important variables. A plethora of treatment resources and methods, including ethnic and local indigenous therapies, have been reported by COPCORD surveys. Not all patients with MSK disorders seek proper attention or therapy; 55% of the men or women who complained of rheumatic symptoms did not recall seeing a doctor ever in the Shanghai China COPCORD survey[20], 38% of the aboriginal (Australian) cases had not sought or received any treatment[26], and 21.3% of the MSK cases in village Bhigwan (India) had never been to a doctor or a healer.[2] Less than 5% of the Bhigwan cases admitted using herbal medicines (though they are popular in India), and the reason offered for this intriguing practice was that villagers wanted a quick relief from their pain that could only be provided by a modern medicinal pill.[2] In sharp contrast, 72.4% and 56.9% subjects with MSK disorders in the rural and urban regions sought traditional Chinese medicine in the Shantou China population surveys.[17] Interestingly, the Vietnam COPCORD reported that 4.2% of their MSK disorder cases had been seen earlier by a rheumatologist. This is unusual for a developing country where, by and large, rheumatology is an underrated and undeveloped speciality.

RISK FACTORS

The role of climate, occupation, lifestyle, diet, hypermobility, and trauma in causing MSK pain and disorders have been evaluated and speculated upon by several COPCORD investigators.[2,11,16,17,28,34] None of the COPCORDs have carried out prospective cohort studies of causality and risk factors.

Does ethnicity matter? The answer can be best illustrated by the Malaysian COPCORD survey data from a selected semi-urban population comprising people of Malay, Chinese and Indian origin living and working in a common environment for several

decades.[25] The frequencies of pain (any site) were 28.4%, 24.8% and 15.4% in Indian, Malay and Chinese women respectively; the similar rates for men were 19%, 19.6% and 9.9% respectively. The Indian and the Malay respondents, both males and females, scored over their Chinese counterparts at practically every pain site, including joints. These differences are likely to be due to several factors ranging from ethnicity, perceptions and diets to lifestyles, traditions and culture.

Four samples from the various COPCORD surveys in South East China Shantou region were combined to study the risk factors associated with rheumatic complaints in 10,638 adults; a rising trend in rheumatic symptoms in the region over 12 years was recorded.[17] The most likely risk factors from this Chinese study were latitude and stair-climbing.

A COPCORD survey (designed for knee pain and knee OA) of 2188 adults (age 35–64 years), living in six-storey building without elevators in Taiyuan (North China), reported age, sex and body mass index as risk factors (multinomial logistic regression) for knee OA; although suspected, the model did not find staircase climbing significant.[98]

In a case–control study, Bangladesh investigators[34] reported that cultivation, pulling, higher number of pregnancies, use of oral contraceptives, and low-back pain during menses were risk factors for non-specific low-back ache.

Bhigwan COPCORD[99] also reported a lack of significant association of HLA-DRB1* with RA; the odds ratio (OR) for HLA-DRB1* 04, 10 and 01/04/10 was 1.04, 1.85 and 1.13 respectively.

Occupational overuse is likely to play a major role in various forms of STR and ill-defined symptoms. Men and women squat in fields continuously for several hours at a stretch to work at sowing, removing weeds, harvesting etc, and this is bound to mechanically stress the spine, pelvis and lower limbs.

Of special concern has been the frequent finding by several COPCORD surveys of traditional medicines adulterated with steroids and other anti-inflammatory analgesics.[2,25,28]

The prevalence of gout (3.8%) was exceptionally high in the Australian Aborigine COPCORD[26], and the investigators reported alcohol consumption and obesity as the chief risk factors. Rural Indonesia (Java) reported a 0.8% prevalence of gout with alcohol, obesity, renal impairment, diet, hypertension and family history being the important risk factors.[14] Though reported considerably less by several China COPCORD surveys, a gout-targeting community survey (using modified COPCORD CCQ) in Shanghai, China, reported a prevalence of 0.77% in men and 0.34% in both sexes.[100] In a matched case–control analysis of subjects with hyperuricaemia in the latter survey, alcohol (OR 2.8) and hypertension (OR 3.1), and hypertension alone (OR 4.6) were reported to be the risk factors for gout in men and women respectively.

PRESENT AND FUTURE

The 'Bone and Joint Decade (BJD) 2000–2010' was launched to focus attention on MSK health and disease.[101,102] Education, patient empowerment, and reduction in the global burden of MSK disorders are some of the principal goals. The decade is of special relevance to the developing world.[8,103] In a key international meeting between BJD, ILAR and WHO in Vienna (Austria) in 2005, it was decided to review the current COPCORD status and update its CCQ and methods.[104] COPCORD is much more than mere collection of epidemiological data.[105] If COPCORD is able to provide treatment advice and services to the community, as is being done by COPCORD India[8,64,106], it will enhance its socioeconomic impact and appeal to millions of

sufferers in the region. It is an opportune time for the BJD movement to reach out to the WHO-ILAR COPCORD to spearhead the control and treatment of MSK disorders in the world and in developing economies in particular.[8]

Several well-designed COPCORD population surveys have been completed during the period 2005–2007 – Iran, Cuba, Guatemala and India (Jammu, Delhi, Lucknow, Kolkatta, Chennai and Pune regions) – and their results are in various stages of analysis, review and publication. The revised CCQ, including a section on trauma, has been used in several of the latter surveys. By the end of 2009, BJD India, along with Indian Council of Medical Research (Government of India) would have completed screening of a population of 100,000+ spread over at least 16 survey sites (selected from all over the country) using the Bhigwan COPCORD model and its revised updated CCQ.

The WHO-ILAR COPCORD is certainly poised to fulfil its primary objective of measuring the burden of rheumatic MSK disorders in the developing world, and in time aid in its control and prevention.[8,107–109] COPCORD is an excellent example of the ILAR mission statement of 'think global, act local'.[110]

SUMMARY

The WHO-ILAR COPCORD was designed to capture pain and disability in the developing world, and has completed population surveys (mostly non-randomized) in several countries during the last three decades. The current report is largely based on COPCORD data. Despite changes, the core methods of data collection and recording have remained stable and allow fair comparison between surveys. The prevalence of painful rheumatic MSK disorders has varied from 11.6% (Shantou, China) to 55% (Australian Aborigine) in rural surveys and from 12.3% (Vietnam) to 46.5% (Peru) in the urban surveys. Knee (7–41%) and low back (6–35%) were the most frequent pain sites. The predominant ailments in the community were ill-defined aches and pains, soft-tissue rheumatism, and degenerative disorders. COPCORD India further demonstrated that inflammatory arthritis accounted for less than 10% of the community cases. The prevalence of rheumatoid arthritis (ACR classified) and symptomatic osteoarthritis varied (0.2–1.2% and 2.3–29% respectively). The emerging spectrum (MSK) was similar to that in the rest of the world, albeit with enormous proportions and dismal rheumatology care services. Several ongoing new COPCORD initiatives (especially in India and Guatemala), now inclusive of some 'Bone and Joint Decade' components (especially trauma), using uniform standardized methods, are likely to improve quality and comparability of data from different surveys. COPCORD has yet to map MSK in several developing economies (particularly in Africa).

Practice points

- the prevalence and impact of rheumatic MSK disorders are likely to vary between different ethnic communities, although disease patterns may be similar
- soft-tissue aches and pains and degenerative disorders are the commonest painful rheumatic MSK disorders ailments in the community
- several ill-defined aches and pains and soft-tissue rheumatism may be due to factors of occupational overuse, modest and strenuous lifestyles, and poor nutrition; these are potentially amenable to effective management

- several patients with ill-defined aches and pains, and so-called non-specific arthralgias, self-medicate and do not seek proper medical advice
- several patients of rheumatic MSK disorders consume herbal medicines and/or use other complementary and alternative medicines, and these are often consumed along with modern medicine without the knowledge of the doctor
- symptoms and signs of inflammatory arthritis are often masked by improper and unscrupulous use of oral steroids, sometimes in the form of adulterated herbal drugs
- though less common, inflammatory arthritis may remain undifferentiated for prolonged periods; several of these cases are post-infective forms of seronegative spondyloarthropathy related to common gastrointestinal infections
- several ethnic communities from Asia-Pacific and South America report a significant prevalence of rheumatoid arthritis, and the diagnosis is often clinical (rather than the 1988 ACR classification criteria) in several community patients
- rural communities suffer from a spectrum of rheumatic musculoskeletal disorders similar to the urban communities

Research agenda

- to initiate newer uniform WHO-ILAR COPCORD population survey studies with sufficient investigation facilities to apply current classification approaches
- to improve the diagnosis and management of ill-defined aches and pains and soft-tissue rheumatism in the community
- to ascertain risk factors (especially diet, occupation, immunogenetics, environment), incidence, and socioeconomic data in-long term COPCORD studies
- to establish a COPCORD data repository for global use

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The WHO-ILAR COPCORD owes its success to hundreds of investigators who have toiled the length and breadth of their regions in extremely difficult and challenging scenarios to provide meaningful data. There have been little, if any, government support (being a non-government initiative) or financial incentives. By and large, very few COPCORD surveys have solicited or accepted pharmaceutical sponsorship. Academic and Research Medical Institutions have been in the forefront, but several grass-root investigators have belonged to private practice sectors. The rheumatology associations (mostly APLAR and ILAR) have provided seed funds to initiate several COPCORD surveys. Though it may not be appropriate to identify individuals, some have played a seminal role in envisaging and propagating COPCORD: the late Professor H. A. Valkenburgh (The Netherlands), former Professor K. D. Muirden (Australia) and Dr R. D. Wigley (New Zealand). Dr J. Darmawan (Indonesia), former COPCORD Coordinator, and Dr N. Khaltaev (WHO) are credited with encouraging and initiating several COPCORD surveys.

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