

Prevalence of arthritis in India and Pakistan: a review

Ehtisham Akhter · Saira Bilal · Uzma Haque

Received: 9 September 2010 / Accepted: 30 January 2011 / Published online: 18 February 2011
© Springer-Verlag 2011

Abstract Recent studies of rheumatoid arthritis worldwide suggest that prevalence of arthritis is higher in Europe and North America than in developing countries. Prevalence data for major arthritis disorders have been compiled in West for several decades, but figures from the third world are just emerging. A coordinated effort by WHO and ILAR (International League Against Rheumatism) has resulted in collecting data for countries like Philippines, China, Malaysia, Indonesia, and rural South Africa but the information about prevalence of arthritis in India and Pakistan is scarce. Since both countries, i.e., India and Pakistan, share some ethnic identity, we reviewed published literature to examine the prevalence of arthritis in these countries. Medline and Pubmed were searched for suitable articles about arthritis from 1980 and onwards. Findings from these articles were reviewed and summarized. The prevalence, clinical features, and laboratory findings of rheumatoid arthritis are compiled for both India and Pakistan. Data collected from these two countries were compared with each other, and some of the characteristics of the disease were compared with Europe and North America. It is found to be quite similar to developed countries. Additionally, juvenile rheumatoid arthritis is of different variety than reported in West. It is more of polyarticular onset type while in West pauciarthritic predominates. Additionally, in systemic onset, JRA uveitis and ANA are common finding in developed

countries; on the other hand, they are hardly seen in this region. Although the prevalence of arthritis in Pakistan and India is similar to Western countries, there are inherent differences (clinical features, laboratory findings) in the presentation of disease. The major strength of the study is that it is the first to pool reports to provide an estimate of the disease in the Indian subcontinent. Scarcity of data is one of the major limitations. This study helps to understand the pattern of disease in this part of country that can be stepping-stone for policy makers to draft policies that can affect target population more appropriately.

Keywords Arthritis · Rheumatoid arthritis · Juvenile rheumatoid arthritis · Osteoarthritis · Pakistan · India · Prevalence

Introduction

Rheumatoid arthritis is a systemic inflammatory disorder with the potential to cause destructive joint disease, significant disability, and increase mortality. It is a disease, where multiple joints in the body are affected, mainly joints of hands and feet. This leads to joint swelling, pain, stiffness, and possible loss of function. The small joints in the hands and feet are most often affected, but any joint lined by a synovial membrane may be involved. Extra-articular involvement includes skin, respiratory, cardiac, ocular, neurological, and hematological manifestations.

The onset of rheumatoid arthritis may be variable. Insidious development of symptoms is the most common presentation. However, abrupt onset of polyarticular disease has also been described. The disease may occur at any age, but prevalence increases with age; the peak incidence

E. Akhter (✉) · U. Haque
Johns Hopkins University, Baltimore, MD, USA
e-mail: ehtishamakhter@yahoo.com

S. Bilal
Union Memorial Hospital, Baltimore, MD, USA

is in the fourth decade of life [1]. Women are affected more commonly than men [2]. The female preponderance is greater in younger people, and the age-related incidence is approximately equal in elderly [3]. Other studies have also suggested a higher incidence with family history. Rheumatoid arthritis may be sporadic or familial. In occasional families, several generations are affected. No trend of increasing incidence has been found with declining socioeconomic status.

Rheumatoid arthritis occurs worldwide with a variable incidence and severity. It affects approximately 1% of the population worldwide [4] and 1–2% [5] of the population in the Western world. However, these figures may be underestimated since patients with mild disease may never seek a medical opinion.

It is evident from the data that prevalence of rheumatoid arthritis in Europe [6–10] and North America [11] is comparatively higher than in China [12], Japan [13], Malaysia, Indonesia, Philippines [14], and even rural Africa [15]. It is interesting to note that certain populations in Europe may have relative low prevalence of rheumatoid arthritis such as Italy [16] (0.33%). Although USA has rather homogenous prevalence of 1.07%, two of its populations are worth mentioning. Pima Indians [17] in Arizona and Chippew Indians [18] who have a prevalence of 5.3 and 6.8%, respectively. In contrast, people living in developing countries are found to have prevalence as low as 0.0026% in rural Africa [15], 0.17% in Philippines [14], and 0.20% in China [12]. This diversity has led to enhanced interest in genetic and environmental (urban, rural) risk factors associated with rheumatoid arthritis.

Osteoarthritis is a degenerative joint disease. It is characterized by the breakdown of the joint's cartilage. Cartilage breakdown causes bones to rub against each other, causing pain and loss of movement. Most commonly affecting middle-aged and older people, OA can range from very mild to very severe. It affects hands and weight-bearing joints such as knees, hips, feet, and the back.

Data about the prevalence of arthritic disorders in developed countries have been compiled for several decades but due to coordinated efforts by WHO and ILAR (international league against rheumatology) figures for third world countries are emerging. Data from developing countries suggest that prevalence and clinical manifestations may be different in these populations.

The purpose of this article is to review the prevalence of arthritis in India and Pakistan as these countries share same ethnicity. It is done to study the pattern of disease in this part of the world that can help policy makers to target the most affected population and help reduce the burden of disease.

Methods

Medline and Pubmed were searched for literature published either in English or with an English abstract in any other language publications from 1980 to the present. Combination of following group of keywords was used, arthritis, rheumatoid arthritis, osteoarthritis, India, Pakistan, Europe, China, Japan, USA, Malaysia, epidemiology, and prevalence. A separate search was conducted to identify publications related to causes of joint pains.

Further, Medline and Pubmed were searched using authors name and the related articles link for key publications. Abstracts identified using this process were read to select review articles and original research reports of community-based or hospital research studies about arthritis in children, adults, and elderly. Full copies of these publications were obtained using WelDoc segment on Web site of welch library of Johns Hopkins University. Additional articles were identified from the reference lists of the articles retrieved and through discussions with colleagues.

Two types of studies were included in the tables of this review article. First, original research reports of cohort and case control studies that contained data on prevalence of arthritis were studied. Second, reports published by WHO that contain data about joint pains in developing countries like rural Africa, Japan, China, and Indonesia.

The following types of studies were not included: the studies in which ARA criteria were not used for the diagnosis of rheumatoid arthritis; studies that used only joint pain rather defining patients with rheumatoid arthritis or osteoarthritis; cross-sectional studies in which clinician was not present to confirm the diagnosis; review articles that used the similar data that have been included in this review.

Inclusion criteria required additional laboratory data. Laboratory work includes blood samples from clinically diagnosed patients that were tested for hemoglobin, white cell count, ESR, and rheumatoid factor latex test. Additionally, another inclusion criterion was the presence of X-rays.

Incidence rate (the number of new cases per population in a given time period) and prevalence rate (the number of cases of a specific disease present in a given population at a certain time) have been taken from reference articles.

Results

The results of Pakistan and India are shown separately. India has been divided into north and south due to its area and diversity in its population. Moreover, disease pattern in both countries is compared with each other and finally comparison is being made between West and both of these countries.

Pakistan

Rheumatoid arthritis

Demographic features of rheumatoid arthritis in Pakistan are outlined in Table 1.

Farooqi et al. [19] compared the frequency of rheumatic symptoms among 1997 distributed evenly between poor rural, poor urban, and affluent urban communities in northern Pakistan. Highest prevalence (8/1,000) was seen in affluent urban community. Hameed et al. [20] looked at rheumatoid arthritis in affluent and poor communities in southern Pakistan. Surprisingly, M:F ratio was 1:1 and rheumatoid arthritis was seen in older men compared with women. Interestingly, symmetry of arthritis and morning stiffness was present in all patients. In another study, same author studied 88 consecutive referrals in a teaching hospital. Two drugs most commonly used by rheumatoid arthritis were NSAID 98% ($P = 0.013$) and DMARD (anytime) 75% ($P = 0.002$).

Table 2 shows clinical features [21] of disease in a teaching hospital in southern Pakistan. Average time patient complains of morning stiffness of joints, one of the diagnostic features of rheumatoid arthritis, was found to be 68 min (CI 53–82). Nodular disease was found in 7% of patients. Extra-articular features are seen in 14% patients.

Laboratory findings in same settings are shown in Table 3 [21]; 83% of the patients were sero positive for rheumatoid factor.

Average Larsen radiological scores were higher for proximal interphalangeal joints compared with other small joints of hands and feet.

Osteoarthritis

Osteoarthritis findings in southern Pakistan reveal that the mean age of patients of osteoarthritis was found to be 58 years (with confidence interval of 55–61 years). Osteoarthritis was more frequently seen in women with female to male ratio of 4:1. High body weights and high

Table 2 Clinical features of rheumatoid arthritis

Clinical features		<i>P</i> value
Morning stiffness (min)	68 (58–82)	0.036
Rheumatoid nodules (%)	7	0.003
Extra-articular features (%)	14	
HAQ	19.7 (16.4–23)	0.0002

Table 3 Laboratory findings in rheumatoid arthritis

Laboratory values and average Larsen scores		<i>P</i> value
Hemoglobin	11.4 (11–11.8)	0.0003
ESR	63 (57–69)	0.0001
Positive latex	83%	0.02
X-ray score		<i>P</i> value
PIP	5.1 (4–6.3)	0.24
MCP	2.9 (1.8–3.9)	0.014
Wrist	2.2 (0.6–3.6)	0.26
2–5 MTP	2.2 (0.4–3.0)	0.0001
Ist MTP	0.7 (0.5–0.9)	0.0004

body mass index in patients with osteoarthritis confirmed the association of obesity with the disease. Knee osteoarthritis is the most common in these patients with 95% of the patients having this joint involved either single joint or in association with other joints as hip joint. The demographic features and distribution of osteoarthritis have been tabulated in Table 4.

India

Rheumatoid arthritis

The features of rheumatoid arthritis from different regions of India have been summarized in Table 5. Malaviya et al. [1] surveyed rural population in northern India. Symmetric arthritis was seen in all the patients, and morning stiffness

Table 1 Demographic features of rheumatoid arthritis in Pakistan

Demographic features of rheumatoid arthritis	North Pakistan [19] ($n = 1,997$)	South Pakistan [20] ($n = 4,232$)	South Pakistan [21] ($n = 88$)
Prevalence	5.5/1000		0.9–1.98/1,000
F:M	2.7:1	8:3	1:1
Age		53 (40–56)	M (51–81) F (35–52)
Duration of disease (years)		7.9 (6.5–9)	M (8–40) F (5–10)
Family history		14%	

Table 4 Demographic features of osteoarthritis in Pakistan

Demographic features	North Pakistan [19] (<i>n</i> = 1,997)	South Pakistan [21] (<i>n</i> = 88)	Distribution of OA [21]*	
Prevalence	37/1,000		>4 separate sites affected	20%
F:M	1.7:1	4:1	Heberden nodes	18%
Age (years)		58 (55–61)	Thumb (CMC joint)	27%
Family history		4%	Hallux (1st MTP)	2%
BMI kg/m ²		29 (27–31)	Hip	1%
			Knee	95%
			Knee only	61%

* Distribution of OA was available from teaching hospital in South of Pakistan

Table 5 Features of rheumatoid arthritis in India

	Malaviya et al. [1] (<i>n</i> = 39,826)	Kar [22] (<i>n</i> = 4,800)	Chopra et al. [23] (<i>n</i> = 110)	Chandrasekaran [30]
Prevalence	0.75	5.2%		0.2–1%
Age of onset				37.4 ± 9
F:M	9.3:1		3:2	
Family Hx			20–28%	
Age group	25–29	20–40	25–45	Elderly men
Presentation	Symmetrical	Polyarticular	Symmetrical	Polyarticular
Joints involved	Wrist		Fingers wrist	PIP

was found in 86.9% of population. The maximum prevalence of the disease was observed in the age group of 25–29 years. Kar [22] studied the occurrence of rheumatic diseases in West Bengal (eastern region of India). Data have been collected from patients who visited teaching hospital during 6 months. A prospective study by Chopra et al. [23] found that out of 110 patients who came for evaluation of polyarthritis 89 had rheumatoid arthritis. Looking at the features of rheumatic disorders in a referral hospital in South India, rheumatoid arthritis was seen in elderly men and age of onset was 37.4 ± 9 years.

The presentation of rheumatoid arthritis is predominantly polyarticular [22]. The most commonly affected joints in North India [1] were wrist joints in comparison with southern part of country where proximal interphalangeal joints.

Extra-articular manifestations are rare in India [24]. The most common extra-articular manifestation was splenomegaly found in 13% of the patients while lymphadenopathy, hepatomegaly, and subcutaneous nodules were present in 9, 7, and 5%, respectively. Laboratory findings showed that 64% of the patients were seropositive. Erosive joint disease was seen in 60% of the patients (Table 6).

A study of juvenile rheumatoid arthritis by Seth et al. [25] reveals that majority of the cases were of polyarticular type (46%). While systemic and pauciarticular types were 24 and 30%, respectively. He showed that there was male preponderance in systemic and polyarticular juvenile

rheumatoid arthritis but the sex distribution was almost equal in the pauciarticular type. The mean ages of onset for systemic, pauciarticular, and polyarticular diseases were 5.2, 6.8, and 7.2 years, respectively. Systemic type of JRA has the highest percentage (60%) presenting as acute cases. The predominant features in systemic type were joint pain and swelling (100%), fever (100%), rash (57%), hepatomegaly (51%), and lymphadenopathy (25%). In polyarticular JRA, joint pain and swelling (100%), morning stiffness (57%), and fever (37%) were the prominent features while systemic signs as hepatomegaly, lymphadenopathy, and splenomegaly found in few cases. Like polyarticular, pauciarticular predominant feature includes joint pain and swelling and morning stiffness.

In the laboratory work up, anemia (hemoglobin less than 10 mg/dl) was present in one-third to one-half of the patients. ESR was found to be greater than 20 mm in almost all the patients. Most of the patients of polyarticular type were seropositive. Similarly, ANA was found to be positive in 6.5% of the cases in polyarticular variety of JRA and 4.5% of pauciarticular variety while none of the patient of systemic JRA had ANA present. The demographic and clinical features and laboratory findings have been outlined in Table 7.

Juvenile rheumatoid arthritis was also studied separately for North [26] and South [27] India, and demographic and clinical features have been presented in Table 8 along with laboratory findings.

Table 6 Clinical and laboratory findings of rheumatoid arthritis in India

Extra-articular manifestations [30]	
Anemia	69%
Subcutaneous nodules	10%
Splenomegaly	20%
Hepatomegaly	14%
Lymphadenopathy	19%
Laboratory findings	
X-ray (erosive changes)	60%
Genetic association with RA	HLA DR4 [22, 24]
Rheumatoid factor	64%

Table 7 Features of juvenile rheumatoid arthritis in India

	Types		
	Systemic	Pauciarticular	Polyarticular
<i>Juvenile rheumatoid arthritis</i>			
Age of onset	5.2 (0.5–12)	6.8 (1–15)	7.2 (0.35–14)
F:M	1:1.55	1:1.03	1:1.44
Frequency of occurrence	24%	30%	46%
<i>Clinical features</i>			
Joint pain/swelling	100%	100%	100%
Morning stiffness	34%	50%	57%
Fever	100%	10%	39%
Rash	57%	2%	1%
Uveitis	2%	5%	3%
Lymphadenopathy	25%	10%	8%
Hepatomegaly	51%	12%	22%
Splenomegaly	20%	3%	5%
Subcutaneous nodules	3%	0	0
<i>Labs</i>			
Anemia (<10 mg/dl)	52.3%	35.8%	35.8%
ESR (>20)	100%	91.1%	95.9%
Leucocytosis	67.8%	67.9%	51.6%
RF	9.5%	7.3%	14.9%
ANA	0	4.5%	6.5%

In northern India, ages of onset of disease were 4.6, 7.4, and 7 years for systemic, pauciarticular, and polyarticular types of juvenile rheumatoid arthritis, respectively. This onset is early when compared with South India where it was 6.4 years for systemic, 10.4 years for pauciarticular, and 7.0 years for polyarticular. There was male preponderance in all the three types while comparing female to male sex ratio in both north and south parts of the country except in type I of pauciarticular onset JRA and that is because this variety consists of only girls less than 6 years of age. Similarly, female predominates in RF+ subtype of

Table 8 Juvenile rheumatoid arthritis in India: differences between north and south

	Systemic		Pauciarticular		Polyarticular	
	North	South	North	South	North	South
<i>Juvenile rheumatoid arthritis</i>						
Age of onset	4.6	6.4	7.4	10.4	7.0	10.6
F:M	1:4.5	1:1.8	1:2.8	5:0 (I)	1:1.1	4.8:1 (RF+)
				1:25 (II)		1:1 (RF–)
				1:1 (III)		
Frequency of occurrence	14.9	13.3	47.3	35.1	37.8	51.7
<i>Clinical features (% of population affected)</i>						
Joint pain/swelling	100		100		100	
Morning stiffness						
Fever	100	100	40	14.65	67	25
Rash	27	43	11	0	7	0
Uveitis	0	0	0	4.3	3.5	2.9
Lymphadenopathy	81	90	14	5.1	28	7.6
Hepatomegaly	63	54	6	0.8	4	5.8
Splenomegaly	63	40.9	6	0.8	4	2.9
Subcutaneous nodules	5.4	6.8		0		4.6
<i>Laboratories (population %)</i>						
Anemia (<10 mg/dl)	72	54	14	20.7	46	27.5
ESR(>20)	90	100	80	88.8	96	87.1
Leucocytosis	63	54	28	2.6	50	11.6
RF	0	2.2	0	0	3.5	13.4
ANA	0	11.4	0	5.1	3.5	38.6

poly articular type where F:M ratio is 4.8:1, while RF– subtype has 1:1 ratio. The ratio of 1:1 was also seen in subtype III of pauciarticular that consists of negative ANA and negative HLA B27 boys and girls. Less than half of the patients (47%) in North India were of pauciarticular type while in south majority of the cases (51%) were of polyarticular type.

The systemic features were seen more frequently in systemic juvenile rheumatoid arthritis than in other types. About three-fourth of the patients with systemic juvenile rheumatoid arthritis had hemoglobin less than 10 g/dl in North India while in South, this finding was seen in only half of the patients. ESR of more than 20 was found in almost all the patients of all subtypes in patients of both parts of country. Only 3.5% patients of poly articular type in North India were seropositive and had positive antinuclear antibodies that is much less when compared with South India where this percentage is 13.4% for RF+ and 38.6% for ANA. Similarly, higher percentages were also found in systemic (11.4%) and pauciarticular (5.1%) types

in south region when compared with north where there are zero percentages for both types.

Osteoarthritis

There were not many studies for patients with osteoarthritis. Some of the studies look at the prevalence of osteoarthritis in patients while studying rheumatoid arthritis. The prevalence of osteoarthritis was 5.8(95% CI: 5.1–6.5) [4]. The prevalence of osteoarthritis was less in 30 years old than between older than 65 years old [23]. The female to male ratio was found to be 1.3:1.

Comparison between Pakistan and India

After reviewing data, it was found that pattern of rheumatoid arthritis is almost similar in both countries. The prevalence in Pakistan was 0.5% where it was 0.2–1% in India. The huge interval in Indian prevalence may be because of diversity in its population. Female to male ratio was 8:3 in Pakistan and 3:2 in India. Higher percentage of patients in India has family history (24%) compare with Pakistan where it was seen only in 14%. Table 9 outlines the comparison between two countries.

Comparison with West

The mean age of onset of patients of rheumatoid arthritis in India and Pakistan is 37 years while in most of European countries and North America, peak age is late thirties to early forties. The male to female ratio in both India and Pakistan is approximately 3:2 whereas in West this ratio is 3:1 with reduced number of male patients. The presentation of rheumatoid arthritis is predominantly polyarticular in contrast to presentation in West where oligoarticular presentation is more common. The mean time patient complains of morning stiffness in Pakistan was 68 min while in United Kingdom, it was found to be only 47 min. The symmetrical involvement of the joints was found in 90–100% patients in the both Western and Indian patients.

While comparing the findings of juvenile rheumatoid arthritis in India with West, it was seen that type of onset

differs [28]. Polyarticular type predominates in India while in the West, pauciarticular is more frequent. Additionally, in systemic type onset, JRA uveitis and ANA are common findings in Europe and North America but are hardly seen in this region [29].

Discussion

This article reviews data about arthritis in India and Pakistan. It shows that except minor difference in family history, prevalence and clinical features of arthritis are similar in both countries. When laboratory findings were compared between two countries, difference was only noted in percentage of people with low hemoglobin levels. Comparing data from these two countries with Europe and North America, it was seen that although prevalence is similar, disease differ in presentation, e.g., in Europe and North America, main presentation is oligoarticular, where as in India and Pakistan presentation is predominantly polyarticular.

Since 1981, coordinated efforts of WHO-ILAR resulted in collection of data from third world and Far East countries. This helped us to understand the pattern of disease in different communities. There have been several studies comparing clinical features of rheumatoid arthritis in different areas of the world. There is general impression that the disease is more severe among Europeans and northern Americans. This might not be true because in third world countries, most of the data collected are from institutions and easily accessible communities, and lack of medical access in rural areas may exclude severely disabled patients. One of the drawbacks of comparing studies is that they are not matched for either age or disease duration. This leads to comparing different sets of population. There are some studies where patients are matched like comparing patients in United Kingdom and Malaysia or rural Africa. In these comparative studies, more X-ray erosions are seen in British population than in either of two countries. In spite of all these differences, it is general impression that extra-articular features are more frequently seen in Europe and North America than in developed countries or Far East.

Almost one-sixth of the population of the world lives in India and Pakistan. An increase of 0.1% in prevalence results in millions of affected people. The most affected population is in its reproductive years that add to burden of disease. Studies conducted in this region have been isolated, and there was no systemic analysis. This study combines and analyzes the data from these two countries, so that pattern of disease can be understood more appropriately.

The results of the study should be interpreted in the context of several limitations. Data from India as well as

Table 9 Rheumatoid arthritis: differences between Pakistan and India

	Pakistan	India
Prevalence	0.5%	0.2–1%
F:M	8:3	3:2
Family History	14%	24%
Rheumatoid nodules	7%	2.8% [30]
RF+	83%	82.2%

Pakistan are mainly derived from hospital-based studies. Moreover, lack of health infrastructure causes late presentation of disease that might cause misrepresentation of disease onset and severity at onset. Finally, there is not enough data about osteoarthritis in India. Although more than half of the population of Pakistan is younger than 16 years, juvenile rheumatoid arthritis has not been studied extensively.

The major strength of the study is that it is the first to pool reports to provide an estimate of the disease in the Indian subcontinent. Other important features to be considered are that the most studies included in it use same model initiated by WHO-ILAR in 1981 and implemented in many developing countries like Indonesia and rural Africa. Thus, the results are mostly homogenous.

Rheumatoid arthritis is chronic systemic disease for which no definite cure has been found yet. The main purpose of treatment is to decrease morbidity in patients. The main purpose of the article is to analyze the data from ethnically similar populations that can serve as stepping-stone for policy makers to draft policies that can target the most affected population.

References

- Malaviya A, Kapoor S, Singh R, Kumar A, Pande I (1993) Prevalence of rheumatoid arthritis in adult population. *Rheumatol Int* 13:131–134
- Simonsson M, Bergman S, Jacobsson LT, Petersson IF, Svensson B (1999) The prevalence of rheumatoid arthritis in Sweden. *Scand J Rheumatol* 28:340–343
- http://www.podiatry.curtin.edu.au/encyclopedia/rheumatoid_arthritis
- Joshi VR (2003) Arthritis in elderly. *J Indian Med Assoc* 101:408–410
- www.ices.on.ca/webbuild/site/ices-internet-upload/file_collection/Arth-chp1-.pdf
- Chopra A, Patil J, Billempelly V, Relwani J, Tandle HS (2001) Prevalence of rheumatoc diseases in rural population in Western India: a WHO-ILAR COPCORD study. *JAPI* 49:240–246
- Mijiyawa M (1995) Epidemiology and seminology of rheumatoid arthritis in third world countries. *Revue Du Rhumatisme* 62: 121–126
- Carmona L, Villaverde V, Hernandez-Garcia C, Ballina J, Gabriel R, Laffon A (2002) The prevalence of rheumatoid arthritis in the general population of Spain. *Rheumatology* 41:88–95
- Aho K, Kaipainen-Seppanen O, Heliovaara M, Klaukka T (1998) Epidemiology of rheumatoid arthritis in Finland. *Semin Arthritis Rheum* 27:325–334
- Kvien TK, Glennas A, Knudrod OG, Smedstad LM, Mowinckel P, Forre O (1997) The prevalence and severity of rheumatoid arthritis in Oslo: results from a county register and a population survey. *Scand J Rheumatol* 26:412–418
- Saraux A, Guedes C, Allain J, Devauchelle V, Valls I, Lamour A, Guillemain F, Youinou P, Le Goff P (1999) Prevalence of rheumatoid arthritis and spondyloarthritis in Brittany, France. *J Rheumatol* 26:2622–2627
- Dans LF, TankehTorres S, Amante CM, Penserga EG (1997) The prevalence of rheumatic diseases in a Filipino urban population: a WHO-ILAR COPCORD study. *J Rheumatol* 24:1814–1819
- Silman AJ, Ollier W, Holligan S, Birrell F, Adebajo A, Asuzu MC, Thomson W, Pepper L (1993) Absence of rheumatoid arthritis in a rural Nigerian population. *J Rheumatol* 20:618–622
- Brighton SW, de la Harpe AL, van Staden DJ, Badenhorst JH, Myers OL (1988) The prevalence of rheumatoid arthritis in a rural African population. *J Rheumatol* 15:405–408
- del Puente A, Knowler WC, Pettit DJ, Bennett PH (1989) High incidence and prevalence of rheumatoid arthritis in Pima Indians. *Am J Epidemiol* 129:1170–1178
- Riise T, Jacobsen BK, Gran JT (2000) Incidence and prevalence of rheumatoid arthritis in the county of Troms, northern Norway. *J Rheumatol* 27:1386–1389
- Gabriel SE (2001) The epidemiology of rheumatoid arthritis. *Rheum Dis Clin North Am* 27:269–281
- Silman AJ, Pearson JE (2002) Epidemiology and genetics of rheumatoid arthritis. *Arthritis Res* 4:265–272
- Farooqi A, Gibson T (1998) Prevalence of the major rheumatic disorders in the adult population of the North Pakistan. *Br J Rheumatol* 37:491–495
- Hameed K, Gibson T, Kadir M, Sultana S, Fatima Z, Syed A (1995) The prevalence of rheumatoid arthritis in affluent and poor urban communities of Pakistan. *Br J Rheumatol* 34:252–256
- Hameed K, Gibson T (1996) A comparison of the clinical features of hospital out-patients with rheumatoid disease and osteoarthritis in Pakistan and England. *Br J Rheumatol* 35: 994–999
- Kar N (1994) A short communication on occurrence of rheumatoid disease attending hospital. *Indian J Public Health* 38:115–118
- Chopra A, Ragnath D, Singh A, Subramanian AR (1998) The pattern of rheumatoid arthritis in the Indian population: a prospective study. *Br J Rheumatol* 27:454–456
- Vibha A, Usha, Goel SC, Gupta RM (1998) A probable explanation for mild extra articular manifestations in Indian patient of rheumatoid arthritis: a preliminary study. *Indian J Pathol Microbio* 41:297–301
- Seth V, Kabra SK, Semwal OP, Jain Y (1996) Clinico-immunological profile in juvenile rheumatoid arthritis-Indian experience. *Indian J Pediatr* 63:293–300
- Singh S, Salaria M, Kumar L, Minz R, Datta U, Sehgal S (1999) Clinico-immunological profile in juvenile rheumatoid arthritis at Chandigarh. *Indian Pediatr* 63:449–454
- Chandrasekaran AN, Rjendran CP, Madhavan R (1996) Juvenile rheumatoid arthritis-Madras experience. *Indian J Pediatr* 63: 501–510
- Aggarwal A, Misra R (1994) Juvenile chronic arthritis in India: is it different from that seen in western countries. *Rheumatol Int* 14:53–56
- Aggarwal A, Misra R (1996) Juvenile rheumatoid arthritis in India- rarity of antinuclear antibody and Uveitis. *Indian J Pediatr* 63:301–304
- Chandrasekaran AN, Radhakrishna B (1995) Rheumatoid arthritis and connective tissue disorders: India and South East Asia. *Baillieres Clin Rheumatol* 9(1):45–48