Total Incidence and Distribution of Inflammatory Joint Diseases in a Defined Population: Results from the Kuopio 2000 Arthritis Survey

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ABSTRACT. ***Objective.*** To study the incidence of inflammatory joint diseases in a defined population in Finland.

Methods. We collected data for the year 2000 on a population of 87,000 inhabitants of Kuopio, Finland, of whom 20% were < 16 years of age. Information about the study was given through a local newspaper, and subjects attended one health center and 2 local hospitals for study. Inclusion criteria were that subjects have at least one peripheral joint with synovitis or signs of inflammation in sacroiliac, glenohumeral, or hip joints on the first visit. Incidence rates were calculated according to the diagnosis on the first visit, except for children, for whom diagnoses were established after 3 months' followup.

Results. A total of 188 adult incident cases (138 women, 50 men) and 11 children (8 girls, 3 boys) satisfied the inclusion criteria. The incidence of all arthritides was 230/100,000 (95% confidence interval 198.9–263.9) for the whole population; 271/100,000 (95% CI 233.7–312.7) for adults and 64/100,000 (95% CI 31.7–113.8) for children. Among adults the annual incidence of rheumatoid arthritis (RA), ankylosing spondylitis (AS), psoriatic arthritis (PsA), reactive arthritis (ReA), other spondyloarthropathies (SpA), connective tissue disease (CTD), crystalline arthritis, viral arthritis, and undifferentiated arthritis were 36, 7, 23, 10, 13, 9, 19, 7, and 149/100,000, respectively. The mean age at diagnosis was 49.4 ± 16.3 years for all cases of arthritis among adults, about the same for both women and men. The mean age at diagnosis was 59.7 years in RA, 31.5 years in AS, 48.7 years in PsA, 38.0 years in ReA, 36.5 years in other SpA, 36.1 years in CTD, 65.0 years in crystalline arthritis, 53.3 years in viral arthritis, and 48.3 years in undifferentiated arthritis. Four of 11 children had juvenile idiopathic arthritis (JIA). The incidence of JIA was 23/100,000 in the population < 16 years of age. Of the remaining cases, 3 children had antibodies against *Sindbis* (Pogosta) virus and 4 had a transient monoarthritis.

Conclusion. The overall incidence of arthritides among adults was slightly higher than previously reported from Finland. The incidence rates in the child population are in agreement with previous figures. These data are useful in planning the provision of health care. (J Rheumatol 2003;30:2460–8)

Key Indexing Terms:

EPIDEMIOLOGY	INCIDENCE	EARLY ARTHRITIS
RHEUMATOID ARTHRITIS	SPONDYLOARTHROPATHY	JUVENILE ARTHRITIS

Only a few studies cover a broad spectrum of rheumatic diseases in the community setting. There is also a lack of agreement among researchers about the nosology or taxonomy in classifying patients with early arthritis[1]. The total incidence of inflammatory rheumatic diseases in the Heinola Town Case-finding Study in Finland was estimated to be 218/100,000 of the adult population in 1974[2]. The distribution of diagnoses was estimated on the basis of the data from the Followup Survey of Arthritis, Heinola, which was a larger series without a well defined population base. Half the cases had undifferentiated arthritis. In a recent study from Sweden, the incidence of all arthritides was 115/100,000, only half that in Finland a quarter of a century earlier[3].

The annual incidence of rheumatoid arthritis (RA) according to the American College of Rheumatology (ACR, formerly the American Rheumatism Association, ARA) 1958 or 1987 criteria[4] lies in most Caucasian populations between 24 and 50/100,000 of the adult population[2,3,5-11], although lower figures have been reported from France[12]. Some Native American tribes such as the Pima have a much higher incidence than Caucasian populations[13,14].

Studies on the incidence of ankylosing spondylitis (AS) have given figures of 6 to 10/100,000 in Finland[2,15,16], and 6/100,000 from Rochester, Minnesota, USA[17]. In Finland, the incidence of psoriatic arthritis (PsA) was 6 to

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7/100,000[2,15,18], which is comparable with the incidence reported from the United States[19], whereas the incidence in England was half of this[20]. The incidence of postenteric reactive arthritis (ReA) in Finland was estimated to be 14/100,000 and that of the postvenereal form 13/100,000[2], whereas in a primary care based study in Norway the incidence for postenteric ReA was 5/100,000 and for post-*Chlamydia* ReA 4.6/100,000[21]. The incidence in the Swedish study was the same as in Finland, yet in both studies the diagnosis of ReA was clinical[2,3].

The incidence of all arthritides among children in Finland was reported to be 109/100,000 in a population based study[22]. The incidence of juvenile rheumatoid arthritis (JRA) has varied from 11 to 23/100,000 in the population under 16 years of age[22-26].

We assessed the total incidence of inflammatory joint diseases and their distribution in various disease categories in a defined population in Finland.

MATERIALS AND METHODS

The collection period was the year 2000.

Collection area and strategy. All physicians practising in the Kuopio Health Centre, private clinics, and occupational health services or in various departments of the Kuopio University Hospital were requested to refer their patients who had inflammatory joint diseases and no previously diagnosed rheumatic disorder and who were residents of Kuopio City to the rheumatological outpatient clinic of the Health Centre, the Municipal Hospital, or the University Hospital for evaluation as a part of the Kuopio 2000 Arthritis Survey. As well, inpatients from the departments of the University Hospital were referred for examination to the rheumatological outpatient clinic of the University Hospital. Child patients were studied at the Paediatric Clinic of the University Hospital. The population was given information through the local newspaper.

Study population. At the end of the year 2000 there were 86,651 inhabitants in the city of Kuopio. Of them, 17,297 (20%) were under the age of 16 years. The demographic structure of the population is representative of the whole Finnish population. Information on the age distribution of inhabitants in Kuopio was obtained from the Finn Region Database maintained by Statistics Finland at VTTK Group Ltd. (formerly the State Computer Center).

Patients. All patients who were referred because of an inflammatory arthritis to the Health Centre or the University Hospital for the first time during the year 2000 and who were registered in Kuopio City were evaluated. At least one joint with peripheral synovitis or signs of an inflammatory disorder in the sacroiliac, glenohumeral, or hip joints assessed by ultrasonography (US), scintigraphy, or magnetic resonance imaging (MRI) had to be registered on the first visit. Those with traumatic conditions or inflammation in joints with previously diagnosed osteoarthritis (OA) were excluded. Patients with only tenosynovitis or bursitis were also excluded. Patients who had had a definite ReA and who had completely recovered from the previous episode and had a totally new attack in 2000 were included. The diagnosis was established by one permanent doctor at the Health Centre who is a specialist in internal medicine and in training for rheumatology, or 2 consultants in rheumatology or 6 doctors in training under their supervision at the outpatient clinic of the University Hospital, or pediatricians at the pediatric clinic. These are the only clinics in Kuopio City in which special services for rheumatology are available.

Classification criteria. The classification criteria are shown in Table 1. Most of the diagnoses were clinical. The diagnoses of RA and juvenile idiopathic arthritis (JIA) were established according to the internationally accepted criteria sets[4,26]. For all the other diseases the criteria differed from the international criteria for classification of patients with long-lasting disorders because they do not perform well in early diseases.

Clinical data. A questionnaire on the history of the disease and the family and possible risk factors was administered. Information on age, sex, and disease duration was collected. The number of swollen joints was recorded and a health assessment questionaire was administered. A blood sample was taken for analysis of basic laboratory tests (blood count, erythrocyte sedimentation rate, C-reactive protein, liver enzymes, creatinine), rheumatoid factor (RF; sensitized sheep cell agglutination titer of 80 or RF of 30 IU by turbidimetry was regarded as positive), and HLA-B27. A urine sample was studied for all patients. Stool culture was done for patients with preceding diarrhea. Serological tests for bacteria and viruses capable of inducing arthritis were done on clinical grounds, as was collection and examination of synovial fluid. Radiographs of hands and feet were taken from all cases with symptoms in hands and feet and a radiograph of the pelvis or lumbar spine was taken from patients with pelvic or back pain. Radiographs from other joints were done when needed. US of hip joints was performed for 166/188 (88%) adult patients, and for other joints as needed. US findings were abnormal in the hip joint if the distance between the capsule and the femoral neck exceeded 8 mm, or if the difference from the opposite side was > 2 mm[27,28], and in the glenohumeral joint if the distance between the humeral head and the joint capsule was > 3 mm measured on the glenoid labrum posteriorly[29].

Child patients were examined clinically and were also screened serologically for many bacteria, including *Campylobacter*, *Salmonella*, *Yersinia*, and *Borrelia*, and also in most cases for viruses, such as *Sindbis* (Pogosta) and parvovirus, capable of inducing arthritis.

The diagnoses were established after the first visits, with clinical, laboratory, and imaging data already available or ordered on those visits, except for children, for whom they were established after followup for 3 months. Case ascertainment data from adult patients were later reviewed by ES and OK-S. They reached consensus finally in all cases, but had thorough discussion about classification in 18 (10%) cases mainly concerning classification of ReA and crystalline arthritis.

The study was approved by the Ethics Committee of the Kuopio University Hospital. All patients or parents of children in the study gave written consent. Permission was required from the Ministry of Health to use drug reimbursement certificates for evaluation of sensitivity of the collection method, and from the Social Insurance Institution to obtain copies of these certificates.

Statistical analysis. The mean age at diagnosis with standard deviations in each disease category were calculated. The differences in the mean age at diagnosis between the sexes was tested by Student's unpaired t-test and between the diagnostic categories by analysis of variance. Incidence rates according to diagnoses at first visits were calculated using the number of cases as numerator and the child and the adult population at risk (the population of Kuopio City at the end of 2000) as denominator. Confidence intervals (CI) were calculated using the Poisson distribution. The incidence rates were adjusted for age by the direct method using the 1990 Finnish population as a reference[30]. The incidence of rare diseases with no incident cases among the other sex in this sample was estimated using the method described by Yazici, *et al*[31].

Sensitivity. The sensitivity of the method to identify incident cases without previously diagnosed arthritis was evaluated by using the number of patients for whom disease modifying antirheumatic treatment was initiated in 2000, and who were not included in the study at diagnosis, but were noted by the investigators during 2001, and by using the drug reimbursement certificates written for social insurance benefits until the end of 2001. Copies of the certificates were obtained from the Social Insurance Institution.

RESULTS

The incidence of all arthritis cases in the whole population

Table 1. Classification criteria in the Kuopio 2000 arthritis survey.

Disease	Criteria
Rheumatoid arthritis	At least 4 of the ACR 1987 classification criteria[4]
Ankylosing spondylitis	Back pain > 3 months and bilateral sacroiliitis grade 2 or more or syndesmophytes or squared vertebrae in radiographs
Psoriatic arthritis	Peripheral arthritis with psoriasis, excluding RF-positive polyarthritis or spondylitis with psoriasis
Reactive arthritis	Previous gastrointestinal or urogenital tract infection associated with peripheral synovitis or with inflammatory signs in sacroiliac, glenohumeral, or hip joints and positive stool culture or positive LCR test for *C. trachomatis* or elevated levels of antibodies against enteric bacteria associated with ReA
Other spondyloarthropathy	Inflammatory back pain with scintigraphic or MRI-defined sacroiliitis or with arthritis in glenohumeral, hip, or peripheral joint(s) with or without dactylitis or enthesitis
Virus arthritis	Typical clinical picture with rash or with elevated IgM or IgG antibodies against viruses
Crystalline arthritis	Typical clinical picture with elevated serum uric acid level, or with monosodium urate, calcium pyrophosphate, or dihydroxyapatite crystals in synovial fluid or with typical erosions or chondrocalcinosis in radiographs
Connective tissue disease	Arthritis and typical signs of a specific CTD in tissue biopsies, radiographs, or laboratory tests
Undifferentiated arthritis	Other RF-positive mono-, oligo-, or polyarthritis or RF-negative mono-, oligo-, or polyarthritis
Juvenile idiopathic arthritis	The Durban classification criteria for JIA[26]

was 230/100,000, and the incidence of arthritides among adults was 271/100,000. Table 2 shows patients' demographic data, the incidence rates, and the mean and median duration of symptoms before diagnosis in various disease categories. Table 3 shows the frequency of RF and HLA-B27 in various diagnostic categories; 31 of 186 adult patients (17%) were RF positive and 40 of 172 adult patients (23%) showed HLA-B27 antigen. The mean age at diagnosis for adult patients with arthritis was 49.4 years, and it differed significantly between the disease categories ($p < 0.001$). The mean age at diagnosis was lowest in AS and highest in crystalline arthritis. Connective tissue diseases (CTD), ReA, and unspecified spondyloarthropathies (SpA) also occurred in younger age groups, whereas only one-

Table 2. Number of incident cases, annual incidence rates per 100,000, mean and median delay from symptom onset to diagnosis, and mean age at diagnosis in various diagnostic categories among patients with inflammatory joint diseases in Kuopio in 2000.

Disease	All	Women	Men	Mean Delay from Onset of Symptoms to Diagnosis, mo	Median Delay from Onset of Symptoms to Diagnosis, mo	Mean Age at Diagnosis*, yrs
Rheumatoid arthritis	25	17	8	9	6	59.7 ± 15.8
Incidence (95% CI)	36.1 (23.3–53.2)	46.3 (26.9–74.1)	24.5 (10.6–48.3)			
Ankylosing spondylitis	4	0	4	60	54	31.5 ± 2.9
Incidence (95% CI)	5.8 (1.6–14.8)	< 8.2/100,000	12.3 (3.3–31.4)			
Psoriatic arthritis	16	10	6	54	11	48.7 ± 9.2
Incidence (95% CI)	23.1 (13.2–37.5)	27.2 (13.1–50.0)	18.4 (6.8–40.1)			
Reactive arthritis	7	2	5	3	3	38.0 ± 12.0
Incidence (95% CI)	10.1 (4.1–20.8)	5.4 (0.7–19.7)	15.3 (5.0–35.8)			
Other spondyloarthropathy	9	9	0	7	7	36.5 ± 15.3
Incidence (95% CI)	13.0 (5.9–24.6)	24.5 (11.2–46.5)	< 9.2/100,000			
Connective tissue disease	6	6	0	32	11	36.1 ± 17.2
Incidence (95% CI)	8.7 (3.2–18.8)	16.3 (6.0–35.5)	< 9.2/100,000			
Crystalline arthritis	13	5	8	2	2	65.0 ± 16.1
Incidence (95% CI)	18.7 (10.0–32.1)	13.6 (4.4–31.8)	24.5 (10.6–48.3)			
Viral arthritis	5	3	2	2	2	53.3 ± 9.7
Incidence (95% CI)	7.2 (2.3–16.8)	8.2 (1.7–23.9)	6.1 (0.7–22.1)			
Undifferentiated arthritis	103	86	17	11	4	48.3 ± 15.3
Incidence (95% CI)	148.5 (121.2–180.1)	234.0 (187.2–289.0)	52.1 (30.4–83.5)			
All arthritides among adults	188	138	50	12	5	49.4 ± 16.3
Incidence (95% CI)	271.1 (233.7–312.7)	375.5 (315.5–443.7)	153.3 (113.8–202.8)			
Juvenile arthritis	11	8	3	1**	1**	7.7 ± 4.2
Incidence (95% CI)	63.6 (33.1–118.8)	88.8 (38.3–174.9)	36.2 (7.5–105.8)			
All arthritides in the whole population	199	146	53			
Incidence (95% CI)	229.7 (198.9–263.9)	319.1 (269.4–375.2)	129.6 (97.1–169.5)			

* $p < 0.001$ between disease categories among adults. ** Mean and median delay to the first visit.

Table 3. Number of adult patients with positive RF and HLA-B27 in various diagnostic categories among patients with inflammatory joint diseases in Kuopio in 2000.

Disease	Patients, n	RF Positive/Examined	HLA-B27 Positive/Examined
Rheumatoid arthritis	25	15/25	2/20
Ankylosing spondylitis	4	1/4	4/4
Psoriatic arthritis	16	0/16	3/16
Reactive arthritis	7	1/6	6/7
Other spondyloarthropathy	9	0/9	3/8
Connective tissue disease	6	0/6	0/6
Crystalline arthritis	13	0/12	1/8
Viral arthritis	5	0/5	0/5
Undifferentiated arthritis	103	14/103	22/98
All	188	31/186	40/172

fourth of the incident cases with RA were less than 50 years of age.

Twenty-five patients satisfied the ACR 1987 classification criteria for RA[4]. Most of them had symmetric polyarthritis with hand-joint involvement. The incidence of RA was 36/100,000 in the adult population, 46/100,000 for women and 25/100,000 for men. The age adjusted incidence was 35/100,000. The mean age at diagnosis was 59.7 ± 15.8 years for all patients with RA: 62.2 ± 17.8 years for women and 54.4 ± 9.2 years for men ($p = 0.260$). Fourteen patients (56%) had RF-positive RA and 11 patients RF-negative RA. The mean age at diagnosis was 10 years lower among RF-positive than in RF-negative cases. Erosive changes in hand or foot radiographs were noted in half of the patients, in hand radiographs in 35% of the cases. Three patients had erosions in both hands and feet. The mean delay from the first symptoms to diagnosis was about 9 months, median 6 months. The incidence of RF-positive RA was 20/100,000 (95% CI 11.0–33.9) and RF-positive RA and undifferentiated arthritis 37/100,000 (95% CI 24.5–54.9).

Four patients had AS. The incidence of AS was 6/100,000. Typing for HLA-B27 was performed in all 4 instances, and all patients were positive for this allele. All patients had bilateral sacroiliitis in radiographs, and one also showed radiographic changes in the thoraco-lumbar region. The mean delay from the first symptoms to diagnosis was 5 years, median 4.5 years.

Sixteen patients had PsA. The incidence of PsA was 23/100,000. Three patients showed radiographic sacroiliitis, and 2 of them were HLA-B27 positive. The mean delay from the first symptoms to diagnosis was 4.5 years, median 11 months. The longest delay was 32 years in a case with spondylitis.

Seven patients had ReA. The incidence of ReA was 10/100,000. Six of 7 patients were HLA-B27 positive. *Chlamydia trachomatis* induced ReA in 3 cases, *Yersinia pseudotuberculosa* in 2 cases, *Campylobacter jejuni* in one case, and Salmonella group D in one case. Patients with *C. trachomatis* infection had urethritis, and they showed positive ligase chain reaction against *C. trachomatis*. Patients with infection caused by *Y. pseudotuberculosa* were treated with antibiotics, one with azithromycin and the other with doxycycline, before arthritis flared. Both patients had high concentrations of IgM class antibodies against *Y. pseudotuberculosa*, but no antibodies against Salmonella, Campylobacter, or Chlamydia, and they were also negative for RF. One patient with diarrhea had positive stool culture for *C. jejuni* and the other patient for Salmonella group D.

Nine patients were classified as having other SpA. The incidence of other SpA was 13/100,000. Two patients had signs of symmetrical sacroiliitis by scintigraphy, but not radiographic changes; 2 patients had bilateral sacroiliitis by MRI; and 5 patients had unilateral sacroiliitis on radiographs and 2 or more of the following symptoms or signs: arthritis in glenohumeral, hip or peripheral joints, dactylitis, or enthesitis. One of them had also an inflammatory bowel disease, and another had colitis after radiotherapy for ovarian cancer. The mean and median delays from symptom onset to diagnosis were 7 months.

Six patients, all women, had arthritis together with connective tissue diseases (CTD). The incidence for such arthritis was 9/100,000 in the whole adult population and 16/100,000 for women only. Two patients had Sjögren's syndrome, one had scleroderma, and 3 patients had polyarthritis with fever and signs of autoimmune disorders on skin biopsy or in laboratory tests or had subcutaneous calcification in radiographs.

Five patients had a probable or definite viral arthritis. The incidence of viral arthritis was 7/100,000. All patients had a typical rash before or in connection with arthritis. In 3 cases the diagnosis was clinical, and 2 patients had elevated IgM antibodies against *Sindbis* virus.

Thirteen patients had crystalline arthritis. The incidence of crystalline arthritis was 16/100,000. Eight of these patients had elevated serum uric acid concentration with a typical clinical picture of gout. Two also showed typical erosions in foot radiographs. Five patients showed cartilage calcification typical for chondrocalcinosis in radiographs.

Synovial fluid analysis was done only for 3 patients with acute arthritis in a knee joint. They had inflammatory synovial fluid, which remained negative for crystals and also for bacteria in microscopy and culture. They all had signs of OA and meniscal calcification in radiographs. Two patients had an acute arthritis and radiographic changes in a wrist joint.

In 103 instances, the diagnosis remained undifferentiated mono-, oligo-, or polyarthritis, giving an incidence of 149/100,000 for this subgroup. Of these cases, 14% were RF-positive.

US of the hip joints was performed for 166 of 188 adult patients, including all patients with hip problems. In some cases of crystalline or unspecified arthritis US was not performed because the US equipment was not available in the health center at the beginning of 2000.

Synovitis was diagnosed in 32 instances. In 6 patients it was bilateral. Synovitis of the hip joint occurred in all other diagnostic groups, except in crystalline arthritis. The US findings of glenohumeral joints were recorded for 23 patients. An abnormal distance (> 3 mm) between the joint capsule and humeral head measured on the glenoid labrum posteriorly was detected in 7 glenohumeral joints.

Eleven children, 8 girls and 3 boys, had juvenile arthritis. The incidence of juvenile arthritis was 64/100,000 in the population < 16 years of age: 89/100,000 for girls and 36/100,000 for boys. The diagnosis of JIA was established in 4 cases, for 3 girls and one boy. The incidence of JIA was 23/100,000. The mean age at diagnosis of JIA was 8.5 ± 5.3 years. Among the children, 10 of 11 patients were tested for antinuclear antibodies (ANA); one child had a borderline titer. RF testing was performed in 7 of 11 instances: one child had a positive result. HLA-B27 was also tested in 7/11 cases and 2 children were positive for this allele. One child with JIA had a polyarticular disease with a borderline ANA titer. She was HLA-B27-positive, and also had uveitis in both eyes. Three children had oligoarthritis.

Of the remaining cases, 3 children showed high titers of IgG class antibodies against *Sindbis* virus (1280–2560) and one of them also had IgM antibodies against this virus. She had had maculopapular rash before arthritis. In 2 cases the arthritis was transient, and the third child was first taking oral corticosteroids, and methotrexate was started later. In addition, 2 children had a transient monoarthritis in their knee joints and 2 boys had a transient synovitis in their hip joints.

On the first visit, 176 adults and 11 children were included in the study. Twelve adult patients were included in the study after the inclusion period was over. Two of them were treated in the surgical ward for suspected septic arthritis, but were diagnosed as having crystalline arthritis. Nine patients attending the University Hospital outpatient clinic in 2000 were overlooked as Kuopio residents, but the mistake was corrected on their second visits, and they were classified according to the diagnosis after their first visits. One patient with RA was diagnosed and then prescribed disease modifying antirheumatic drugs (DMARD) by an experienced general practitioner at the Health Centre. She was also included in the study on her second visit.

In addition to these 199 patients, 5 cases (4 adults and one child who were not included in the study) were detected using data from the drug reimbursement register. The doctors who were participating in the study had written their certificates. Chronic inflammatory joint diseases were not diagnosed in any other health centre or hospital than those participating in the study. The sensitivity of the method on the first visit was 92% for all patients, and 95% for the cases for whom drug reimbursement certificates for DMARD were written. Surveillance by the investigators on the missed cases increased the sensitivity up to 97%.

DISCUSSION

This is the first epidemiological study that includes all cases that have consulted primary care physicians about their inflammatory joint diseases in all age groups in a defined catchment area.

The overall incidence of arthritides among adults, 271/100,000, was slightly higher than previously reported from Finland. The overall annual incidence of 218/100,000 (95% CI 150.9–304.6) for all inflammatory rheumatic diseases in the Heinola Town Case-finding Study a quarter-century ago was based on a population of 15,600 adults[2]. The population was so small that the estimation of incidence remained inaccurate. In a population based Swedish study[3] the incidence was less than half that in our study. The few other studies on the occurrence of a large spectrum of arthritides have come from early arthritis clinics, or have been planned for detecting early onset RA, like the Norfolk Arthritis Register in England[8,32,33].

Sensitivity of the method to identify incident cases without previously diagnosed arthritis was good. One limitation of this study is that the number of self-limiting arthritides is difficult to estimate. Some patients may not have sought any professional help for their joint problems, and some patients might not have been referred at all. However, the incidence data for all arthritides are higher than previously reported from Finland and Sweden[2,3], and data for chronic arthritides are comparable with previous findings from Finland[9,15,16,18,24,25]. Thus, the inaccuracy is not significant, at least in assessing the need for therapy of these diseases in a community. On the other hand, information about the study in a local newspaper might have shortened the delay to seek medical help for joint problems in some instances, but the delays were still too long for aggressive early treatment.

Physicians also have different opinions concerning the diagnoses. The diagnoses in this study were established after the first visit with information that was either already avail-

able for, or that was recorded from, examinations ordered on the first visit. One doctor examined 66% of the adult patients at the Health Centre and in the Municipal Hospital, 2 rheumatologists examined 27% of the patients in the University Hospital, and 6 trainees who worked under the supervision of the rheumatologists examined 7% of the patients at the rheumatology outpatient clinic. The diagnoses for children were established by pediatricians after 3 months' followup. Two investigators, one from the health centre and one from the university hospital, reviewed the data later. They debated the classification of cases with ReA and crystalline arthritis, but in the end reached consensus. If a disease did not satisfy the classification criteria that were discussed and defined before data collection started, the patient was classified as having an undifferentiated arthritis.

The proportion of RA was lower and that of PsA and undifferentiated arthritis higher in this series than previously reported from the early arthritis clinics, as shown in Table 4. The sex distribution among all arthritis cases was similar to earlier studies[15]. The age distribution at diagnosis varied among different categories of arthritis. Table 5 illustrates that the mean age at diagnosis in RA and in undifferentiated arthritis was higher in this series than in other early arthritis clinic series[32,33]. Younger subjects were prone to AS, CTD, ReA, and other SpA. In the Heinola study[2], the incidence of all arthritides was 11% higher in the age group 16–35 years and it was 9% lower in the group aged 56 years and older than in this study. This is in agreement with the finding that the age at diagnosis of RA in Finland increased by 9 years between 1975 and 1995[15]. A similar trend has been reported in a hospital-based series from Japan[34]. No marked differences in the age at diagnosis between the sexes or between patients with RF-positive and RF-negative RA were noted in an earlier study from Finland[15]. The differences in the present study may be due to the small number of cases.

The incidence of RA was of the same order of magnitude as previously reported from Finland[15] and Minnesota, USA[5], for the last 2 decades, but somewhat higher than in the first report from the Norfolk Arthritis Register in England[8] and also in southern Sweden[3]. In the Norfolk series, during the followup the number of patients satisfying the ACR classification criteria for RA increased[35]. It is likely that in the present series some patients with undifferentiated arthritis, particularly those with positive RF, will also develop a disease satisfying the classification criteria for RA. On the other hand, aggressive treatment with current treatment modalities may prevent progression of the disease to the point of meeting the criteria for RA.

The incidence of AS was comparable with earlier data[2,15,16]. The mean age at diagnosis was 32 years. The first symptoms of AS usually occur between 15 and 30 years of age, but the delay to diagnosis has been long, almost 10 years in Finland[14]. The mean age at diagnosis was lower in this study than reported in the earlier studies[15,16], but there were only 4 cases. However, the longest delay for this type of a disease in our series was over 30 years, in a patient with psoriasis and spondylitis.

The incidence of PsA was 3 times higher than that previously reported from Finland[2,15,18], the USA[19], and Sweden[3]. In an English study, the incidence was even lower[20]. Many early arthritis studies have limited the duration of symptoms, unlike this study, in which there was no limitation for duration of joint symptoms. The patients with PsA also had the longest delay from symptom onset to diagnosis.

Table 4. Distribution of incident cases (percentages) by diagnoses in various early arthritis series.

Disease	Isomäki[2], 1974–75	Hülsemann[32], 1984–86	Mau[33], Published 1989	Present Study, 2000
Rheumatoid arthritis	19	19	40	14
Ankylosing spondylitis	5	6	14	2
Psoriatic arthritis	3	3	4	9
Reactive arthritis	13	11	7	4
Connective tissue disease	3	6	1	3
Crystalline arthritis	3	0	1	7
Undifferentiated arthritis	45	54	28	61*
Patients in series, n	332	217	141	183**

* Other SpA were included in the group of undifferentiated arthritis in this analysis. ** Patients with viral arthritis were excluded.

Table 5. Mean age at diagnosis of patients in various disease categories in early arthritis series.

Disease	Mean Age at Diagnosis, yrs		
	Hülsemann[27], 1984–86	Mau[28], Published 1989	Present Study, 2000
Rheumatoid arthritis	53	57	60
Ankylosing spondylitis	26	34	32
Psoriatic arthritis	47	49	49
Reactive arthritis	33	42	38
Undifferentiated arthritis	41	44	48

Awareness of arthritis associated with psoriasis, which has increased among physicians and the public during the last 2 decades, and notice of this study in newspapers might explain the high incidence figure for PsA. However, it is possible that earlier studies underestimated the real incidence, detecting only patients who had most needed medical treatment for their joint problems.

The diagnosis of ReA is by a combination of clinical symptoms and laboratory tests for identification of triggering bacteria, but there are no unequivocally accepted ReA criteria. The probability of the diagnosis is also dependant on the tests used and the occurrence rate of ReA in various populations[36]. Attack rates of 0.2–12% after an appropriate infection have been reported[37-39]. During epidemics most arthritides are of short duration, and patients recover without consulting even primary care physicians. HLA-B27 may determine disease severity rather than susceptibility to arthritis[40-42]. The Finnish prevalence of HLA-B27 is higher (15%) than in most other European countries. In Finland in the year 2000 about 12,000 *C. trachomatis*, 3500 *Campylobacter,* 2500 *Salmonella*, and 700 *Yersinia* infections were reported to the health authorities.

The incidence rate for ReA observed in the present study was lower than that reported in Finland in 1974 and also in a recent study from Sweden[2,3]. It may be due to use of a different definition of ReA. In both those studies the diagnosis of ReA was clinical. In this study, 10 patients with mono- or oligoarthritis and high levels of IgG antibodies against *C. trachomatis* but who were negative for urine ligase chain reaction test, and 3 patients with a preceding urinary tract infection were classified as having an undifferentiated arthritis. Had they also been included as incident cases of ReA, the incidence rate would have been similar to that previously reported from Finland[2] and Sweden[3]. However, the incidence was comparable with that reported from Norway[21].

Classification of SpA into subgroups at diagnosis is still difficult, although the European Spondylarthropathy Study Group criteria set distinguishes them from other inflammatory disorders[43]. Classification criteria for AS select patients with a prolonged disease, and neglect cases that only show syndesmophytes in radiographs[44]. In this study, 18% of patients with undifferentiated arthritis had features of SpA. Patients classified as having other SpA did not fulfil the Amor criteria for SpA, but the response-to-treatment criterion could not be taken into account[45].

The incidence of arthritis associated with CTD was in agreement with that in previous series[2,32,33]. Joint involvement is only one symptom or sign of CTD, and it may occur at diagnosis or later in disease. Therefore, this kind of strategy in patient recruitment does not allow estimation of the total incidence of CTD.

Many viral infections can induce acute or chronic arthritis[46]. *Sindbis* virus and parvovirus are the most common arthritis-inducing viruses in Finland. Since 1982, more than 90% of children have been vaccinated against mumps, rubella, and measles at age 18 months, and again at age 6 years. This vaccination program has influenced the incidence of arthritis induced by these viruses, which have almost disappeared from Finland[47,48].

In viral arthritis symptoms typically are of short duration and recovery is usually complete. However, in a series of 73 patients with Pogosta disease in Finland, polyarthritis occurred in 40% of the cases[49]. In a followup study of musculoskeletal symptoms after Pogosta virus infection, only 50% of 26 patients were without symptoms after 2.5 years from the infection, and 2 patients had chronic arthritis[50]. Pogosta disease is a mosquito-borne arthritis and it occurs in epidemics about every 7 years. The last epidemics in Finland were in 1995 and 2002. In 2000 there was no outbreak, and therefore the number of cases was small, 2 adults and 3 children in this series.

None of the arthritides was associated with human immunodeficiency virus, but one patient had had hepatitis C infection for 5 years before the diagnosis of RF-positive oligoarthritis. Although the number of subjects with these diseases is increasing in Kuopio, the figures are still small.

The incidence of crystalline arthritis has varied in different series, and often this category has been excluded. The incidence also depends on the age structure of the population. In this series, the mean age at diagnosis among patients with crystalline arthritis was close to that in RA. However, women with crystalline arthritis were 19 years older than men.

The incidence of all arthritides among children was lower than in the earlier Finnish series, but the incidence of JIA did not differ from that previously reported from Finland[22,24,25].

Synovitis in glenohumeral or hip joints has not been included in any criteria set. In this study, 21% of patients had synovitis in either glenohumeral or hip joints. The increasing use of US in clinical practice will raise the question how inflammatory findings in these joints should be taken into account in different criteria sets.

It is difficult to organize large population surveys because they are laborious and expensive. Our study population was well defined and reasonably large. The organization of the health care system in Kuopio City made it possible to reach most of the patients in the area. Some patients with prolonged arthritis that started in 2000 were not diagnosed until 2001 or later, but we suppose that the number of these cases is similar every year. Thus despite the delay from symptom onset to diagnosis we included in the study all previously undiagnosed cases, if they satisfied the inclusion criteria. This might have lead to overestimation in some categories of long-lasting arthritides since the population and health care staff were aware of the study.

The overall incidence of inflammatory joint diseases

described here shows that the number of cases with arthritis in the population is not decreasing[2]. These incidence figures can be used as an estimate of the number of new patients when rheumatological health care is planned in a community. The results also illustrate the age distribution of cases in various disease categories, and confirm the shift of new cases with certain arthritides to older age groups previously reported from our country[15]. Followup of the cohort will shed further light on the accuracy of the diagnoses and the prognoses of the patients.

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