Incidence and Clinical Manifestations of Rheumatic Fever: A 6 Year Community-Based Survey

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ABSTRACT: **Background:** Most data on the incidence of rheumatic fever come from hospital records. We presumed that there may be cases of RF that do not require hospitalization, especially in countries with high quality community health care.
Objectives: To explore the incidence and characteristics of RF using community-based data.
Methods: A retrospective descriptive study was conducted among the members (more than 450,000) of the Clalit Health Services, Central district, during 2000–2005. The electronic medical files of members up to 40 years old with a diagnosis of RF in hospital discharge letters or during community clinic visits were retrieved. Patients with a first episode of RF according to the modified Jones criteria were included.
Results: There were 44 patients with a first episode of RF. All patients were under the age of 29. The annual incidence among patients aged 0–30 years was 3.2:100,000; the highest incidence was among children aged 5–14 years (7.5:100,000), and in males the incidence was 2.26 times higher than in females. The incidence was higher among patients from large families, of non-Jewish ethnicity, and from rural areas. Twenty-five percent of the patients were both diagnosed and treated in an ambulatory care setting.
Conclusions: Although the incidence of RF in the western world and in Israel is low, the disease still occurs and mainly affects children. Any future estimates of disease incidence should take into account that RF is becoming an ambulatorily treated disease.

IMAJ 2010; 12: 78–81

KEY WORDS: rheumatic fever, incidence, ambulatory care, medical database

Rheumatic fever is an inflammatory complication of group A beta-hemolytic streptococcal pharyngitis. No specific sign, symptom or laboratory test is pathognomonic for the disease. The diagnosis is clinical and is based on the modified Jones criteria [1]. In recent years the incidence of RF in the western world and in Israel has been low [2]. Outbreaks of RF are usually seen following outbreaks of GAS pharyngitis or scarlet fever. RF mainly occurs in low socioeconomic populations in developing countries but is observed in developed countries as well [1,2]. The illness appears mainly in children aged 5–15 years and is rarely seen over the age of 40; most cases develop 2–3 weeks after GAS pharyngitis [3].

To establish a diagnosis, there must be two "major" criteria, or a single "major" criterion and two "minor" criteria [1,4]. Although echocardiography is widely used, echo findings are not diagnostic and the diagnosis of carditis is clinical.

INCIDENCE AND PREVALENCE OF RF

According to World Health Organization statistics, it is estimated that at least 15.6 million people have rheumatic heart disease, of whom 233,000 die every year. The worldwide incidence of new RF cases per year is estimated to be more than 471,000, of whom about 60% will develop rheumatic heart disease [5,6]. Among children, the incidence of the disease can reach 50 cases per 100,000 children. The highest rates were reported in indigenous populations in Australia and New Zealand [4]. These statistics are based on scanty epidemiologic findings in developing countries, making it difficult to establish the actual incidence of the disease. It seems that the true number of cases is much higher than those reported [2,5,6]. Previous and ongoing studies used the Jones criteria to examine the incidence and clinical presentation of RF in various populations.

A 2005 study in northern Australia found the incidence of RF to be 54:100,000 yearly, with an average patient age of 12 years [7]. In Mexico in the 1990s, the incidence was 700:100,000 between ages 5 and 20 [8]. In Ankara, Turkey, 118 new cases were diagnosed from 1999 to 2002, with arthritis being the most common symptom followed by carditis [9]. Researchers in southern India found no change in the incidence of RF in recent years [10]. In Athens, Greece, only seven new cases of RF in children aged 0–14 were diagnosed during the 10 year period 1992–2002 [11].

In Israel, an epidemiologic study by the Israeli Ministry of Health during the years 1981–1990 found that RF was more

RF = rheumatoc fever

GAS = group A beta-hemolytic Streptococcus

common in the non-Jewish population, in children aged 5–14, and in low-income populations [12]. According to the Israeli computerized database of rheumatic diseases in children, it appears there are 2–3 RF cases per 100,000 per year [13]. Ilia et al. [14] found that RF was more common among Bedouin and Sephardic Jews, and in large families and crowded living conditions. Recurrent bouts were more common in girls, and chorea was seen only in girls. The most common symptom was arthritis, followed by carditis [14]. In another study conducted in regional hospitals in northern Israel [15], the incidence was 5:100,000, which did not decline in recent years, and the most common symptom was arthritis, followed by carditis.

All data gathered in Israel to date were collected from hospital records. We presumed that there may be cases of RF that did not require hospitalization. If this is true, the 0.2:100,000 incidence of new RF cases in Israel for 2000–2004 may be under-reported [16]. The aim of the present study was to examine the incidence and characteristics of new cases of rheumatic fever in the community in one district in Israel for the years 2000–2005 by using the medical and administrative databases of Clalit Health Services, central district.

PATIENTS AND METHODS

A retrospective descriptive study was carried out among members of Clalit Health Services, central district (more than 450,000 members). Clalit is the largest health management organization in Israel. The study was approved by the institutional review board.

For several years Clalit has been using computerized personal medical files that include all the demographic, clinical and laboratory data in addition to the list of medications used by each patient, and a problem list generated by the primary care physician. The data are available for all members of the HMO, covering more than 95% of the patient-physician encounters in the HMO.

We searched the computerized data for members in the age range birth to 40 years old with a new diagnosis of RF in the study period according to the modified Jones criteria. For this purpose we retrieved the medical files of the following patients: patients with a diagnosis of RF in hospital discharge summaries, in the diagnoses of the medical encounters in the community, and in the problem lists in the primary care medical records. The electronic medical files of these patients were retrieved to verify the diagnosis of RF and that this was the first episode of RF. If the case was not clear we retrieved hospital discharge summaries and talked with the primary care physician for further confirmation of the diagnosis. We collected the following data for each case: year of diagnosis, age, gender, country of birth, year of immigration to Israel, ethnicity (Jewish/non-Jewish), locale of habitation (urban, rural), marital status, number of people in the household, socioeconomic status (a patient was defined as having "low socioeconomic status" if he or she had an exemption from paying the monthly National Insurance fee). The total population in the HMO district for each year served as our denominator for the calculation of the annual incidence.

HMO = health management organization

STATISTICAL ANALYSIS

We used descriptive statistics of disease incidence, patient socio-demographic data, and clinical manifestations of the disease.

RESULTS

We found 44 new cases of RF, i.e., with a first episode of RF, in the study period [Table 1]. The average age was 11.2 ± 5.2 years (range 3–28). No new episodes were found over age 28, although we reviewed patient files up to age 40.

Table 2 displays the clinical characteristics of the cases. The most common major clinical findings were carditis (65.9%) and migratory polyarthritis (54%). The most common minor clinical findings were elevated erythrocyte sedimentation rate or elevated C-reactive protein (81.8%) and fever and arthralgia (54.5%). Echocardiography generally diagnosed a mild

Table 1. Demographics of 44 patients with first episode of rheumatic fever

		Total central district population ages 0–30 (annual average in the study period)	No.	Annual incidence/ 100,000
Total		228,432	44	3.2
Gender	Female	113,433	14	2.1
	Male	114,998	30	4.4
Age at diagnosis (yrs)	0-4 years	38,453	2	0.9
	5–9 years	37,064	17	7.6
	10–14 years	40,410	18	7.4
	15–19 years	37,273	3	1.3
	20–24 years	34,869	2	1.0
	25–29 years	34,662	2	1.0
Year of immigration	Born in Israel	201,155	40	3.4
	After 1990	24,034	4	2.1
	Before 1990	3,276	0	0
Habitation	Urban	189,822	32	2.8
	Rural	37,769	12	5.3
Family size	≤ 4	166,649	28	2.8
	≥ 5	61,784	16	4.3
Ethnicity	Jewish	224,438	42	3.1
	Non-Jewish	8,423	2	4.0
Socioeconomic status	Other	207,944	41	3.3
	Low	20,488	3	2.4

valvular pathology. No patients were found to have severe valvular pathology, but all patients had mitral and aortic valve pathology. Only three-quarters (33/44) of the patients were hospitalized, and the average hospitalization stay was 5.6 ± 3.5 days (range 1–18 days).

Table 3 compares the clinical characteristics of hospitalized and ambulatorily treated cases. In hospitalized cases carditis was the most frequent feature, whereas in non-hospitalized cases carditis and migratory polyarthritis were seen equally (P = NS).

Table 2. Clinical characteristics of 44 patients with rheumatic fever

Major criteria	No. of patients (%)
Carditis	29 (65.9%)
Migratory polyarthritis	24 (54.6%)
Chorea	10 (22.7%)
Subcutaneous nodules	0
Erythema marginatum	2 (4.6%)
Minor criteria	
Fever	24 (54.6%)
Arthralgia	24 (54.6%)
Elevated ESR or CRP	36 (81.8%)
Elongated P-R interval	7 (15.9%)
Performed throat culture	38 (86.4%)
Positive throat culture	18 (40.9%)
Performed ASLO	39 (88.6%)
Echocardiography	
Echo done	42 (95.5%)
Echo abnormal*	27 (61.4%)
Mitral regurgitation	11 (25.0%)
MR & aortic regurgitation	16 (36.4%)
Other findings	6 (13.6%)
Cardiomegaly	4 (9.1%)
Pericardial effusion	1 (2.3%)
Pericardial effusion & tricuspid regurgitation	1 (2.3%)

* Three of the patients who underwent echocardiography did not have results on file.

ESR = erythrocyte sedimentation rate, CRP = C-reactive protein, ASLO = anti-stretolysin-O

Table 3. Major criteria in hospitalized patients and in ambulatory care patients with rheumatic fever

	Hospitalized (%) (N=33)	Ambulatory care (%) (N=11)
Carditis	66.7	63.6
Migratory polyarthritis	51.5	63.6
Chorea	24.2	18.2
Subcutaneous nodules	0	0
Erythema marginatum	6.1	0

INCIDENCE OF RHEUMATIC FEVER

Between 5 and 10 new cases were diagnosed yearly (average 7.33). The incidence in the population from birth to age 30 was 3.2:100,000 a year. The peak incidence occurred in the 5–14 year range (7.5:100,000, Table 1). The incidence among males was 2.1 times higher than among females. The incidence was higher in the rural population, in non-Jewish populations, and in large families.

DISCUSSION

Rheumatic fever is an uncommon inflammatory complication of group A beta-hemolytic streptococcal pharyngitis. RF is seen mainly in low socioeconomic populations in developing countries, but is still seen in developed countries [1,2]. We identified 44 patients with a first episode of RF during the years 2000–2005. One-quarter were not hospitalized, a finding that may characterize the status in developing countries as well as the current trend to reduce hospitalizations. It means that identifying and evaluating RF in surveys that are based solely on hospitalization data would miss these cases, emphasizing the importance of the current study.

Our finding that the disease was twice as common in males had been noted by Miyake and colleagues [17]. The peak incidence at age 5–14 years, with an average age of 11.2 years and an age range of 3–28 years is supported by previous studies [1,2,12].

We found carditis, generally expressed as a mild systolic murmur, to be the most common sign and this finding was confirmed by echocardiography. According to the literature, migratory polyarthritis is the most common sign, with carditis in second place (40–60% of cases) [2]. Previous studies in Israel also showed migratory polyarthritis to be more common than carditis [14,16]. This difference may result from the increased use of echocardiography (although not required for the diagnosis by the Jones criteria), as well as the current differentiation made between migratory GAS-reactive polyarthritis and classic RF [18].

Studies performed in Israel to date were based exclusively on in-hospital data [14,15]. Our study revealed that 25% of the patients had not been hospitalized; therefore, long-term follow-up is needed to determine whether ambulatory diagnosis and care suffice. Our findings indicate a substantial addition to disease incidence estimates (an increase of one-third as compared to exclusive in-hospital data). It is of interest that the clinical manifestations in the two groups were similar; these are important findings for all future epidemiologic studies.

We did not find an association between low socioeconomic status and a higher incidence of RF, but this may be due to the definition of low socioeconomic status according to the Israel National Insurance, which is more suited to define adult and elderly populations and may be inaccurate in the pediatric population. Our findings do suggest that there is a relation to low socioeconomic status as reflected by the higher incidence of RF in larger families and in the non-Jewish population.

In conclusion, we used medical and administrative community databases and identified new cases of RF in our district. We found that a quarter of the cases were not hospitalized. It seems that the demographic and the clinical characteristics of hospitalized and ambulatorily treated patients were almost the same and in concordance with the published literature. Although the incidence of RF in the western world is low, the disease still occurs and mainly affects children. Any future estimates of the disease incidence should take into account that the disease is becoming an ambulatorily treated disease.

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