Prevalences of rheumatoid arthritis in Roman Catholic nuns and the general female population in Brittany, France: A pilot study

Y. Ollivier, A. Saraux,
P. Le Goff

Unit of Rheumatology, Hôpital de la Cavale Blanche, CHU Brest, BP814, F 29609 Brest-Cedex, France

Yann Ollivier, MD; Alain Saraux, MD, PhD; Paul Le Goff, MD.

Please address correspondence to: Prof. A. Saraux, Rheumatology Unit, Hôpital de la Cavale Blanche, CHU Brest, BP 814, F 29609 Brest-Cedex, France. E-mail: Alain.Saraux@chu-brest.fr

ABSTRACT

Objective. *To evaluate the influence of lifestyle factors on the prevalence of rheumatoid arthritis (RA) by compar-ing Roman Catholic nuns and the gen-eral female population.*

Method. *RA prevalence in the general population was evaluated using a stan-dardized telephone survey in 1857 homes taken at random. Individuals who reported an inflammatory joint disease were contacted by a rheumatologist of our unit, missing data were collected from the general practitioner or rheum-atologist with the patient's permission, and if necessary a physical examination was done by a rheumatologist. The 9 largest Roman Catholic nun communi-ties in Brittany were screened using the same standardized questionnaire admin-istered face-to-face; nuns who reported an inflammatory joint disease were in-terviewed and examined by rheumatolo-gists. In both populations, RAwas diag-nosed when (1) the rheumatologist of our unit who interviewed the patient considered the RA classification criteria positive and (2) the rheumatologist who examined the patient gave a diagnosis of RA independently from RA classifica-tion criteria.*

Results. *Data were available for 1706 adult females in the general population and 721 nuns. Of the 20 nuns who re-ported RAor polyarthritis, 11 received a diagnosis of RA (prevalence 1.52%). The prevalences adjusted for the French pop-ulation after 40 years were 1.66% (95% confidence interval, 0.84-2.44) and 1.33 (0.27-2.40) among the nuns and the general female population, respectively.*

Conclusion. *Although our nun popula-tion was too small for definite conclu-sions, we found no evidence of a differ-ence in RA prevalence among nuns and the general female population in Brit-tany.*

Introduction

Rheumatoid arthritis (RA) is probably a multifactorial disease. Although ge-netic profiles conferring susceptibility to RAhave been recognized, the risk of RA in identical twins of RA patients is only 12 to 32% (1-4), suggesting a role for non-genetic factors. However, epi-demiological surveys have found evi-dence that hormonal or environmental factors (e.g. pregnancy, breast-feeding, oral contraception, smoking, or stress) have influence on the risk for RA. Comparisons of populations with simi-lar genetic backgrounds but different lifestyles may provide insight into the potential influence of nongenetic fac-tors on the risk for RA. As compared to the general population of adult females, Roman Catholic nuns have very differ-ent lifestyles: they have no sexual or reproductive activity (and therefore do not use oral contraceptives), abstain from tobacco use, often eat sensibly, and may be shielded from severe stress. So, this provided us with a unique op-portunity to look for an influence of lifestyle differences on the risk of RA by comparing the prevalence of the dis-ease in the general adult female popula-tion and in Roman Catholic nuns of Brittany, France.

Patients and methods

For this study, we used prevalence data for the general population obtained in an earlier study (5) using a validated me-thod for RAscreening and diagnosis (6).

Sampling method

General population. National census data indicate that the population of Brittany was about 2,867,911 in 1996 (7). Virtually every home in Brittany has a telephone subscription with the na-tional telephone company. We random-ly selected 1857 homes in Brittany from the official list of phone numbers. *Roman Catholic nuns.* The diocese of Brittany indicated that about 3000 nuns belonging to 15 congregations resided in the area in 1997, in communities ran-ging from 10 to more than 100 mem-bers. We sent a letter to the regional mother superior of each congregation to explain our study and to ask for their participation. If needed, we sent a sec-ond letter then contacted the mother su-perior by telephone. Fourteen congre-gations accepted our study and one re-fused. We selected the 9 largest commu-nities, which had 721 members in all.

Study design
Screening phase
– *General population.* Each adult (old-

er than 18 years) living in the randomly selected homes was administered a standardized telephone questionnaire by a lay interviewer. The interviewers were 60 volunteers belonging to RA patient organizations. Data on adults absent from home at the time of the call were obtained from other adult members of the household.

– *Roman Catholic nuns*. The nuns did not have individual telephone line. So, using the same questionnaire, we compared data from a face-to-face interview by a lay person to those from a face-to-face interview by a rheumatologist of our unit (AS or YO): A hundred and ten nuns were interviewed by one of us after being interviewed by a lay person. We studied agreement between these two methods with a Kappa test. Reported diagnosis was the best item in detecting inflammatory rheumatic diseases using such a methodology (Kappa: 0.89; data not shown), as previously reported (6). Each of the 721 nuns was interviewed in person by one of nine lay interviewers from the patient organizations, who used a questionnaire similar to the telephone survey questionnaire (Table I).

– *Both populations*. Oral informed consent was obtained. The questionnaire had a closed question on whether the individual had "arthritis" and an open question on the cause of "arthritis". Individuals who reported "arthritis" answered additional items designed to screen for the presence of the clinical components of 1987 American College of Rheumatology (ACR) classification criteria for RA (8) and were interviewed by a rheumatologist of our unit (a telephone interview for general population; face to face interview with AS or YO for the nuns). When diagnosis remained unknown or discordant with RA, the patient's own general practitioner or rheumatologist was interviewed (with the patient's permission). Patients with no diagnosis and patients who had not had a recent rheumatic examination were examined without charge by a rheumatologist (of the Société de Rhumatologie de l'Ouest (SRO) for general population; AS or YO for the nuns).

– *For the nuns with cognitive dysfunc-*

Table I. Items for screening for rheumatoid arthritis and evaluating joint symptoms.

Have you ever had any articular pain?
　　　What diagnosis were you given?
　　　Have you ever had arthritis (swollen joints) ? How many joints?
　　　Did the arthritis last longer than 6 weeks?

Was the arthritis the same on both sides (symmetric)?*

Have you ever had arthritis (swelling) in your hand joints?

Have you ever had arthritis (swelling) in your legs?

Have you ever felt stiff for a while in the mornings? If so, how long did the stiffness last (number of minutes)?

Have you ever had rheumatoid nodules?*

*Nuns who did not understand these terms received an explanation from the interviewer. All the interviewers were trained by the same rheumatologist regarding explanations of terms.

tion. We (AS, YO) obtained data from medical records and general practitioners, with the permission of the mother superior. If necessary we conducted a physical examination.

Case ascertainment

The case definition was based on RA 'ever'. So, we recorded positive patients although they had no signs or symptoms.

When a diagnosis of RA reported by the individual was substantiated by the other interview data (self-reported criteria, laboratory test abnormalities, and treatment), confirmation was deemed unnecessary. Otherwise, additional data were obtained from the general practitioner or rheumatologist of the patient, and if necessary from our rheumatic examination (a rheumatologist of the SRO for general population; AS or YO for the nuns).

The diagnosis of RA was considered confirmed if patients fulfilled both criteria: (1) the rheumatologist of our unit who interviewed the patient retained the self-reported classification criteria for RA; (2) the rheumatologist who examined the patient accepted the diagnosis without using the RA classification criteria.

Statistics

The sample size (3055 persons) for the general population of adult females was calculated to detect a prevalence of 0.5% with a precision of 0.25%, the alpha risk being set at 5%. The sample size for the nuns was limited to the biggest communities in this survey. Our

goal was to describe prevalences and confidence intervals in these two groups and then to evaluate the feasibility of a study in a large population of nuns. Data from the 1990 French census was used as the reference for determining prevalence standardized on age and sex to the overall population of France (using direct method). The data were analysed using the SPSS computer program version 9.0.

Results

Study outcomes

In the general population. Of the 1857 homes contacted by telephone, 1672 had at least one adult female who accepted the interview (response rate 1672/1857, 90%). Data were obtained from 2873 adults (5).

In the population of nuns. The 721 nuns screened for RA had a mean age of 81 years (range 53-103; SD: 8.5). Cognitive disorders were present in 97 nuns, in whom screening for RA relied on a medical file review. Among the 624 other nuns, one refused the interview and two were absent (participation rate 99.5%). Of the 621 interviewed nuns 91 reported arthritis.

Prevalence of RA in the two populations

Eleven nuns had RA (prevalence 1.52%). Nuns respectively with and without RA had a mean age of 78.3 and 80.8 years (NS) and entered the religious communities at 19.4 and 18.8 years (NS). Mean age at RA onset was 54.9 years. Ten of the 11 nuns with RA were interviewed face-to-face; thus, the pre-

Table II. Age distribution of the individuals with and without rheumatoid arthritis (RA) in the population of nuns and in the general population of adult females, in Brittany, France.

Age	Nuns		Females in general population	
	RA-	RA+	RA-	RA+
< 40 yrs.	0	0	525	1
40 - 49	0	0	267	2
50 - 59	9	0	258	4
60 - 69	69	1	197	3
70 - 79	224	5	176	2
80 - 89	325	5	70	1
90 - 99	92	0	0	0
> 100	3	0	0	0

valence of RA confirmed by face-to-face interview was 1.60% (10/621). Nine nuns said they had RA(true positive rate, 9/10, 90%). In all, 20 nuns said they had RA, yielding a false-positive rate of 55% (11/20). The age distribution in the nuns and general population of adult females with and without RA is given in Table II. Mean age was considerably older in the nuns. The prevalence of RA standardized on the French population (after forty years) was 1.66% (95% confidence interval, 0.84-2.44) and 1.33 (95% confidence interval, 0.27-2.40) respectively in nun's and general female population of Brittany. These prevalences are similar, with broad but overlapping confidence intervals.

Discussion

The validity of the questionnaire for case detection RA has been demonstrated for the telephone surveys in the general population (6). We deemed that further validation for the face to face survey in the population of nuns was unnecessary, since the questionnaires, which were exactly the same, were administered by lay interviewers who had participated in the earlier studies. Furthermore, there were no potentially embarrassing questions. Nevertheless, we have demonstrated that in this population of elderly nuns, data from a face-to-face interview by a lay interviewer closely match those collected by a physician (Kappa 0.89 for self-reported diagnosis). These results are in agreement with our previous study in an RA-control comparison. We demonstrated that self-reported diagnosis obtained using a questionnaire in plain language performed satisfactorily when administered by patient interviewers in detecting RA (Se = 0.99, Sp = 0.87). Overall agreements with clinical diagnoses were 97.7% for RA and 94.4% SPA, dropping to 90.4% and 79.1%, respectively, when self-reported diagnosis was excluded (6).

We have found a prevalence of 1.52% for RA among elderly nuns in Brittany. Among the nuns with RA, 90% reported their diagnosis accurately. This result is similar to the self-reporting rate in a middle-aged population (6, 9).

A preliminary study reported in 1990 estimated the prevalence of RAat 1.4% among nuns in the United Kingdom (10). However, mean age was only 59 years, as compared to 80 in our study, and the sample size was considerably smaller (220 vs 721).

Epidemiological surveys are useful to disclose the association between nongenetic factors and the development of RA. Evidence of an higher incidence of RA in female than in male population has led to conduct epidemiologic surveys to study the influence of hormonal modifying factors as parity, breast feeding, pill use or hormonal replacement therapy, but their respective association with the onset of RA remain unclear as far as conclusions are contradictory (11-21). There is more evidence for an increased risk for RA in current smoker (22-25). The association between stressful life events and the development of RAneed to be confirmed with epidemiological method avoiding memory bias (26). To study the influence of an environmental fac-

tor it is important to control the genetic aspect. Comparing the prevalence of diseases between nuns and other, genetically similar populations is of interest because differences would suggest a possible role for lifestyle factors, including sexual and reproductive activity, smoking, diet, and social support. We compared two populations which genetic profiles are probably very close since 90% of the nun's were born in Brittany and nearly as many of elderly in general population (83%) (27). We did not find any difference in RA prevalence between nuns and the general population of female adults in Brittany. However, the population of nuns was too small to allow definite conclusions (the power of the comparison calculated post-hoc is not strong enough).

One limitation of our study is that we have no data on cigarette use or oral contraceptive use in the two populations. However, the nuns entered their congregations in their late adolescence, on average, and at the time oral contraceptives were not yet on the market. Furthermore, very few women belonging to the generation that is in its 80s today have ever smoked (28). We do not have data on these points for the general population of females in Brittany.

Our finding that the prevalence of RA was similar in the two populations may suggest that pregnancy and breastfeeding have not effect, or have opposite effects, on the prevalence of RA. Given that nuns are not exposed to sexually transmitted agents, our data suggest that these organisms may not play a major role as risk factors for RA. Stress has been reported to increase the risk for RA(26). However, Roman Catholic nuns may seem to be sheltered from many of the stress-inducing factors inherent in life in the general community, no objective data are available regarding the level of stress among nuns.

We could not control several bias of our study: what was the prevalence of RA in the non-respondents of the general population ? The response rate to this telephone survey was good and probably gave us a reliable prevalence of RA in general population. The face to face interview in religious communities was costly in terms of time, then

with only nine interviewers (volunteer for two or three days), we privileged the biggest communities. Was prevalence of RAmore important in the biggest religious communities which are probably more adapted for disable persons (lift, infirmary …) ? All nuns with RA excepted one were able to walk but we did not ask them if they have chosen those communities for these conveniences. The population of nuns in our study was elderly. In the general population, some elderly women live in institutions, under conditions that may be somewhat similar to those in a religious community. No epidemiological data on the prevalence of RAin nursing homes are available in France. Our methodology did not allow for an evaluation of the prevalence of RAin elderly women in the general population, whether institutionalised or not. Further work is needed to clarify the influence of age. Unfortunately, few nuns in Brittany or elsewhere in France are younger than 65 years of age, so that a multicenter design would be needed. Alternatively, the study could be done in a country where nuns are younger. Such a study would provide valuable data on the effects of oral contraceptives and smoking in young adulthood on the risk for RA.

References

1. AHO K, KOSKENVUO M, TUOMINEN J, KAPRIO J: Occurrence of rheumatoid arthritis in a nationwide series of twins. *J Rheumatol* 1986; 13: 899-902.
2. SILMAN AJ, MACGREGOR AJ, THOMSON W *et al.*: Twin concordance rates for rheumatoid arthritis: results from a nationwide study. *Br J Rheumatol* 1993; 32: 903-7.
3. LAWRENCE JS: Heberden oration, 1969: Rheumatoid arthritis – nature or nurture? *Ann Rheum Dis* 1970; 29: 357-79.
4. BELLAMY N, DUFFY D, MARTIN N, MATHEWS J: Rheumatoid arthritis in twins: a study of aetiopathogenesis based on the Australian Twin Registry. *Ann Rheum Dis* 1992; 51: 588-93.
5. SARAUX A, GUEDES C, ALLAIN J *et al.*: Prevalence of rheumatoid arthritis and spondylarthropathy in Brittany, France. *J Rheumatol* 1999; 26: 2622-7.
6. GUILLEMIN F, SARAUX A, FARDELLONE O, GUGGENBUHL P, BEHIER JM, COSTE J, for the Epidemiology Committee of the French Society of Rheumatology: Detection of cases of inflammatory rheumatic disorders: performance of a telephone questionnaire designed for use by patients interviewers. *Ann Rheum Dis* 2003; 62: 957-63.
7. *Annuaire statistique de la France*. Edition 1996. Paris: INSEE; 1996.
8. ARNETT FC, EDWORTHY SM, BLOCH DA *et al.*: The American Rheumatism Association 1987, revised criteria for the classification of rheumatoid arthritis. *Arthritis Rheum* 1988; 31: 315-24.
9. LING SM, FRIED LP, GARRETT E, HIRSCH R, GURALNIK JM, HOCHBERG MC, and the Women's Health and Aging Collaborative Research Group: The accuracy of self-report of physician diagnosed rheumatoid arthritis in moderately to severely disable older women. *J Rheumatol* 2000; 27: 1390-4.
10. MACGILL PE, BROUGHAM PA: Sex, hormones and rheumatoid arthritis: the nun's story. *Br J Rheumatol* 1990; 29: 159.
11. SPECTOR TD, ROMAN E, SILMAN AJ: The pill, parity, and rheumatoid arthritis. *Arthritis Rheum* 1990; 33: 782-9.
12. ENGEL A: Rheumatoid arthritis in US adults 1960-62. *In* BENNETT PH and WOOD PHN (Eds.): *Population Studies of the Rheumatic Diseases*. Amsterdam, Excerpta Medica 1968, 83-9.
13. JORGENSEN C, PICOT MC, BOLOGNA C, SANY J: Oral conception, parity, breast feeding and severity of rheumatoid arthritis. *Ann Rheum Dis* 1996; 55: 94-8.
14. BRUN JG, NILSSEN S, KVALE G: Breast feeding, other reproductive factors and rheumatoid arthritis. A prospective study. *Br J Rheumatol* 1995; 34: 542-6.
15. BRENNAN P, SILMAN A: Breast-feeding and the onset of rheumatoid arthritis. *Arthritis Rheum* 1994; 37: 808-13.
16. VANDENBROUCKE JP, VALKENBURG HA, BOERSMA JW *et al.*: Oral contraceptives and rheumatoid arthritis: further evidence for a preventive effect. *Lancet* 1982; 16; 2 (8303): 839-42.
17. LINOS A, WORTHINGTON JW, O'FALLON WM, KURLAND LT: Case-control study of rheumatoid arthritis and prior use of oral contraceptives. *Lancet* 1983; 1 (8337): 1299-1300.
18. DEL JUNCO DJ, ANNEGERS JF, LUTHRA HS, COULAM CB, KURLAND LT: Do oral contraceptives prevent rheumatoid arthritis? *JAMA* 1985; 254: 1938-41.
19. VESSEY MP, THOROGOOD M: Patterns of oral contraceptive use in the United Kingdom. *Br J Rheumatol* 1989; 28 (Suppl. 1): 46-7.
20. VANDENBROUCKE JP, WITTEMAN JC, VALKENBURG HA *et al.*: Noncontraceptive hormones and rheumatoid arthritis in perimenopausal and postmenopausal women. *JAMA* 1986; 255: 1299-303.
21. MERLINO LA, CERHAN JR, CRISWELL LA, MIKULS TR, SAAG KG: Estrogen and other female reproductive risk factors are not strongly associated with the development of rheumatoid arthritis in elderly women. *Semin Arthritis Rheum* 2003; 33: 72-82.
22. HELIOVAARA M, AHO K, AROMAA A, KNEKT P, REUNANEN A: Smoking and risk of rheumatoid arthritis. *J Rheumatol* 1993; 20: 1830-5.
23. KARLSON EW, LEE IM, COOK NR, MANSON JE, BURING JE, HENNEKENSCH: A retrospective cohort study of cigarette smoking and risk of rheumatoid arthritis in female health professionals. *Arthritis Rheum* 1999; 42: 910-7.
24. VOIGT LF, KOEPSELL TD, NELSON JL, DUGOWSON CE, DALING JR: Smoking, obesity, alcohol consumption, and the risk of rheumatoid arthritis. *Epidemiology* 1994; 5: 525-32.
25. STOLT P, BENGTSSON C, NORDMARK B *et al*. and the EIRAStudy Group: Quantification of the influence of cigarette smoking on rheumatoid arthritis: results from a population based case-control study, using incident cases. *Ann Rheum Dis* 2003; 62: 835-41.
26. DARWISH MJ, ARMENIAN HK: A case-control study of rheumatoid arthritis in Lebanon. *Int J Epidemiol* 1987; 16: 420-4.
27. ROUXEL M: Bretagne: les nouveaux profils des migrants. *Octrant* 2000; 4: 4-10.
28. HILL C: Le tabagisme des femmes en France. *Rev Pneumol Clin* 1999; 55: 283-9.