ORIGINAL ARTICLE

Effect of ethnic origin (Caucasians versus Turks) on the prevalence of rheumatic diseases: a WHO-ILAR COPCORD urban study in Iran

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Abstract The objective of this study was to compare the prevalence of musculoskeletal complaints and rheumatic disorders in Caucasians and Turks in an identical environment. Subjects were selected randomly for an interview from Tehran's 22 districts. The Community Oriented Program for Control of Rheumatic Diseases questionnaire was filled in, positive cases were examined, and if needed, laboratory or X-ray tests were performed. A total of 4,096 houses were visited, and 10,291 persons were interviewed. They were 71.4% Caucasians and 23.1% Turks with similar distribution of age and gender. Musculoskeletal complaints of the past 7 days were detected in 40.8% of Caucasians and 45.5% of Turks ($p < 0.001$). In Caucasians, the total of musculoskeletal complaints in men was 33.8% (95% CI, 31.4–36.2%) versus 48.3% in women (95% CI, 45.7–50.8%). In Turks, the total of musculoskeletal complaints in men was 36.6% (95% CI, 32.2–41.1%) versus 55.8% in women (95% CI, 55.8–60.6%). The data of Caucasians versus Turks were as follows: knee pain 20.2% (95% CI, 18.2–22.1) versus 24.1% (95% CI, 20.5–27.6), with $p < 0.001$; dorso-lumbar spine pain 15.1% (95% CI, 13.6–16.6) versus 18.4% (95% CI, 15.1–21.8), with $p < 0.001$; shoulder pain 10.7% (95% CI, 9.4–11.9) versus 12.3% (95% CI, 9.7–14.8), with $p = 0.025$; osteoarthritis 14.1% (95% CI, 12.8–15.2) versus 16.4% (95% CI, 14.3–18.6), $p = 0.04$; and knee osteoarthritis 12.3% (95% CI, 11.8–14.1) versus 15.3% (95% CI, 13.3–17.4), with $p < 0.001$. There were no significant differences regarding the prevalence of soft tissue rheumatism, rheumatoid arthritis, ankylosing spondylitis, Behcet's disease, fibromyalgia, and gout. Although musculoskeletal complaints were more frequent in Turks than in Caucasians, the prevalence of rheumatic disorders was rather similar except for knee osteoarthritis.

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The prevalence of rheumatic diseases differs in various countries. The Community Oriented Program for Control of Rheumatic Diseases (COPCORD) project is aimed at the recognition, prevention, and control of rheumatic disorders in developing countries, where two thirds of the world's population lives [1–3]. Results of COPCORD reports all

done with the same methodology show different figures of the prevalence of various rheumatic diseases in Australia [4, 5], Bangladesh [6], Brazil [7], Chile [8], China [9–11], Cuba [12], Indonesia [13], India [14], Iran [15–17], Kuwait [18], Malaysia [19], Mexico [20], Pakistan [21], Philippines [22–24], Thailand [25], Vietnam [26], and Egypt [27]. Possible explanations of the differences are the geographical situation of the country (Table 1) and the ethnic origin of the studied population. One COPCORD study was done in Australia in two different ethnic groups, in Caucasians [4] and in Aboriginals [5]. However, the studies were not done at the same time (1992 and 2004) or at the same geographical environment. A review article on the epidemiology of musculoskeletal disorders in the developing world has been published recently [28].

The COPCORD Iran study [16] was done in 10,291 subjects in Tehran. The population of Iran is composed of several ethnic groups, including Caucasians 71.4%, Turks 23.1%, Semites 0.3%, and mixed 5.2% [16]. Caucasians are the indigenous population and Turks are from East Asian race and have their origin in the northern part of China (Wikipedia, Turkic people). They invaded Iran during the tenth and thirteenth century.

The aim of this study was to compare the point prevalence of rheumatic diseases and complaints in the two main ethnic groups (Caucasians and Turks) in the same environment and at the same time frame.

Materials and methods

The field The city of Tehran (capital of Iran) was selected for the COPCORD study [16]. The goal of the study was to interview 10,000 subjects; the time period for the project was set for 1 year. Because Tehran is a large metropolis and majority of its people work during the week, the interviews could only take place during weekends (Fridays).

Sampling plan The last Iran population census (1996) gave an average of 2.7 persons per household (aged 15 and over) in Tehran. To reach the goal of 10,000 interviews, 50 clusters containing each 90–100 households were randomly selected by multistage sampling from Tehran's 22 municipal districts obtained from the Iranian Post Office zip code database. The number of clusters of each district was proportional to their population size. Each address pointed to the cluster head, and from there, adjacent houses to the right were selected.

Questionnaire The COPCORD Core Questionnaire (CCQ) was used to screen subjects for musculoskeletal complaints. The original CCQ was translated from English to Farsi and back-translated to English by two independent rheumatol-

ogists. The comparison of the original and the back-translated questionnaire did not differ significantly. The original CCQ comprised seven main sections: background information (A), work history (B), pain/tenderness/swelling/stiffness during last week (C1) and past (C2), functional disability (D), difficulty in performing specific tasks (E), treatment (F), and evaluation (G). In our study, we added another section for extra-articular symptoms of some rheumatic diseases (aphthous ulcers, blurred vision, etc.) (H). The Farsi version of the CCQ was validated in a pretest in 50 subjects.

Sections A, B, C1, D, G, and H of the final questionnaire were administered to all individuals. Respondents who did not report any rheumatic complaint during the past week (negative C1) were asked about any rheumatic complaint before the last week of the interview (C2). Respondents with current functional disability (positive D) were administered part E of the CCQ. Finally, treatment questions (part F) were asked from all who had any current or past musculoskeletal or extra-articular complaints.

Training of field data collectors Interviewers were chosen from Bachelor of Science-certified nurses or nurse-midwives. Physical examinations were performed by rheumatology subspecialty fellows. Blood sampling was done by lab technicians. Data collection was supervised by the head of each team (general practitioner physician). Quality control of the data was done by specially trained physicians. Before the study, each group of personnel took part in a special comprehensive training workshop. The training consisted of COPCORD history and its concepts, study purpose, how to interview subjects and administer the questionnaires, and the physical exam checklist. Interviewers passed an exam by interviewing a selected number of subjects. The observed agreement was 0.96, and the κ coefficient was 0.919 (standard error, 0.112).

Pilot study It was undertaken to assess the feasibility of the project and test the subjects' compliance. Five teams participated in the pilot study. Each team had a team leader, three interviewers, one rheumatologist, and one lab technician for blood sampling. Five clusters, out of those selected for the main study, were randomly selected, one from each of the northern, southern, eastern, western, and central parts of the city. One hundred sixty-eight houses were visited, and 284 interviews were completed [16].

Data collection On Mondays, houses to be visited, from the selected cluster, were selected by the project manager. On Wednesdays, the houses were visited by the interviewers to announce and explain the COPCORD study and fill out the family folder forms containing the identification

Table 1 COPCORD studies

	Cases (number)	Pain (percent)	LBP (percent)	Neck (percent)	Knee (percent)	OA (percent)	STR (percent)	FM (percent)	RA (percent)	SPA (percent)	CTD (percent)	Gout (percent)
Australia [4]	1,437	34	22	17	15	8.2	5.8		0.70	0.21		1.5
Australia Aboriginal [5]	847	33	12.5		11.2	5.5	7.4			0.5		4
Bangladesh rural [6]	2,635	26.9	6.6			7.5	2.7	4.4				
Bangladesh urban slum [6]	1,317	24.9	9.9			9.2	2.5	3.2				
Bangladesh urban rich [6]	1,259	27.9	9.2			10.6	3.3	3.3				
Brazil [7]	3,038	7				7	2.5		0.4	0.1	0.1	
Chile [8]	200	43		3.5		43						
China–Beijing [9]	4,192		35	5	30				0.34	0.26	0.01	
China–Shantou [9]	5,057		13.1	2	2.6				0.32	0.26	0.02	
China–Shanghai [10]	6,584		5.6	2.4	7		3.4		0.47	0.11	0.06	0.22
China–Chenghai [11]	2,040		10.2	4.1	6.5							
Cuba [12]	300	58	14.2	14	11.5	58	6.1	0.7	2.7		0.7	
Indonesia urban [13]	1,071		23.3	11.8					0.3			
Indonesia rural [13]	4,683		15.1	4.8					0.2			0.81
India [14]	4,092	18.2	11.4	6	13.2	5.8	5.5		0.5			0.12
Iran urban [17]	10,291	41.9	21.7	13.4	25.5	16.6	4.6	0.7	0.33	0.23		0.13
Kuwait [18]	7,670											
Malaysia [19]	2,594	21.1	11.6	6.1					0.15	0.12		
Mexico [20]	2,500	17	6	1.4	12	17		1.4	0.3			0.3
Pakistan [21]	2,090	14.8	1.9			3.7	1.9	2.1	0.55	0.10	0.05	0.14
Philippines rural [23]	846	14.5	11.3	7.3	7				0.2			0.6
Philippines urban [24]	3,006		2.1			4.1	3.8	0.2	0.17	0.03		0.13
Thailand [25]	2,463	17.6	4	3.4	5.7	11.3	1.5		0.12	0.12	0.08	0.16
Vietnam [26]	2,119		11.2		18.2	4.1	15.4		0.28		0.09	0.14
Egypt [27]	5,120	16.7	5.1	2.2	9.3	8.5	6.6	1.3	0.29	0.15	0.05	

LBP low back pain, *neck* neck pain, *knee* knee pain, *OA* osteoarthritis, *STR* soft tissue rheumatism, *FM* fibromyalgia, *RA* rheumatoid arthritis, *SPA* seronegative spondylarthropathies, *CTD* connective tissue diseases

information of persons 15 years and above. On Fridays (Iranian weekend holiday), three teams went into their assigned fields. Each team was composed of the team's head, four to six interviewers (depending on week 1, 2, or 3 of the visited cluster), one to three rheumatologists, and one to three lab technicians for blood sampling. They went back to the same cluster the next Friday to collect data from those who were absent the previous Friday and a third time (the following week) to take the remaining absentees. In each cluster, 95–100 households (according to the population density) joined the study.

The COPCORD questionnaire was administered to all interviewed persons by a trained interviewer. A human mannequin figure was used to mark the pain sites by the interviewee. The data collected by each interviewer were checked by the team's head, and in case of a positive answer needing physical examination, the person was presented to the rheumatology fellow who examined the subject on the site. If laboratory tests were necessary, blood samples were taken immediately. For necessary X-rays, they were sent to the nearest radiology center.

Diagnoses and definitions The CCQ, exam sheet, and para-clinical results of positive cases examined by the rheumatology fellow were reviewed by one of the rheumatology professors of the Rheumatology Research Center to confirm

the final diagnosis of the subject. Diagnosis was made upon the clinical judgment by expert opinion.

Quality control and monitoring The project manager and his supervisors checked regularly all interviewers, lab technicians, and rheumatology fellows. Special evaluation checklists were used for both direct observation of interviewers and for refilling some of the CCQ questions. On the field, all family folder forms, CCQs, and examination sheets were checked by the team leaders. All questionnaires were checked again during the enumeration process in the Rheumatology Research Center for any missing data or mistakes. They were rectified either by the interviewer (by interviewing the subject again and asking the missed questions 1 week later) or by telephone contacts. Relevant weekly report was given to the observers from the weekly data.

Data analysis Five percent of the data at the end of each data entry session underwent quality control. Data were weighted (post-stratification weight) according to the weight of population census in Tehran (1996). It was calculated using the formula $W_{ij} = N_{ij}/n_{ij}$, where W was the weight, i the sex group, j the age group, N the number of people in the target group of the Tehran census, and n the same group in the Tehran COPCORD study. Stata program (Version 8) was used for all analyses.

Ethical issues The study proposal was approved by the National Ethics Committee on Medical Research of the Ministry of Health and Medical Education. All subjects were informed about the study goal and methods. They were enrolled after their informed consents were obtained. Participants could withdraw from the study at any stage (interview, physical exam, and para-clinical tests). A brief report on their health status and relative educational notes, lab results, and X-rays were sent to subjects who underwent physical examination. All lab tests and X-rays were free.

Results

Study period The COPCORD study was performed from the 27th of February 2004 until September 2005, so data collection took 18 months.

General data A total of 4,096 houses were visited. The number of selected subjects was 13,741. From them, 2,868 were absent after three consecutive weekly visits, and 582 of available persons refused the interview. The total number of interviewed persons with completed questionnaires was 10,291; they were Caucasians 71.4%, Turks 23.1%,

Semites 0.3%, and a mixture of different ethnicities 5.2%. The male/female ratio was 0.9:1 with 4,878 men (47.4%) and 5,413 women (52.6%). These figures are comparable with the 1996 Tehran census, which showed a male/female ratio of 1.04:1 with 51.1% male and 48.9% female after correction for the age groups in our study.

The age distribution and male/female ratio were very similar for both ethnicities at different age groups (Table 2). The proportion of teenagers and young adults was very high in both ethnic groups (Caucasians 40.3% and Turks 38%). The proportion of people over 50 was rather low (21% for Caucasians and 22.1% for Turks). There was no significant differences of age range proportions compared to the Tehran census [17].

The educational level of Caucasians and Turks were as follows: illiterate, 5.5% versus 11.1% ($p<0.001$); secondary school diploma, 10.1% versus 11.8% ($p=0.014$); college diploma, 34.4% versus 29.2% ($p<0.001$); university diploma, 22% versus 14.4% ($p<0.001$).

Musculoskeletal complaints during the past 7 days Among the interviewed subjects, in 40.8% of Caucasians, overall complaints were noted (pain 40%, swelling 12.4%, and stiffness 24.3%), and in 45% of Turks, overall complaints were found (pain 45.5%, swelling 14.1%, and stiffness 28.2%). The differences between the two groups are statistically significant (Table 3). Musculoskeletal complaints were significantly higher in women than men. In Caucasians, the total musculoskeletal complaints in men was 33.8% (95% CI, 31.4–36.2%) versus 48.3% in women (95% CI, 45.7–50.8%) In Turks, the total musculoskeletal complaint in men was 36.6% (95% CI, 32.2–41.1%) versus 55.8% in women (95% CI, 55.8–60.6%).

The joint distribution of musculoskeletal complaints is summarized in Table 4. The most frequent sites were knee (20.2% Caucasians and 24.1% Turks), dorso-lumbar spine (15.1% Caucasians and 18.4% Turks), shoulder (10.7% Caucasians and 12.3% Turks), and cervical spine (9.4%

Table 2 Age distribution

Age	Caucasian		Turk		p value
	Number	Percent[a]	Number	Percent[a]	
15–29	3,004	40.3	1,081	38.0	0.032
30–39	1,573	21.1	622	21.9	NS
40–49	1,280	17.2	513	18.0	NS
50–59	729	9.8	293	10.3	NS
60–69	503	6.8	185	6.5	NS
70 and over	356	4.8	152	5.3	NS
All	7,445	100	2,846	100	

[a] Adjusted percentages

Table 3 Musculoskeletal complaints during the past 7 days

	Caucasian		TURK		p value
	Number	Percent[a]	Number	Percent[a]	
Pain	2,980	40.0	1,294	45.5	<0.001
Swelling	925	12.4	403	14.1	0.025
Stiffness	1,808	24.3	802	28.2	<0.001
Overall	3,037	40.8	1,310	46.0	<0.001

[a] Adjusted percentages

Caucasians and 11.1% Turks). The differences between Caucasians and Turks were statistically significant for most of the sites, always higher for Turks, while the pattern of the distribution remained approximately the same for both ethnic groups (Table 4).

Diagnosed diseases The prevalence of osteoarthritis (OA) was 14.1% in Caucasians and 16.4% in Turks. Knee OA was the most frequent among them. It was detected in 12.3% of Caucasians and 15.3% of Turks. The difference was statistically significant. The rate for other locations of OA (hand, hip and neck) was the same in the two groups (Tables 5 and 6).

Other disorders were chondromalacia patellae, low back pain, sciatica, de Quervain tenosynovitis, trigger finger, carpal tunnel syndrome, tennis elbow, golfer's elbow, shoulder rotator cuff tendonitis, and frozen shoulder. They were equally often seen in both ethnic groups with no statistically significant difference between them, except for trigger finger that was more frequent in Caucasians and frozen shoulder more frequent in Turks (Table 5).

Inflammatory disorders were rheumatoid arthritis (0.25% Caucasians and 0.40% Turks), ankylosing spondylitis

(0.11% Caucasians and 0.15% Turks), systemic lupus erythematosus (0.04% in Caucasians and none in Turks), and Behcet's disease (0.055% Caucasians and 0.109% Turks). The differences were not statistically significant between Caucasians and Turks (Table 6).

Other diseases included fibromyalgia, discovered in 0.6% of Caucasians and 0.7% of Turks, and gout, seen in 0.09% of Caucasians and 0.21% of Turks. The differences were not significant between Caucasians and Turks (Table 6).

Discussion

The age and sex distribution of the studied population was very similar in both ethnic groups, but the educational level differed, with more participants having university level in Caucasians than in Turks.

Musculoskeletal complaints were statistically more frequent in Turks than in Caucasians. The differences persisted in different age groups and genders. In both groups, women had around 50% more complaints than men. Although Turks had more complaints than Caucasians in their different joints, the pattern of joint distribution was very much similar in both groups. Knee joint had the highest percentage of complaints, followed by dorso-lumbar spine, shoulder, and cervical spine. Osteoarthritis was seen slightly more in Turks than Caucasians with statistically significant difference; however, the difference was not clinically relevant. The difference was evident for knee osteoarthritis. One may interpret the difference by lower income of Turkish people, as suggested by their lower educational level. However, there was no difference for hand, hip, and neck osteoarthritis. Turkish people are

Table 4 Musculoskeletal complaints during the past 7 days: joint distribution

	Caucasian		Turk		p value
	Percent[a]	CI	Percent[a]	CI	
Shoulder	10.7	9.4–11.9	12.3	9.7–14.8	0.025
Elbow	4.3	3.3–5.3	5.7	4.2–7.1	<0.01
Wrist	6.3	5.3–7.3	5.9	4.1–7.7	0.006
Hand	5.2	4.3–6.2	6.3	4.4–8.2	NS
Hip	4.5	3.6–5.5	5.6	4.1–7.1	0.03
Knee	20.2	18.2–22.1	24.1	20.5–27.6	<0.001
Ankle	7.1	6.0–8.1	9.0	6.7–11.3	0.003
Toes	4.1	3.3–5.0	4.7	3.1–6.2	NS
Cervical	9.4	8.1–10.7	11.1	8.7–13.6	0.01
Dorso-lumbar	15.1	13.6–16.6	18.4	15.1–21.8	<0.001
All sites	40.8	38.5–43.1	46.1	41.7–50.4	<0.001

[a] Adjusted percentages
CI 95% Confidence Interval

Table 5 Osteoarthritis, neck and back pain, and soft tissue rheumatism

	Caucasian		Turk		*p* value
	Percent[a]	CI	Percent[a]	CI	
Total osteoarthritis	14.1	12.8–15.2	16.4	14.3–18.6	0.04
Knee osteoarthritis	12.3	11.8–14.1	15.3	13.3–17.4	<0.001
Hand osteoarthritis	2.8	2.3–3.4	3.0	2.3–3.6	NS
Hip osteoarthritis	0.3	0.2–0.4	0.4	0.2–0.7	NS
Neck OA	1.4	1.1–1.7	1.8	1.3–2.5	NS
Chondromalacia patellae	3.4	2.7–3.9	3.1	2.3–3.8	NS
Low back pain	15.0	13.2–17.3	15.0	13.2–17.3	NS
Sciatica	0.7	0.5–1.0	0.9	0.5–1.4	NS
De Quervain tenosynovitis	0.2	0.1–0.3	0.2	0.04–0.35	NS
Trigger finger	0.2	0.1–0.4	0.06	0–0.16	0.04
Carpal tunnel syndrome	1.3	1.0–1.6	1.2	0.9–1.6	NS
Tennis elbow	1.1	0.8–1.4	1.1	0.7–1.6	NS
Golf elbow	0.4	0.3–0.6	0.5	0.2–0.9	NS
Shoulder Rotator cuff	2.3	1.9–2.7	2.0	1.4–2.8	NS
Frozen shoulder	0.35	0.2–0.5	0.8	0.4–1.2	0.04
Soft tissue rheumatism (all)	4.1	3.6–4.6	4.1	3.0–5.6	NS

[a] Adjusted percentages
CI 95% Confidence Interval

more in business than in university careers, and they do not have lower income. In both ethnic groups, women had more osteoarthritis than men. For other mechanical disorders, especially regarding low back pain and soft tissue rheumatism, there was no difference between Caucasians and Turks. The same was found for rheumatoid arthritis, ankylosing spondylitis, Behcet's disease, and gout, although they were seen more frequently in Turks. The non-significant differences regarding rare diseases could be due to the low power of the study for them.

In the past, some studies were done comparing the situation in England and Pakistan on RA and OA patients [29]. There were differences in the clinical presentations. However, the study was done in two different countries, and it was on clinical manifestations, not the prevalence of the disease. In the same line, the severity of RA was assessed in northern Pakistan and compared to those of Western countries [30]. The study showed less aggressive disease in Pakistani in comparison to Caucasians. In the UK, the influence of racial origin on disease expression was studied in RA [31]. The disease was less severe in patients of Indian and Pakistani origin than in Europeans. The features of black Zimbabwean and British Caucasian RA patients were compared [32]. The disease was less severe in Black Zimbabwean than in UK white patients. In Israel, the expression of RA in two ethnic Jewish Israeli groups was studied [33]. Disease manifestations in Jewish RA patients of Sepharadic origin are more serious compared with those in patients of Ashkenazi origin.

As there are only small differences between Turks and Caucasians except knee and total OA, environmental risk factors may play an important role, and further studies in other countries are needed to give an answer on this question.

Table 6 Inflammatory disorders

	Caucasian		Turk		p value
	Percent[a]	CI	Percent[a]	CI	
Rheumatoid Arthritis	0.25	0.16–0.36	0.4	0.18–0.64	NS
Seronegative Spondylarthropathies					
Ankylosing Spondylitis	0.11	0.04–0.2	0.15	0.03–0.31	NS
Systemic Lupus Erythematosus	0.04	0–0.14	0	–	NS
Behcet's Disease	0.055	0.021–0.147	0.109	0.039–0.307	NS
Gout	0.09	0.02–0.19	0.21	0.08–0.39	NS
Fibromyalgia	0.6	0.4–0.8	0.7	0.4–1.1	NS

[a] Adjusted percentages
CI 95% Confidence Interval

Conclusion

Turks complain more musculoskeletal disorders (pain and stiffness) than Caucasians, with statistically significant difference. However, after examination by rheumatologist, the prevalence of diagnosed diseases was not much different in them except for knee osteoarthritis. Finding no difference in disease distribution in the two totally different ethnic groups residing in the same environment may support the theory that the difference in the prevalence of musculoskeletal disorders in different parts of the world can be ascribed to the geographical situation and the environmental factors and less to their genetic background. However, the same conclusion cannot be drawn for some rare autoimmune diseases such as Behcet's disease [34].

Disclosures None.

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