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Cancer incidence among Iranian immigrants in Sweden and Iranian residents compared to the native Swedish population

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ABSTRACT

Background and goals: Comparing cancer incidence by migrant studies is one of the main approaches to generate hypotheses on the aetiology of cancer. Immigrant studies are most informative when cancer incidence data are available from both the source and the host country.

Methods: The age standardised incidence rate (ASR) and standardised incidence ratio (SIR) of cancers among the Iranian immigrants were compared to the native Swedish population as the standard population by using the Swedish Family-Cancer Database (FCD) from 1958 to 2006. We also compared SIRs between Iranian immigrants and Iranian residents for whom the data were derived from the Iranian national cancer registry report of 2006.

Results: Among the 65,501 Iranian immigrants, the median age at immigration was 26 years and the median length of stay was 16 years. Their all-cancer ASR was 175.3 and 153.1 per 100,000 person years for males and females, respectively, during the period from 1996 to 2006, higher than for the Iranian residents. The ASRs increased among the male Iranian immigrants during the past two decades but were stable among females. The risk for all-cancers among Iranian immigrants was lower than that for the native Swedish population. The Iranian immigrants had a significantly increased risk for male urinary bladder (SIR = 1.40) and thyroid cancers (2.64) compared to the Swedes.

Conclusion: The reasons for the decreased risk for all-cancers among the Iranian immigrants remain to be established. The ASR difference between the Iranian immigrants and the Iranian residents may be due to the differences between the registry systems, selected immigrant groups and environmental exposures.

1. Introduction

Global cancer incidence varies extensively between developed and developing countries. However, the differences between incidence rates at site-specific cancers are usually much larger than those between overall rates. This is due to the low incidence rate for all cancers in developing countries, but very high risk for site-specific cancers such as liver, oesophageal, stomach and cervical cancers.[1,2] Studies of migrants may provide valuable insight into the aetiology of cancer. Classical

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cancer studies on immigrants to the USA and Australia showed that the incidence in common cancers adapts to the level of the new host country in one or two generations.[3] These findings were fundamental to the understanding of the environmental aetiology of human cancer. Studies in Sweden have shown that the second generation immigrants, those born in Sweden, have already adopted the Swedish cancer incidence rates. The first two decades of life are important in setting the pattern for cancer development in subsequent life.[4,5] In all, Sweden is an excellent choice of country for an immigrant cancer study because of a uniform cancer registration, the health care system and the large number of immigrants, around 13% of the population, from practically all around the world.

Immigrant studies are most informative when cancer incidence data are available from both the source and host countries, a requirement that has been met by few previous studies on non-European populations. The Iranian national cancer registry programme has been developed during recent years and can be used to estimate the incidence in the source country. The number of Iranian immigrants in Sweden is 3.7% of all immigrants. In the present study, we focus on Iranian migrants to compare their cancer risks to the native Swedish population and to Iranian residents. The results of this study might be used to gain insight into the causes of cancers and the prevention of cancer.

2. Materials and methods

The Swedish Family-Cancer Database (FCD) was first assembled from the national databases in 1996 and since then it has been periodically updated.[6] The FCD contains information pertaining to those born in Sweden since 1932 together with their biological parents' data. Additionally, data on immigrants are also included. This database is the largest in the world on familial cancer and its updated version (2008, VIII),[7] which has been supplied with longitudinal demographic and socio-economic data from national censuses, has been used for this study. The details of this database have been explained elsewhere.[8]

The Iranian immigrants were defined according to their birth country. Follow-up was started on date of immigration or January 1, 1958, whichever came latest. The total number of Iranian immigrants was 65,501; there were 308 immigrants with missing dates of immigration, and for those cases, their presence on national censuses from 1960, 1970, 1980, 1990 and 2000 was assumed as the start year of immigration. Follow-up was terminated on diagnosis of cancer, death, emigration, last year presence at census or the closing date of our study, December 31, 2006.

Age-standardised rate (ASR), which is a summary measure of a rate that a population would have if it had a standard age structure, was calculated. The world population was used for this standardisation. It is expressed per 100,000 populations at risk (person years). The ASR for Iranian immigrants was calculated for a 10-year period from 1996 to 2006, because the population size for 1 year was not sufficient to calculate the ASR.

The Iranian cancer registry is a revised form of a population-based cancer registry which registers only pathological records by a cross sectional method. The population at risk is the population at the mid time of the survey. It is known as a 'pathologic-based cancer registry' in Iran. About 60,000 new cancer cases were registered in 2006; with its completeness and reliability, the most valid report detailing Iranian residents was reported in a previous publication.[9] The ratio of ASR among Iranian immigrants and Iranian residents was calculated so as to compare their cancer incidence ratio.

The International Classification of Disease, revision 7 (ICD-7) (www.wolfbane.com/icd), has been used in the FCD, and the Iranian cancer registry is based on the International Classification of Diseases for Oncology, 3rd Edition (ICD-O) (www.who.int/classifications/icd). To compare the ASR between the study populations, the classification of cancers in the FCD was modified to ICD-O.

Standardised incidence ratios (SIRs) were calculated as the ratio of observed to expected number of cases. The expected numbers were calculated from 5-year age ranges, sex, region (seven regions of Sweden), time period (10-year bands from 1985 to 2006) and site-specific cancers' standard incidence rates. Due to the low number of cases and the small population of Iranian immigrants before 1985, this year was selected for the starting point of the SIRs calculations. Cancer incidence for the native Swedish populations was used as reference. Confidence intervals (95% CI) were calculated assuming a Poisson distribution. Time trend analysis was used by regression, and a *P*-value less than 0.05 was selected as the significance point. SAS software ver.9.1 was used for data analysis.

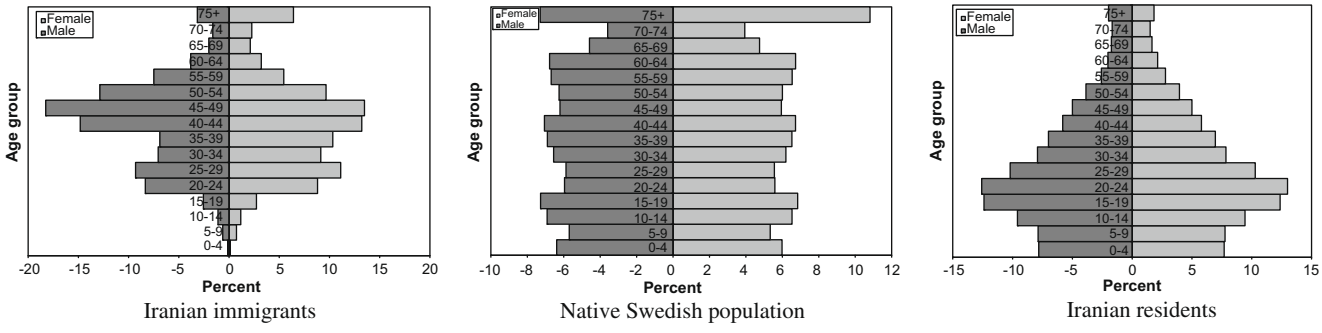

Fig. 1 – Population pyramids for the Iranian immigrants compared to the native Swedish population and Iranian residents in 2006. *P*-value < 0.00001.