The incidence of kidney cancer in Iran: a systematic review and meta-analysis

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1. Introduction

Cancer is an important cause of death worldwide. Among cancers, kidney cancer (KC) is known as the most murderous urinary tract cancer and the 9th and the 14th most common cancer for men and women, respectively [1]. Over 300000 (200000 males) new cases of KC have been diagnosed annually with about 140000 (90000 males) deaths [2]. The renal cell carcinoma is more than 90 percent of all kidney that occurs in both genders and the incidence and prevalence of the renal cell carcinoma has been increasing over the times [3].

KC has a different geographical distribution based on population, lifestyle, nutrition, physical activity, and environmental factors. The incidence rates of KC varies more than 15-fold worldwide; Eastern European countries have the highest and South America have the lowest incidence [4]. Although few epidemiological studies have been done on the KC in Iran, it is the most common urological cancer among Iranian men and women [5] and one of top ten cancers in the population of Southern Iran [6].

Formal cancer-related data of Iranian population were published in 1956 for the first time [7]. The National Cancer Registry in Iran was established in 1984. Thereafter, various types of reports were published about the incidence and prevalence of cancers [8-10]. To the best of our knowledge, there is no study on the exact incidence rate of KC among Iranian.

Therefore, we carried out a systematic review and meta-analysis of the Iranian studies to determine the incidence rate estimation of KC among the Iranian population.

2. Methods

The study was planned and conducted in 2017. The systematic review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) checklist [11].

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E-mail address: alesaleh70@yahoo.com (H. Salehiniya).
3. Results

3.1. Description of literature search

The search process and Study selection base on PRISMA flow chart in this systematic review has been outlined in Fig. 1. The literature searches yielded 159 potentially relevant studies from the primary searches. In total, 98 studies met inclusion criteria and entered into the second stage of evaluation. Some studies were excluded for the following reasons: being irrelevant to the topic (n = 52), incorrect study population (n = 19), duplicate studies (n = 4), and insufficient data (n = 8). Overall, the review included 15 unique studies.

3.2. Description of the included studies

The basic characteristics of the included studies have been summarized in Table 1. According to the geographical area, three studies were conducted in Fars province [6, 12, 13], two in Ardabil province [14, 15], one in Kerman province [16], one in Semnan province [17], one in East Azerbaijan province [18], one in Tehran province [19] and one in Shahroud city [20], and five in all states of Iran [21-25].

3.3. The results of individual studies

This study showed the male to female sex ASIR ratio is 1.42. The highest ASR (3.81 per 100,000) of males was reported from Fars province between 2007 and 2010 [6] and for females (2.9 per 100,000) was reported from Ardabil province between 2000 and 2004 [15], while the lowest ASR in males and females was reported from Kerman province between 1996 and 2000 (0.9 and...
The results of meta-analysis

The ASR of KC was 1.94, 95% CI (1.62 to 2.55) for males and 1.36 95% CI (1.09 to 1.62) in females. The heterogeneity of the studies was demonstrated by Cochran’s test (Q = 799.6, df = 25, I² = 96.9%, p < 0.001) for males and (Q = 807.2, df = 22, I² = 97.3%, p < 0.001) for females. The results of the random-effect meta-analysis for ASRs of KC for males in Iran has been represented in Fig. 2 and for females in Fig. 3. All the measurements in the forest plot were magnified by 10⁵.

4. Discussion

The aim of the present study was to evaluate the incidence rate of KC in Iran. The results demonstrated that the incidence rate of KC among Iranian men is low (ASR = 1.94 per 100,000). Some Asian countries such as South Korea (4.7 per 100,000), Turkey (4.4 per 100,000), and Mongolia (3.3 per 100,000) have high Standardized Incidence Ratios (SIR). Additionally, other countries such as Indonesia (1 per 100,000), Turkmenistan (1.2 per 100,000) and Kyrgyzstan (1.4 per 100 thousand) have the lowest SIR [25].

The results of the study have demonstrated that the incidence of KC among Iranian women (ASR = 1.36 per 100,000) was lower compared to Iranian men (ASR = 1.94 per 100,000). This difference between ASR of female and male is probably related to the different incidence of KC risk factors in Iranian both men and women.

The known risk factors for the most predominant form of KC, renal cell cancer, include hypertension, smoking, obesity, as well as some other less important factors like familial history of KC, environmental and occupational exposure to genotoxic agents or nephrotoxic agents agents acrylamide, cadmium and trichloroethylene, low physical activity, chronic pharmacotherapy with diuretics and phenacetin, alcohol consumption [1]. Although these factors affect the incidence trend of KC, the relative impact of each factor may vary in different populations.

Previous studies have shown that hypertension is more prevalent among Iranian men then woman and hypertension is one on leading causes on KC [26]. Cigarette smoking, as another risk factor for KC, is more prevalent in Iranian males [27, 28]. Additionally, cadmium levels are higher among Iranian men who are living in industrial areas and have environmental and occupational exposure [29]. Among risk factors of KC, these items may cause of high ASR of KC among Iranian males.

According to the results of the study, the highest ASR of KC among Iranian men is observed in Fars province (3.81 per 100,000) and the highest ASR among Iranian women occurs in Ardabil province (2.9 per 100,000). The high incidence rate of KC in Fars province can be attributed to high prevalence of associated risk factors including low socioeconomic status and environmental exposures in this area [30]. Moreover, hypertension is a common health problem in Fars province which has the highest ASR of KC among Iranian men [30] and hypertension can be a major contributor to the high prevalence of KC in this province.
For women, Ardabil province is an area with different disparities in terms of the prevalence of possible risk factors in compare to other provinces in Iran. The high prevalence of KC in this region can be due to different genetic and environmental factors of the area [14, 33].

The results of the current study have shown that the lowest ASR of KC in Iran, in both genders, is observed in Kerman province (0.9 for men and 0.5 for women per 100,000). The low incidence rate of KC in this province can be attributed to the demographic characteristics of the people, differences in lifestyle, and the presence of other types of diseases and cancers [34, 35]. In Kerman province, other types of cancer such as breast, skin, and colorectal cancers among women and skin, bladder, and stomach cancer among men have higher incidence rate [34, 36, 37].

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### 5. Conclusion

The incidence rate of KC in Iran was lower in comparison to other parts of the world. Thus, further studies are necessary to outline the exact incidence rate and the trend of KC in Iran.

### Conflict of interest

None declared.

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**Fig. 2 - Forest plot of the random-effect meta-analysis for ASRs of kidney cancer in males in Iran.**
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