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Incidence, Pathology, and Ethnicity Pattern of Kidney Neoplasms in the Multi-ethnicity Country of Iran During 2008-2010

Abstract

Our study aimed to analyze the rate of kidney neoplasm in Iran from 2008 to 2010, including its geographical and pathological specification, which has not been discussed before, and provincial distribution, as well as its possible relationship with ethnicity. We gathered the data from the nationwide Iranian cancer registry system during 2008-2010. Pathological information and tumor grade were extracted from scanned reports of patients' pathology records, which a urologist reviewed. The incident rate (IR) of kidney cancer was 1.54, and the age-standardized rate (ASR) was 1.91 per 100000 cases during 2008-2010. The most prevalent Fuhrman grade was grade 2 (47.87%).T_1, T_2, and T_3 pathologies comprised 39.5%,30.1%, and 28% of the samples. The median [IQR]of reported tumors was 6.0[4.5-9.0] cm. The highest ethnic ASR of RCC was observed in the Kurd ethnicity (ASR: 2.26) and the lowest in the Baluch ethnicity (ASR: 0.94). The highest ASRs were reported in the provinces of Fars (ASR: 2.76), Tehran/Alborz (ASR: 2.62), and Kermanshah (ASR: 2.59), and the lowest in Ilam (ASR: 0.53), Golestan (ASR:0.86), North Khorasan (ASR:0.87), and Sistan-Baluchestan (ASR: 0.94). This is the first report to provide national data on the ethnicity and pathological characteristics of kidney cancer in Iran. The most prevalent pathology has been the T_1 stage, Fuhrman grade 2. Kurdish ethnicity revealed the highest ASR and the highest prevalence was reported in the Fars province.

Keywords: *Kidney, Incidence, Renal cell carcinoma, Pathology*

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Background:

Cancer is a notable global health issue, particularly in less developed nations. The primary cause of mortality in Iran is cancer, according to the latest report from the Ministry of Health and Medical Education [1]. Among all types of malignancies, genitourinary cancers have been reported to have a high mortality and morbidity rate [2]. The most lethal form of urinary tract neoplasm is renal cell carcinoma, and it ranked as the 9th most common cancer in men and 14th most common cancer in women [3]. Kidney cancer is a significant health concern in Southern Iran, ranking among the most prevalent types of cancer that impact the general population [4]. In Iran, the age-standardized rate (ASR) of renal neoplasm was 1.94 in men and 1.36 in females [5]. The incidence of renal neoplasm differs among various localities and is affected by diverse factors, such as population, nutrition, lifestyle, physical activity, and environmental conditions. For example, nations in Eastern Europe exhibit the greatest incidence of renal carcinoma, while South America has the lowest [6]. Within the countries of the European Union (EU), it was approximated that the age-standardized incidence rate of kidney cancer per 100,000 was 15.8 for males and 7.1 for females [7]. In Iran, there is limited accessible data on the incidence of genitourinary cancers, possibly due to the absence of nationwide screening programs and inadequacies in the cancer registration systems [8]. It is crucial to identify the epidemiological features of each predominant cancer in Iran, as each type of cancer demonstrates a specific pattern and distribution based on time, region, and ethnic groups [9-11]. Understanding the current status and trends in cancer incidence rates can aid in the development of effective prevention programs. Although kidney cancer is a significant health concern in Iran, there is currently no comprehensive report on its national and provincial distribution. Specifically, we could not find any report on the national pathological specifications of kidney cancer (T stage, Fuhrman grade). Hence, our research aims to probe the incidence of renal carcinoma in Iran from 2008 to 2010, as well as its relationship with ethnicity and geographical distribution. Additionally, we aim to explore the Fuhrman grade and pathological specifications of reported renal kidney tumors during this period.

Methods:

In this retrospective study with a cross-sectional design, we employed information obtained from the Iranian Cancer Registry office in the Ministry of Health and Medical Education. The data collection consisted of every instance of newly diagnosed kidney cancer cases that occurred from 2008

to 2010. All the data provided to this center from the archives of the Ministry of Health pertained to the years 2008 to 2010. The extraction of pathology information from the scanned pathology reports in the mentioned databank has been carried out over these three years. Additionally, the features of patients, such as their age when diagnosed, sex, location of residence by postal code at diagnosis, province, and characteristics of the tumor, were also taken into account. The collected data was encoded using the International Classification of Diseases for Oncology (ICD-O), with the code for kidney cancer being C64 [12]. To ensure accuracy, pathology reports were reviewed by a urologist to gather information on the cancer grade and other pathological tumor specifications. The incidence of kidney cancer was estimated by a count of diagnoses made within a particular age category throughout a certain duration by the total number of cases within that identical age group. The Age Standardized Ratio (ASR) for the targeted population was obtained by summing up all age groups. To adjust for age, the crude incidences of cancer were recalculated using direct standardization with the World Health Organization (WHO) standard population. Incidence rates (Incidence Rate, representing the reported raw incidence) were reported per 100,000 people, and ASRs were estimated based on province populations in each year, separately for each age group using the geometric method. A weighted average is computed by taking into account the overall male and female populace of each year. It was also estimated for the three years of 2008-2010. To compare the IR of renal carcinoma amid diverse ethnic groups, we employed the Poisson regression model and deemed a p-value of below 0.05 as the threshold for statistical significance. To estimate the population in 1387-1389 based on census data from 1390 and 1385, and to calculate the population growth between these two censuses, a geometric calculation method was used for population estimation. The Statistical Package for Social Sciences (SPSS version 25), Excel (2016), and ArcGis (10.2) were employed for the statistical and spatial analysis of data.

Results:

The Mean±SD of the age of the patients with kidney cancer was 53.0±19.4 years. Among kidney cancers, the most common cancer was renal cell carcinoma which constituted 964 (86.7%), 1044(87.0%), and 1029 (86.0%) of all kidney neoplasms from 2008 to 2010. (Table 1)The most frequent pathologies in decreasing order were renal cell carcinoma (RCC; 3037, 86.6%), Wilms/neuroblastoma (219, 6.2%), transitional cell carcinoma (83, 2.4%), malignant carcinoma (84, 2.4%), sarcoma (42, 1.2%), other carcinomas (28, 0.8%), and lymphoma (14, 0.4%). Fuhrman grades were extractable in 1849 pathology reports and included grades 1, 2, 3, and 4 in 366 (19.8%), 884 (47.8%), 479 (25.9%), and 120 (6.5%) pathology records. Among the cases of RCC (renal cell carcinoma) that were analyzed, the highest frequency was observed in the 50-69-year age group, which accounted for 47.69 percent of all cases. The pathological stage (T stage) of kidney tumors was extractable in 286 scanned reports and included T1 [113(39.5%), T2 [86 (30.1%), T3 [80 (28.0%), and T4 [7 (0.2%)]. The kidney tumor size was extractable from 424 reports, and the mean/median [IQR] of kidney tumor size was 6.96/6.0 [4.5-9.0] cm. Kidney tumors of ≤ 5 cm, 5.01-10 cm, 10.01-15 cm, and > 15 cm were reported in 160 (37.7%), 197 (46.5%), 59 (13.9%), and 8 (1.9%) reports. The crude incidence rate of kidney cancer during 2008-2010 was 1.60 per 100000 cases, and the average ASR was estimated at 1.99 per 100000 cases. The geographical distribution of ASR per 100000 people is depicted in Figure 1, which represents the average 3-year ASR in Iran based on different provinces. The red colors of the map represent higher average 3-year ASRs.

Distribution of kidney cancer by Province

The provinces of Fars (ASR: 2.79), Tehran and Alborz (ASR: 2.62), Kermanshah (ASR: 2.59), and Bushehr (ASR: 2.61) exhibited the greatest ASRs of renal carcinoma, while the provinces of Tehran and Alborz (IR: 2.26), Fars (IR: 2.2), and Kermanshah (IR: 2.09) had the highest incidence rates (IRs). Table 2 illustrates the comparison of ASR and IR in different ethnic groups, with the Kurd ethnicity having the highest ASR of kidney cancer (ASR: 2.26) and the Baluch ethnicity having the lowest (ASR: 0.94). The Persian ethnicity was used as the reference ethnicity in this table.

Discussion:

This study found a higher incidence of kidney cancer in certain provinces of Iran, such as Fars, Tehran/Alborz, and Kermanshah, from 2008 to 2010. (Table.1)Our investigation revealed a noteworthy dissimilarity with statistical significance (P=0.046) in the incidence of kidney cancer between individuals of Kurd and Persian ethnicity. Further analysis showed that renal cell carcinoma (RCC) was the most common type of renal neoplasm, making up 86.6% of the total instances. To the best of our knowledge, this is the first study to investigate the relationship between kidney cancer incidence and ethnicity in a single country within the Middle Eastern and Central Asian populations. Furthermore, the study provides new data on the distribution of grade, pathological T stage, and size of renal cancer at a national level, which to our best knowledge, has not been previously reported.

According to global reports, kidney cancer is on the rise in most developed countries [13]. According to available data, some Asian countries demonstrate an elevated Standardized Incidence Ratio (SIR) regarding renal carcinoma, including South Korea (4.7 per 100,000), Turkey (4.4 per 100,000), and Mongolia (3.3 per 100,000) [14]. On the other hand, different

nations like Indonesia (1 per 100,000), Turkmenistan (1.2 per 100,000), and Kyrgyzstan (1.4 per 100,000) have low SIR for kidney cancer. Iran is classified as part of central South Asia, with an average ASR of 1.94 per 100,000, which is among the lowest reported ASRs for kidney cancer in the world [5]. Based on obtainable data, the incidence of renal carcinoma among the Iranian populace is inferior in comparison to that of developed nations, with an estimated incidence rate of 1.9 [15].

Available data indicate that Renal cell carcinoma (RCC) is the prevalent category of renal carcinoma, representing roughly 90% of the total occurrences [16, 17]. In 2014, RCC represented 80% of all kidney tumors worldwide [18, 19]. The incidence of RCC is higher in developed countries, which could be attributed to better diagnosis in these countries [13]. North America, Australia, and Europe have reported higher rates of RCC compared to Africa, Japan, India, and China [18, 20, 21]. Available data shows that while renal cell carcinoma (RCC) has generally risen, some nations have experienced a rise and then a decline in both incidence and mortality rates [16]. This trend has been observed in Poland, Sweden, Finland, and the Netherlands [22]. While the incidence of renal cell carcinoma (RCC) is inferior in Iran in comparison with the Western nations, available data shows a gradual augmentation in the incidence of RCC from 2003 to 2009 in Iran, with elevated rates detected in males in comparison to females. It remains unclear whether the escalation in RCC incidence is a result of an enhanced national cancer registry or alterations in the risk factors associated with RCC [20, 23]. Previous studies have identified several risk factors for renal carcinoma, encompassing population features like race, gender, and age [22, 24, 25]. Available data suggests that in Iran, the incidence of kidney cancer is higher among males compared to females, with an age-standardized rate of 2.2 versus 1.7 [15], which is consistent with similar reports from other countries [26-29]. This gender difference in incidence rates may be related to variations in the risk factors for kidney neoplasms between Iranian men and women. However, previous publications from Iran have solely presented the frequency of kidney cancer in a restricted number of provinces or concentrated exclusively on the age range of newly diagnosed cases while disregarding the spatial distribution of kidney tumors across the entire country. Investigating the geographical distribution of kidney neoplasms in Iran is crucial due to the country's diverse ethnic population, as illustrated in Figure 1. According to available data, the incidence of kidney cancer in the central and southeast regions of Iran is relatively high, as indicated by the red areas on the map. These dissimilarities could potentially be ascribed to variances in the occurrence of risk factors linked with renal neoplasms, such as contact with industrial chemicals in urban regions., demographic characteristics of the population, and lifestyle differences [26]. Previous reports have identified Fars (with an age-standardized rate of 3.81 per 100,000) and Ardabil province (with a rate of 2.9 per 100,000) as having the highest incidence of kidney neoplasms among Iranians [5]. A different report identified the Fars and Tehran provinces as having the highest incidence rates of kidney neoplasms [26]. The obtainable data implies that the elevated frequency of renal carcinoma within the Fars province could be linked to the predominance of correlated risk factors, such as poor economic conditions and exposure to environmental hazards within the locality [30]. Available data indicates that over the past three decades, the incidence of renal neoplasm has shown a steady increase. This may be due to improved reporting systems, as well as changes in dietary and lifestyle patterns [31].

One of the objectives of this investigation was to scrutinize whether there are any variations in the incidence of kidney neoplasms among different Iranian ethnic groups residing in various geographical regions of Iran. Among the ethnic groups studied, the highest age-standardized rate (ASR) was observed in the Kurd ethnicity (ASR=2.26). Meanwhile, the minimum ASR was detected among the Baluch population (ASR:0.94), inhabiting a province located in the southeastern region of Iran and sharing ethnic origins with Baluchs in Pakistan. Interestingly, a previous report showed that Baluch ethnicity had the lowest ASR for prostate cancer, which raises concerns about the potential underdiagnosing or underreporting of cancer in this province [32].

When interpreting the findings of this study, it is important to recognize the following limitations: The data used in this study is derived from the Iranian Cancer Registry System for the years 2008-2010. Any limitations in this system, such as unequal access to healthcare across various provinces, may have impacted the results and conclusions of this study. However, it should be noted that this study provides more comprehensive information about the pathological details of kidney cancers in Iran that had not been previously reported.

Conclusions:

The obtainable data implies that, even though the incidence of renal neoplasm in Iran is inferior to that of developed nations, there is an upward tendency in its incidence. Fars province and individuals of Kurd ethnicity have been identified as having the highest age-standardized rates (ASR) of kidney cancer. Additional investigations are suggested to pinpoint the risk factors associated with renal carcinoma in these communities. The findings of this study offer valuable information that can aid in the screening and management of renal tumors in the times to come.

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The authors declare no conflict of interest.

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Table 1. Frequency of kidney cancer, age-standardized rate (ASR), and incidence rate (IR) in Iran from 2008-2010.

year	**Frequency**	**%**	**Male**		**Female**		**ASR** Per 100000	**IRR** Per 100000
			n	**%**	**n**	**%**		
2008	1111	31.7	698	62.8	413	37.2	1.95	1.53
2009	1200	34.2	743	61.9	457	38.1	2.05	1.65
2010	1197	34.1	725	60.6	472	39.4	1.97	1.62
Total	3508	100	2166	61.7	1342	38.3	1.99*	1.60

* Average of 3-year ASRs

Table 2. Incidence rate of kidney cancer in different ethnicities.

kidney cancer					
Ethnicity	Age-adjusted incidence rate **(95% CI)**	**Crude Incidence rate (95% CI)**	P-Value ASR a	P-Value IRR b	Ethnicity
Kurd	**1.052216** (0.46-2.4)	1.27 (0.65, 2.47)	0.90	0.47	**Kurd**
Turk &Turkmen	**0.7787** (0.35-1.72)	0.803 (0.501, 1.29)	0.54	0.364	**Turk &Turkmen**
Arab	**0.92805** (0.29-2.96)	0.76 (0.331, 1.73)	0.90	0.508	**Arab**
Lor	**0.719036** (0.24-2.13)	0.84 (0.46, 1.52)	0.55	0.573	**Lor**
Baluch	0.9422	0.429		0.264	**Baluch**

[a] Anova test; [b] Poisson regression; * significant at level of 0.05
Persian ethnicity was considered as the comparison group

Legends to figures:

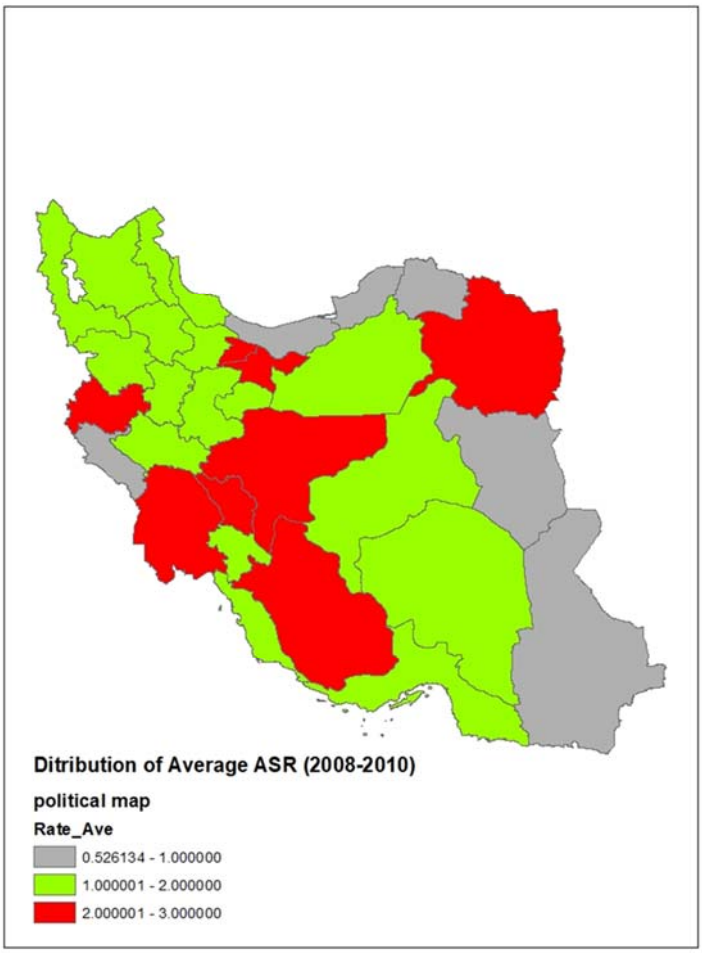

Figure 1. The average provincial 3-year ASR of kidney cancer in Iran.

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