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Epidemiological Trends and Risk Factors Associated with Renal Cell Carcinoma

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Abstract

Background: Renal cell carcinoma (RCC) is most prevalent form of kidney cancer and represents a large global health burden. There are many demographic, environmental, and lifestyle factors to its incidence. Understanding the trends is necessary in order to prevent and manage effectively. The objective of this study was to evaluate the epidemiological trends and risk factors of RCC in a tertiary care hospital in Bangladesh.

Methods: A retrospective study was conducted at Department of Urology, Reliance General and Renal Hospital, Dhaka, from April 2023 to March 2024. Total 40 patients diagnosed with renal cell carcinoma are included in this study following the inclusion and exclusion criteria. Data on demographic characteristics, tumor stages, histological subtypes, and risk factors were collected from medical records and analyzed using SPSS (version 25.0).

Results: Among the 40 patients, mostly were male (72.5%). Stage II tumors were most common (40.0%), and clear cell carcinoma was the predominant subtype (62.5%). Significant risk factors included smoking (72.5%), obesity (30.0%), hypertension (67.5%), and urban residence (60.0%). Family history of RCC was noted in 17.5% of cases.

Conclusion: RCC in this cohort reflects global trends, with a predominance of modifiable risk factors. Targeted interventions addressing smoking, obesity, and hypertension, along with early detection strategies, is crucial for reducing the RCC burden in resource-limited settings.

Keywords: Renal cell carcinoma, epidemiology, risk factors, clear cell carcinoma

Introduction

The most prevalent type of kidney cancer in adults is renal cell carcinoma (RCC), which makes about 90% of all occurrences globally [1]. In the past decade there has been a great progress in our knowledge of its epidemiology, associated risk factors and it has exerted significant impact on clinical management and public health strategies. However, RCC represents a significant global health burden with rising incidence rates in many regions [2].

RCC epidemiology presents a complex interplay between genetic predisposition, environmental exposures, and demographic factors. Incidence continues to rise sharply after the 5th decade of life, and age has always been an important risk factor [3]. There are also gender disparities which are

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highlighted as RCC is almost 2 times more prevalent in males compared to females [4].

The influence of environmental factors is illuminated by geographic variability in RCC incidence. Regions with higher prevalence rates tend to have unique profiles of risk factor exposure, including tobacco use and obesity and industrial pollutants [5]. For example, the smoking risk factor is one of the most well established modifiable risk factor and it is responsible for one third of cases worldwide [6].

The latest advances of molecular epidemiology have unraveled the genetic mutations' role in RCC initiation. Among RCC subtypes, clear cell carcinoma, the most prevalent RCC subtype, frequently harbors mutations in the von Hippel-Lindau (VHL) tumor suppressor gene and the VHL mutation pathway is a key pathway for renal tumorigenesis [7]. There are other subtypes of RCC, including papillary and chromophobe RCC, that have corresponding genetic alterations with impact on prognosis and response to therapy [8].

In addition to genetic and environmental factors, there are certain medical conditions that predispose an individual to develop RCC. Notable risk factors for chronic kidney disease and acquired cystic kidney disease are also important to remember as they indicate the intricacy with which renal health is related to cancer susceptibility. Furthermore, inheritable syndromes like von Hippel-Lindau disease and hereditary papillary RCC syndrome have extremely elevated lifetime risk [10].

RCC has seen great advances in its management, largely attributed to targeted therapies and immunotherapy. Despite these advances, early detection and prognostication remain difficult and especially difficult in the setting of advanced stage disease [11]. Genetic profiling and environmental exposure data integration in an effective risk stratification model will improve the ability to refine clinical decision making and optimize patient outcomes [12].

The objective of this study is to synthesize current knowledge on the epidemiological trends and on the multiple risk factors for RCC. It aims to integrate and provide a detailed overview, accumulated from numerous populations, and using contemporary research methodologies, to inform preventive strategies and therapeutic innovations.

Objective

The objective of this study was to assess the etiological trends and risk factors associated with renal cell carcinoma (RCC).

Methodology & Materials

This retrospective study conducted at Department of Urology, Reliance General and Renal Hospital, Dhaka, Bangladesh from 01 April 2023 to March 2024. Total 40 patients diagnosed with renal cell carcinoma are included in this study.

Selection Criteria

Inclusion Criteria

- Patients diagnosed with renal cell carcinoma (RCC).
- Patients aged 18 years or older.
- Who give informed consent.

Exclusion Criteria

- History of prior primary malignancy.
- Patients with incomplete or missing medical records.
- Patients who declined to take part in the trial.

Data collection

This retrospective study utilized medical records of patients diagnosed with renal cell carcinoma (RCC) at Reliance General and Renal Hospital, Dhaka, from April 2023 to March 2024. A structured data collection form was employed to extract demographic data, tumor stage, histological subtypes, and risk factors including smoking, BMI, hypertension, residence, occupational exposure and family history. The accuracy and completeness of the data were examined. The process was maintained confidentially. The collected data were analyzed to identify epidemiological trends and risk factors for RCC among the study population.

Statistical analysis of data

Data were analyzed using SPSS software (version 25.0). To summarize categorical variables, descriptive statistics such as percentages and frequencies were employed. Results were presented in tables and figures to illustrate demographic characteristics, tumor stages, histological subtypes, and associated risk factors of renal cell carcinoma.

Results

Table 1: Demographic characteristics of patients (n=40)

Characteristics		Frequency (n)	Percentage (%)
Age group (years)	<50	9	22.50%
	50-59	17	42.50%
	≥60	14	35.00%
Sex	Male	29	72.50%
	Female	11	27.50%

Table 1 summarizes the demographic profile of patients diagnosed with renal cell carcinoma (RCC). The majority of patients were male 29 (72.5%), with females accounting for 11 (27.5%). Most patients were between 50-59 years old 17 (42.5%), followed by those aged ≥60 years 14 (35.0%), and the remaining were <50 years old 9 (22.5%).

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Table 2: Distribution of tumor stage and subtypes (n=40)

Parameter		Frequency (n)	Percentage (%)
Tumor stage	Stage I	8	20.00%
	Stage II	16	40.00%
	Stage III	9	22.50%
	Stage IV	7	17.50%
Histological subtype	Clear cell	25	62.50%
	Papillary	8	20.00%
	Chromophobe	4	10.00%
	Others	3	7.50%

Table 2 shows the tumor stages and histological subtypes in RCC patients. Stage II was the most common tumor stage 16 (40.0%), followed by Stage III 9 (22.5%), Stage I 8 (20.0%), and Stage IV 7 (17.5%). Among histological subtypes, clear cell carcinoma was predominant 25 (62.5%), followed by papillary 8 (20.0%) and chromophobe 4 (10.0%). Other subtypes accounted for 3 (7.5%) of cases.

Table 3: Etiology and risk factors associate with RCC (n=40)

Factors		Frequency (n)	Percentage (%)
Smoking	Current	15	37.50%
	Former	14	35.00%
	Non	11	27.50%
BMI	<25	7	17.50%
	25-29.9	21	52.50%
	≥30	12	30.00%
Hypertension	Present	27	67.50%
	Absent	13	32.50%
Residence	Urban	24	60.00%
	Rural	16	40.00%
Occupational exposure	Farmer	8	20.00%
	Business	11	27.50%
	Employee	8	20.00%
	House maker	9	22.50%
	Retired	4	10.00%
Family history of RCC	Yes	7	17.50%
	No	33	82.50%

Table 3 highlights the distribution of etiological and risk factors among renal cell carcinoma patients. Smoking was prevalent, with 15 (37.5%) current smokers and 14 (35.0%) former smokers. Obesity (BMI ≥30) was observed in 12 (30.0%), while 21 (52.5%) were overweight (BMI 25-29.9). Hypertension was present in 27 (67.5%) of cases. Urban residence was noted in 24 (60.0%) of patients, and occupational exposures varied, with business 11 (27.5%) and housemakers 9 (22.5%) being common categories. Family history of RCC was noted in 7 (17.5%) patients.

Discussion

Renal cell carcinoma (RCC) constitutes a major public health issue worldwide, with considerable geographic and population differences in incidence and mortality. Our study, conducted at Reliance General and Renal Hospital in Dhaka, Bangladesh, provides insights into the demographic characteristics, tumor stages, histological subtypes, and associated risk factors of RCC within our patient.

The male predominance observed in our study (72.5% male) aligns with global data indicating higher RCC incidence in males. Similar gender disparities were reported by Capitanio et al. and they attributed the differences to differences in risk factor exposures and possibly hormonal influences [2]. The age distribution in our cohort, consisting of 42.5% of patients aged 50–59 years and 35.0% of patients aged ≥60 years, is in agreement with the notion that RCC incidence increases with age, especially after the fifth decade [4].

Based on tumor stage, we found that 40.0% of patients had Stage II tumors and 22.5% had Stage III tumors. In contrast to some Western studies, early-stage detection is more common, which is likely attributable to the general frequent use of imaging modalities, frequently resulting in incidental findings [3]. Consistent with global trends, in our cohort clear cell carcinoma (62.5%) was most common, which is in the range of 75-80% of RCC cases occurring worldwide [13].

We identified several modifiable risk factors associated with RCC in our study. Our patients had a high smoking prevalence with 37.5% of current smokers and 35.0% of former smokers. There has been strong evidence that RCC is an important risk factor for smoking, which is demonstrated by the meta-analysis of Hunting et al. showing the dose response relationship between the intensity of smoking and RCC risk [6]. Notably, we also saw obesity, with 30.0% of patients obese (BMI >30) and 52.5% were overweight (BMI 25–29.9). Obesity is recognized as a risk factor for RCC, possibly because of concomitant metabolic and hormonal changes [14].

Hypertension was present in 67.5% of our patients, underscoring its role as a significant risk factor for RCC. As Vart et al. conducted a systematic review, it confirmed an association between both hypertension and elevated blood pressure with increased RCC risk, and that also antihypertensive medication use would increase RCC risk [15]. Most of our patients (60.0%) also lived in urban areas which potentially reflect lifestyle-related factors, including dietary habits and exposure to environmental pollutants. However, research regarding risk of RCC among urban versus rural residents has shown contradictory results, which suggests further investigations are needed [16].

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Although there were varied occupational exposures in our cohort, a substantial number worked in business (27.5%) and as housemakers (22.5%). However, certain occupations in which workers are exposed to particular carcinogens were shown to increase the risk of developing RCC, yet there was little evidence of a strong association with high-risk occupations [17]. The presence of family history of RCC in 17.5% of patients in our cohort suggests that a subset of our patients may have a genetic predisposition to RCC. RCC pathogenesis has been linked with genetic factors such as mutations in the von Hippel-Lindau (VHL) gene [18].

Our study is therefore representative of the global trends in RCC by considering the demographic characteristics and the histological subtypes. The finding that modifiable risk factors were identifiable in the current cohort highlights the importance of developing public preventive strategies to reduce RCC incidence through modifiable behavioral and pathophysiological factors as well as comorbid condition management.

Conclusion

This study highlights the prevalence of modifiable risk factors, including smoking, obesity, and hypertension, in patients with renal cell carcinoma. The most prevalent histopathological type was clear cell carcinoma. Early detection and targeted interventions addressing these risk factors are crucial for reducing RCC burden and improving patient outcomes in resource-limited settings like Bangladesh.

Limitations of this study

Our study's limitations include its single-center design and relatively small sample size, which may affect the generalizability of the findings. Furthermore, the study may be biased by the retrospective nature of the study.

Recommendations

Modifiable risk factors such as smoking, obesity and hypertension require targeted awareness programs. Increased prevention and management of RCC as recommendations include early detection through regular screening for high risk groups, improved access to diagnostic facilities, and larger multicenter studies.

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Conflicts of interest

There are no conflicts of interest.

References

1. Ferlay J, Soerjomataram I, Dikshit R, et al., Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012. International journal of cancer 136 (2015): E359-386.
2. Capitanio U, Bensalah K, Bex A, et al., Epidemiology of renal cell carcinoma. European urology 75 (2019): 74-84.
3. Chow WH, Dong LM, Devesa SS. Epidemiology and risk factors for kidney cancer. Nature Reviews Urology. 7 (2010): 245-257.
4. Ljungberg B, Campbell SC, Cho HY, et al., The epidemiology of renal cell carcinoma. European urology 60 (2011): 615-621.
5. Teras LR, Diver WR, Turner MC, et al., Residential radon exposure and risk of incident hematologic malignancies in the Cancer Prevention Study-II Nutrition Cohort. Environmental research 148 (2016): 46-54.
6. Hunt JD, Van der Hel OL, McMillan GP, et al., Renal cell carcinoma in relation to cigarette smoking: meta-analysis of 24 studies. International journal of cancer 114 (2005): 101-118.
7. Cancer Genome Atlas Research Network. Comprehensive molecular characterization of papillary renal-cell carcinoma. New England Journal of Medicine 374 (2016): 135-145.
8. Davis CF, Ricketts CJ, Wang M, et al., The somatic genomic landscape of chromophobe renal cell carcinoma. Cancer cell 26 (2014): 319-330.
9. Chow WH, Gridley G, Fraumeni Jr JF, et al., Obesity, hypertension, and the risk of kidney cancer in men. New England Journal of Medicine 343 (2000): 1305-1311.
10. Latif F, Tory K, Gnarra J, et al., Identification of the von Hippel-Lindau disease tumor suppressor gene. Science. 260 (1993): 1317-1320.
11. Hsieh JJ, Purdue MP, Signoretti S, et al., Renal cell carcinoma. Nature reviews Disease primers 3 (2017): 1-9.
12. Hakimi AA, Pham CG, Hsieh JJ. A clear picture of renal cell carcinoma. Nature genetics 45 (2013): 849-850.
13. Moch H, Cubilla AL, Humphrey PA, et al., The 2016 WHO classification of tumours of the urinary system and male genital organs—part A: renal, penile, and testicular tumours. European urology 70 (2016): 93-105.
14. Renehan AG, Tyson M, Egger M, et al., Body-mass index

and incidence of cancer: a systematic review and meta-analysis of prospective observational studies. The lancet 371 (2008): 569-578.

15. Rodriguez-Valadez JM, Tahsin M, Masharani U, et al., Potential mediators for treatment effects of novel diabetes medications on cardiovascular and renal outcomes: a meta-regression analysis. Journal of the American Heart Association 13 (2024): e032463.
16. Weikert S, Ljungberg B. Contemporary epidemiology of renal cell carcinoma: perspectives of primary prevention. World journal of urology 28 (2010): 247-252.
17. Pesch B, Haerting J, Ranft U, et al., Occupational risk factors for renal cell carcinoma: agent-specific results from a case-control study in Germany. International journal of epidemiology 29 (2000): 1014-1024.
18. Linehan WM, Ricketts CJ. The metabolic basis of kidney cancer. InSeminars in cancer biology 23 (2023): pp. 46-55).

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