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Original Research Article

Epidemiological and Histopathological Study of Renal Cell Carcinoma - A Single Center Experience

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Abstract

Aim: The aim of the present study was to assess the epidemiological and histopathological study of renal cell carcinoma.

Methods: The present study was conducted at department of Urology, IGIMS Patna, Bihar, India and included all patients who have received the diagnostic code of RCC in agreement with the International Classification of Diseases (ICD-10) system and underwent contrast-enhanced computed tomography of the abdomen and nephrectomy over 5-years using the electronic hospital information system (HIS). The study included 100 patients with histologically confirmed renal cell carcinoma.

Results: 45% of the cases were elder (≥60 years), and 40% were between 40–59 years, while 15% of the patients were younger than 40 years. The gender distribution of RCC was 70% male and 30% female. The right kidney harbored most of the masses in 58%, 40% in the left, while 2% were bilateral involvement. Clear cell RCC was the most common histological type in about 69%, followed by papillary RCC (14%), unclassified RCC (10%), and Chromophobe RCC was the least common in 7% of the cases. Half of the patients held tumor stage 2, followed by T1 in 22%, 15% in T4, and 13% in T3. WHO/ISUP grading system revealed that 47% patients had high-grade tumors (G4 in 27% and G3 in 20%), while the remaining 53% had low-grade tumors (G2 in 45% and G1 in 8%). Assessment of gender variation of tumor stage, grade, and comorbidities revealed a statistically significant difference between the pattern of stage and grade of RCC and gender group.

Conclusion: The young patients had a higher tumour stage. Clear cell RCC was the most common histologic type, though less common than that is reported in literature. Less access to the health services and facilities, the absence of the awareness of the population, limited availability of endourological equipment, inadequate expertise and imaging modalities, a far distance from health services, and the low socioeconomic status lead to most of the patients living in low-income countries presenting with advanced diseases.

Keywords: epidemiological, histopathological, renal cell carcinoma

Introduction

Renal cell carcinoma (RCC) accounts for 3% of all adult cancers and 85% of all kidney tumours. [1] Incidence of RCC is lower in Asian region, particularly in India, probably owing to lack of reporting. [2] The incidence is expected to rise in India due to increasing life expectancy, rising awareness, better diagnostic facilities and growing prevalence of risk factors such as obesity. [3] Most of the data about RCC are from Western countries; and data from India are scarce. [4]

There are several risk factors linked to RCC. Smoking is an independent risk factor for developing RCC. [5] Globally, obesity has been estimated to account for over 18% of RCC cases. [6] There is evidence that both obesity and hypertension (HTN) are frequently present in the same patient population. Further HTN is also an independent risk factor for the development of RCC. The most frequent histological types of RCCs include clear cell RCC, papillary RCC, and chromophobe RCC. [7] Clear cell carcinoma is observed at a frequency of 75% of all RCCs. It mainly arises from the epithelium of the proximal tubule. Papillary RCC accounts for approximately 15% of all RCCs and it mainly arises from the epithelium of the proximal tubule. While chromophobe RCCs have been observed at a frequency of ~5% of kidney tumours. It is thought to arise from the distal nephron and epithelium of the collecting tubule. [8,9]

Most of the epidemiological studies of RCC were done in western countries. [10,11] Only a few studies from India reported the study on incidence, survival, risk factors, complications, and stages of RCC. [12-14] Despite the advancements in diagnosis and management of RCC in the last two decades, RCC still is the most lethal urological cancer resulting in a mortality rate of about 40%. [15] In recent years, RCC incidence increasing worldwide and per nation, despite the majority of the renal tumors being identified accidentally through medical imaging (abdominal ultrasound and computed tomography). [16] In cases of metastatic tumors, the mortality of RCC is high, with a low survival rate of about 0–13%. [17]

The aim of the present study was to assess the epidemiological and histopathological study of renal cell carcinoma.

Materials and Methods

The present study was conducted at department of Urology, IGIMS Patna, Bihar, India for 18 months and included all patients who have received the diagnostic code of RCC in agreement with the International Classification of Diseases (ICD-10) system and underwent contrast-enhanced computed tomography of the abdomen and nephrectomy over 5-years using the electronic hospital information system (HIS). The study included 100 patients with histologically confirmed renal cell carcinoma. Patients with the Bosniak classification system indicating benign renal cyst, those with inflammatory and metastatic mass with known other primary origins, and patients with incomplete data were excluded from the study.

Investigated parameters of the patients included age of the patients, gender group, site of the tumor (right, left, and bilateral), location of the mass (upper pole, middle pole, lower pole, and more than one pole of the kidney), clinical tumor stage, lymph node involvement, distant metastasis, and type of operation (laparoscopic, open vs radical, partial nephrectomy). Axial (with 1 mm cross-section), coronal and sagittal planes of CT abdominopelvic with and without contrast were used to determine renal mass size and localization. Histopathological results such as type of renal cell carcinoma, grade of the tumor in accordance to the World Health Organization/International Society of Urologic Pathology. (WHO/ISUP) grading systems were evaluated too.

WHO/ISUP grading system 2016, fourth edition, is the current internationally recommended system for typing renal tumors and was used to report the histopathological findings. T stage was classified into pTX: primary tumor cannot be assessed, pT0: No evidence of primary tumor, pT1a: ≤ 4 cm, limited to the kidney, pT1b: > 4 cm and ≤ 7 cm, limited to the kidney, pT2a: > 7 cm and ≤ 10 cm, limited to the kidney, pT2b: > 10 cm, limited to the kidney, pT3a: invades renal vein/branches, perirenal fat, renal sinus fat or pelvicalyceal system, pT3b: extends into vena cava below the diaphragm, pT3c: extends into vena cava above the diaphragm or invades vena cava wall, pT4: invades beyond Gerota fascia, including a direct extension to the adrenal gland.

WHO/ISUP grading system: Grade 1: Nucleoli are absent or inconspicuous and basophilic at 40x. Grade 2: Nucleoli are not prominent at 10x but visible and eosinophilic at 40x. Grade 3: Nucleoli conspicuous and eosinophilic at 10x. Grade 4: Extreme nuclear pleomorphism, multinucleated cells, and rhabdoid or sarcomatoid differentiation.

The ethical research board committee approved the research. In addition, all study participants and a parent of participants under 18 years of age previously consented to use their medical and surgical data in this study. This study was carried out in accordance to the Helsinki Declaration contents.

Statistical analyses were used in the Statistical Package for Social Sciences (SPSS-IBM) for Windows version 23. The data were analyzed using univariate descriptive statistics. The frequencies and percentages, as well as the mean ± (SD), were presented. Cross-tabulations were used to determine the association between the variables.

Results

Table 1: Sociodemographic Characteristics

Variables	No. of thePatients	Percentage
Age categories		
<18 years	8	8
19–39 years	7	7
40–59 years	40	40
>60 years	45	45
Gender		
Male	70	70
Female	30	30
Comorbidities		
Smoking	16	16
Hypertension	20	20

Diabetes	26	26
Obesity	25	25
Site of the Tumor		
Right	58	58
Left	40	40
Bilateral	2	2
Location of the Tumor		
Upper pole	20	20
Mid pole	15	15
Lower pole	18	18
>1 pole	47	47

45% of the cases were elder (≥60 years), and 40% were between 40–59 years, while 15% of the patients were younger than 40 years. The gender distribution of RCC was 70% male and 30% female. The right kidney harbored most of the masses in 58%, 40% in the left, while 2% were bilateral involvement.

Table 2: Radiological and Histopathological Features

Variable	No. of Patients	Percentage
Tumor stage		
T1a	12	12
T1b	10	10
T2a	30	30
T2b	20	20
T3a	7	7
T3b	4	4
T3c	2	2
T4	15	15
Lymph node involvement		
Yes	35	35
No	65	65
Distant metastasis		
Yes	28	28
No	72	72
Type of RCC		
Clear cell	69	69
Papillary	14	14
Chromophobe	7	7
Unclassified RCC	10	10
Grade		
Grade 1	8	8
Grade 2	45	45
Grade 3	20	20
Grade 4	27	27

Clear cell RCC was the most common histological type in about 69%, followed by papillary RCC (14%), unclassified RCC (10%), and Chromophobe RCC was the least common in 7% of the cases. Half of the patients held tumor stage 2, followed by T1 in 22%, 15% in T4, and 13% in T3. WHO/ISUP grading system revealed that 47% patients had high-grade tumors (G4 in 27% and G3 in 20%), while the remaining 53% had low-grade tumors (G2 in 45% and G1 in 8%).

Table 3: Gender Variation of Tumor Type, Stage, Grade and Associated Comorbidities

	Male	Female	P-value
Age categories			
<18 years	5	3	0.710
19–39 years	6	1	
40–59 years	25	15	
>60 years	34	21	
Comorbidities			
Smoking	16	0	0.03
Hypertension	14	6	
Diabetes Obesity	16	10	
	9	14	
Type of RCC Clear			
cell Papillary	48	21	0.169
Chromophobe	10	4	
Adult, NOS	6	1	
	6	4	
T stage			
Stage 1	14	8	<0.001
Stage 2	31	19	
Stage 3	11	2	
Stage 4	14	1	
Grade			
Grade 1	3	5	<0.001
Grade 2	25	20	
Grade 3	16	4	
Grade 4	26	1	

Assessment of gender variation of tumor stage, grade, and comorbidities revealed a statistically significant difference between the pattern of stage and grade of RCC and gender group.

Discussion

Renal cell carcinoma (RCC) is a molecularly and histopathologically group of heterogeneous tumors. The most common subtypes of RCC are Clear cell RCC (65–70%), papillary RCC (15–20%), and chromophobe RCC (5–7%), respectively. [18] The prevalence of renal cell carcinomas (RCCs) represents 3% of all visceral neoplasms and is the seventh most common cancer with an increasing prevalence. [15] RCC accounts for 90% of tumors originating from the kidneys. It is common in the sixth and seventh decade of life with a median age of 64 years and primarily is a disease of the elderly, with a twofold male predominance. [19,20] Smoking, male gender, age, hypertension, and obesity are several risk factors related to RCC. [21,22] A first-degree relative is also associated with an increased risk of having RCC. [23]

45% of the cases were elder (≥60 years), and 40% were between 40–59 years, while 15% of the patients were younger than 40 years. The gender distribution of RCC was 70% male and 30% female. Asian population has a reportedly low incidence of RCC, which may be multifactorial, including genetic and environmental factors or other factors like low reporting. [24] The younger age of presentation may also be attributable to environmental factors, dietary factors or genetic susceptibility, which needs to be conclusively addressed by larger epidemiological studies. [25] The right kidney harbored most of the masses in 58%, 40% in the left, while 2% were bilateral involvement. Clear cell RCC was the most common histological type in about 69%, followed by papillary RCC (14%), unclassified RCC (10%), and Chromophobe RCC was the least common in 7% of the cases. A previous histopathological study from Northern India, revealed that the majority of RCC cases at presentation were between 39 to 59 years of age (~60%) and nearly 40% of patients presented at <60 years of age. [26] Another noteworthy study in Indian literature that had a relatively small sample size (n=142) also showed RCC was predominant in young patients aged <60 years. [13] Similarly, the present study noted the remarkable prevalence of RCC in young individuals aged ≤60 years (65.0%) as compared to older individuals aged >60 years (35.0%). Evidence from a study that included the adult Indian population demonstrated corroborating observations thereby suggesting RCC is relatively frequent among young individuals aged <60 years. [27] Moreover, a decreasing trend in the prevalence of RCC was observed with increasing age groups suggesting an inverse relationship between age and incidence of RCC. In contrast to above-aforementioned studies, a recently published population based analysis involving a larger population (n=114,539) noted the higher prevalence of RCC in older patients (58-90 years; 64.9%) as

compared to the young adult population (18-57 years; 35.1%). [28]

Half of the patients held tumor stage 2, followed by T1 in 22%, 15% in T4, and 13% in T3. WHO/ISUP grading system revealed that 47% patients had high-grade tumors (G4 in 27% and G3 in 20%), while the remaining 53% had low-grade tumors (G2 in 45% and G1 in 8%). Assessment of gender variation of tumor stage, grade, and comorbidities revealed a statistically significant difference between the pattern of stage and grade of RCC and gender group. A 10-year retrospective Indian study, which included 198 patients (n=36, 18% <40 years and n=162, 82% older patients) reported that 63.8% of younger patients were diagnosed with RCC stages 1 and 2. [29] Another 10-year review study of 445 (n=104, 23% patients 40 years or younger) presented that younger patients had more aggressive diseases such as positive lymph node and metastasis at the time of diagnosis. [30] The present study showed that the rate of young patients was 13%. The previously reported rate ranges between 3% and 7% in patients <40-years. However, an increasing incidence rate in this age group was observed in the last decades compared to older patients. [31]

A recent study by Singh A and Urry RJ, studied the intra and postoperative complications of laparoscopic and open nephrectomy. Results concluded that blood loss and transfusion rates were significantly lower in the laparoscopy group than in open nephrectomy. [32] A study by Reifsnyder JE et al[33], reported that patients who underwent laparoscopy had more major complications compared to the patients who underwent open nephrectomy.

Conclusion

The young patients had a higher tumour stage. Clear cell RCC was the most common histologic type, though less common than that is reported in literature. Less access to the health services and facilities, the absence of the awareness of the population, limited availability of endourological equipment, inadequate expertise and imaging modalities, a far distance from health services, and the low socioeconomic status lead to most of the patients living in low-income countries presenting with advanced diseases.

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