Scientific Research Publishing

Open Journal of Urology, 2026, 16(4), 201-213
https://www.scirp.org/journal/oju
ISSN Online: 2160-5629
ISSN Print: 2160-5440

Epidemiological, Clinical and Prognostic Features of Renal Cancer in a Resource-Limited Setting: A 10-Year Retrospective Cohort Study in Douala, Cameroon

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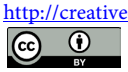
How to cite this paper: Nwaha, A.S.M., Epoupa, F.N., Djousse, B.D., Ngapagna, Y.M., Ngandeu, J.M., Fouda, J.C., Mekeme, J.B.M., Kpanou, Y.A., Moly, L.Z., Ndzama, A., Wouliapouognigni, A., Hamza, H., El Alaoui, M., Leku, B., Essama, J.P., Nguimphe, D., Fonji, M.E., Ndikumana, O.S., Moby, H.E.M. and Ngowe, M.N. (2026) Epidemiological, Clinical and Prognostic Features of Renal Cancer in a Resource-Limited Setting: A 10-Year Retrospective Cohort Study in Douala, Cameroon. *Open Journal of Urology*, **16**, 201-213.
https://doi.org/10.4236/oju.2026.164020

Received: February 27, 2026
Accepted: April 26, 2026
Published: April 29, 2026

Abstract

Introduction: Kidney cancer is the 14th most frequent cancer and the 3rd urological cancer, with a steadily increasing annual incidence. Despite the accuracy of diagnostic methods and improvements in management strategies, several African studies have shown that diagnosis is often delayed, resulting in a poorer prognosis. In this study, we investigated the epidemiological, clinical, and therapeutic characteristics, as well as factors associated with 5-year survival, in patients with kidney cancer at Douala General Hospital and Laquintinie Hospital in Douala. **Methodology:** We conducted a retrospective cohort study from January 1, 2014, to December 31, 2023, at the Douala General Hospital and Laquintinie Hospital of Douala. Medical records of patients older than 17 years presenting with a renal tumour suspected of malignancy based on clinical evidence and/or histologically proven were included. Statistical analysis was performed using R software version 4.1.2. Statistical significance was set at $p < 0.05$. **Results:** Among 623 urological cancers, 28 patients with renal cancer were analysed (prevalence: 5.1%). The mean age was 49.93 ± 11 years with a male-to-female ratio of 1.8:1. Identified histories included hypertension 25%



(7/28), overweight-obesity 50% (14/28), and family predisposition 7.1% (2/28). The presenting mode was the classic triad (flank pain-haematuria-lumbar mass) in 35.7% (10/28); CT urogram was the preferred diagnostic orientation test. Stage III (39.2%) and stage IV (32.1%) were most frequent. The predominant histological type was clear cell carcinoma (42.8%). Extended open radical nephrectomy was performed in 55.5% among operated patients (n = 18). Targeted therapies were administered in 10.7% (3/28) and chemotherapy in 17.8% (5/28). Five-year survival probability was 12.5% with a median survival of 32 months. Right kidney involvement was associated with poor prognosis. **Conclusion:** Kidney cancer affects both young and elderly patients. Diagnosis is suggested by the triad flank pain-haematuria-lumbar mass, suspicious radiology, and/or histopathology. Management is predominantly surgical. Survival is low and prognosis is generally poor.

Keywords

Kidney Cancer, Prevalence, Clear Cell Carcinoma, Nephrectomy, Chemotherapy, Survival

1. Introduction

Kidney cancer is a primary malignant tumor of the renal parenchyma, whose most frequent histological type is clear cell carcinoma, accounting for 85% of renal tumors in adults [1]. Epidemiologically, it ranks as the 14th most common cancer, the 15th in terms of mortality, and the 3rd most frequent urological cancer after prostate and bladder cancers, with increased predominance among individuals over 50 years of age [2].

Over the past three decades, an increase in kidney cancer incidence has been observed in industrialised countries, notably with a 1% annual increase between 2010 and 2019 in the United States of America (USA), mainly due to improvements in screening techniques [3]. Thus, in 2022 worldwide, there were 434,840 new cases and 155,953 deaths across all ages and sexes. In the USA in 2023, kidney cancer accounted for 81,800 new cases and 14,390 deaths. In France, the overall standardized incidence rate is 35.4 per 100,000 persons; in Senegal, 57 new cases were recorded between 2014 and 2018, and in Togo, 32 new cases were reported between 2009 and 2013 [2] [4]-[7].

Although diagnosis is increasingly incidental in industrialised countries, it still follows well-defined clinical and paraclinical characteristics. Therapeutically, the benefits of total nephrectomy are well established; however, it does not provide adequate oncological control when the cancer is not confined to the kidney. The prognosis of locally advanced and metastatic forms has been greatly improved with the advent of immunotherapy, anti-angiogenic agents, and targeted therapies [4] [8].

Prognostic factors identified by various authors are grouped into four categories: **Clinico-biological factors** (sociodemographic data, signs and symptoms, pa-

tient performance status, calcium, haemoglobin, platelets, albumin, etc.); **Anatomical factors** (TNM classification, stage); **Histological factors** (histological subtype, microscopic vascular invasion); **Molecular factors** [9] [10].

Five-year survival rates reported were 73% in Canada in 2021; 77% in the USA between 2012 and 2018; 62.8% in Somalia; and 40% in Sudan between 2000 and 2015. Survival also depends on stage: 81% for stage I, 74% for stage II, 53% for stage III, and 8% for stage IV [5] [11]-[13].

In Cameroon in 2021, kidney cancer moved from the 3rd to the 2nd most frequent urological cancer after prostate cancer, with an incidence rate of 3.36% among adults, predominantly affecting individuals over 50 years of age [14] [15]. However, although it remains a relatively rare disease, in Africa its diagnosis is mostly made at an advanced stage, resulting in a lower probability of survival. Furthermore, studies conducted in our context are mainly epidemiological. For this reason, we decided to conduct this study in two hospitals in the city of Douala in order to complement previous research.

2. Materials and Methods

We conducted a 10-year retrospective cohort study from January 1, 2014 to December 31, 2023 in the urology and oncology units, respectively, within the surgical and oncology departments of the participating hospitals, namely the Douala General Hospital (HGD) and the Laquintinie Hospital of Douala (HLD).

2.1. Case Definition of Renal Cancer

Patients were considered to have renal cancer if they met either of the following criteria: (i) histologically confirmed renal malignancy based on pathological examination of surgical specimens or biopsy samples; or (ii) a renal mass highly suggestive of malignancy on imaging, defined by contrast-enhanced computed tomography showing a solid renal tumor with characteristic features such as heterogeneous enhancement, irregular margins, necrosis, local invasion, venous extension, or presence of lymph node or distant metastases, in a compatible clinical context (e.g., hematuria, flank pain, or palpable mass).

To minimize misclassification bias, only cases with concordant clinical and radiological findings strongly suggestive of malignancy were included in the absence of histological confirmation. Cases with indeterminate imaging features, cystic lesions without suspicious characteristics (e.g., Bosniak I - II), or insufficient diagnostic data were excluded. Whenever available, histopathological results were used as the reference standard.

2.2. Ethical Considerations

This study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the Institutional Ethics Committee of the Douala General Hospital and the Laquintinie Hospital of Douala. Administrative authorization to access medical records was granted by the respective

hospital authorities.

Given the retrospective design of the study and the use of anonymized patient data, the requirement for informed consent was waived by the ethics committee. Patient confidentiality was strictly maintained throughout the study by de-identifying all data during collection and analysis.

After obtaining ethical clearance, we included all patients managed for primary kidney cancer presenting with a renal tumour suspected of malignancy based on a combination of clinical evidence and/or histological confirmation. We excluded patients treated for secondary renal cancer as well as those with incomplete medical records. Sampling was non-random, consecutive, and exhaustive. The variables studied were epidemiological, clinical, therapeutic, histopathological, and prognostic.

2.3. Outcome Definition and Survival Analysis

The primary endpoint was **overall survival (OS)**, defined as the time from the date of diagnosis (date of first imaging or histological confirmation of renal cancer, whichever occurred first) to death from any cause. Patients who were alive at the end of the study period (December 31, 2023) or lost to follow-up were **censored** at the date of last known contact.

Vital status was ascertained through review of hospital records and, where available, follow-up consultations or documented communication. Deaths from causes other than renal cancer were included as events in the analysis, consistent with the definition of overall survival.

2.4. Therapeutic Strategy and Indications

Treatment decisions were made in multidisciplinary meetings when feasible, based on tumor stage, resectability, patient performance status, and available resources.

2.5. Surgical Management

Radical nephrectomy was indicated for localized renal tumors not amenable to nephron-sparing surgery, particularly tumors > 7 cm (≥T2), centrally located masses, or lesions with suspected perirenal fat invasion. **Extended radical nephrectomy** was performed in cases of locally advanced disease, including tumors with venous extension (renal vein or inferior vena cava), adjacent organ involvement (e.g., adrenal gland), or significant locoregional lymph node enlargement requiring lymphadenectomy.

2.6. Systemic Therapy

Systemic treatment was considered for patients with metastatic disease, unresectable tumors, or disease progression after surgery. Targeted therapies (e.g., tyrosine kinase inhibitors such as sunitinib or sorafenib) were preferred when accessible, particularly in patients with suspected or confirmed clear cell carcinoma. Cytotoxic

chemotherapy (e.g., platinum- or gemcitabine-based regimens) was used in selected cases, including patients with non-clear cell histology, rapidly progressive disease, or when targeted therapies were unavailable or unaffordable.

Data were entered and analysed using R software version 4.1.2. Comparison tests were performed after verification of their validity criteria, with statistical significance set at $p < 0.05$. Prognostic factors were determined using Cox regression. Survival was expressed using the Kaplan-Meier method.

3. Results

A total of 623 urological cancers were identified, including 32 kidney cancers. After excluding patients with incomplete records (n = 2) and those who died from unrelated causes (n = 2), 28 patients were included in the final analysis (Table 1).

Table 1. Distribution according to TNM classification, and Fuhman's grading.

TNM	n = 28 (%)
Classification T	
T1a	1 (3.5)
T1b	5 (17.8)
T2a	5 (17.8)
T2b	6 (21.4)
T3a	**7 (25)**
T3b	3 (10.5)
T4	1 (3.5)
Classification N	
N0	9 (32.1)
N1	**18 (64.2)**
Nx	1 (3.5)
Classification M	
M0	**20 (71.4)**
M1	8 (28.5)
Stade	
I	4 (14.2)
II	4 (14.2)
III	**11 (39.2)**
IV	**9 (32.1)**

3.1. Hospital Rate

Kidney cancer represented 5.1% of the recorded cases, making it the second most frequent urological cancer after prostate cancer (89.8%).

3.2. Annual Incidence

We observed an increase in incidence with a peak in 2022 (9 cases).

3.3. Epidemiological Characteristics

The mean age was 49.93 ± 11 years [26 - 69 years]. The most represented age groups were 40 - 50 years and 50 - 60 years; half of the patients were younger than 51 years.

Among the 28 included patients, 18 were men (64.2%) and 10 were women (35.7%), giving a male-to-female ratio of 1.8.

Identified medical histories included hypertension (25%), overweight/obesity (50%), and family predisposition (7.1%).

3.4. Clinical Characteristics

Symptoms were dominated by flank pain (75%) and hematuria (53.57%). Associated signs included weight loss (28.57%), asthenia (25%), and anorexia (17.86%).

On physical examination, 14 patients had a lumbar mass (50%), 9 had poor general condition (32%), 5 had conjunctival pallor (17.8%), and superficial lymphadenopathy was found in 3.5% of cases. The classical triad (flank pain-hematuria-abdominal mass) was present in 35.7% (10/28).

In our study population, 27 over 28 patients underwent CT urography. The tumour was located in the right kidney in 60.71% of cases. The most frequent locations were the upper pole (25%) and lower pole (21.4%). Necrosis was found in 7.1% of cases. The mean tumour size was 111.73 mm [17 - 232 mm], and 50% (13 patients) had tumours measuring between 94 mm and 232 mm.

Localised tumours (T1 - T2: n = 19; 67.8%) predominated over locoregionally advanced tumors (T3 - T4: n = 9; 32.1%). Venous extension most commonly involved the renal vein and the infra-diaphragmatic inferior vena cava (T3b). An exceptional extension to the pulmonary arteries was observed.

Approximately one tumour in four showed local extension (8 cases), including 7 tumours extending into perirenal fat (T3a: 25%) and 1 tumor extending to the adrenal gland (T4: 3.5%).

There was a high proportion of lymph node involvement (n = 18; 64.2%). The most frequent lymph nodes involved were mesenteric (32.1%) and celiac (21.4%). Distant metastases were found in 8 patients (28.5%), involving the liver, lungs, and bones.

Most patients were diagnosed at an advanced stage (stage III - IV: 71.4%, 20/28), while early-stage disease (stage I - II) accounted for 28.6% (8/28).

Histopathological data were available for 19 patients, among whom clear cell carcinoma was the most frequent subtype (63.2%, 12/19), followed by tubulo-papillary carcinoma (n = 5; 26.31%). The Fuhrman grade was reported in only one case and was grade IV.

3.5. Therapeutic Characteristics

Overall, 18 patients (64.2%) underwent locoregional treatment consisting of total

nephrectomy (n = 8; 44.4%) and extended radical nephrectomy (n = 10; 55.5%).

In parallel, 8 patients (28.5%) received systemic treatment, among whom 37.5% received targeted therapies (sorafenib, sunitinib) and 62.5% received chemotherapy (cisplatin, gemcitabine).

Three patients (10.71%) developed postoperative complications: grade II (severe anemia in 2 patients) and grade III (parietal suppuration) according to the Clavien-Dindo classification. Six patients (21.42%) experienced complications related to systemic treatment.

3.6. Survival

In the overall study population, 5-year overall survival was 12.5% with a mean survival of 25 months. Among the 28 patients, 12 (42.85%) survived.

The survival curve showed a survival probability of 92.5% at 1 year and 50% at 3 years. Median survival was 32 months.

Sex-specific overall survival was 61.1% for men (11 alive) and 50% for women (5 alive).

3.7. Factors Associated with Survival

3.7.1. Age and Sex

There was no significant difference in mean age between survivors and deceased patients ($p = 0.83$). Survival between men and women was not significantly different ($p = 0.70$).

3.7.2. Medical History

Analysis (Table 2) showed none of these variables were statistically associated with mortality ($p > 0.05$), and survival probabilities between groups were not significantly different.

3.7.3. Tumor Location, Stage, and Therapeutic Modality

In univariate analysis, left kidney involvement was significantly associated with better survival ($p = 7 \times 10^{-4}$), particularly after the 12th month (Figure 1). Tumor stage was not significantly associated with overall survival ($p = 0.59$). Treatment modalities were also not significantly associated with overall survival.

Table 2. Distribution of kidney cancer predisposing factors and mortality.

Variables	Modalities	Mortality		Survival rate	p-value
		No	**Yes**		
CKD	No	12	15	44.44%	1
	Yes	0	1	0.00%	
Diabetes	No	12	13	48.00%	0.23
	Yes	0	3	0.00%	
Hypertension	No	9	12	42.86%	1
	Yes	3	4	42.86%	

Continued

Alcohol	No	8	9	47.06%	0.7
	Yes	4	7	36.36%	
Phytotherapy	No	9	12	42.86%	1
	Yes	3	4	42.86%	
Daily water intake	≥1.5 L	1	7	12.50%	0.08
	>1.5 L	11	9	55.00%	
Surgery	No	9	15	37.50%	0.28
	Yes	3	1	75.00%	
Family history of Kidney cancer	No	10	16	38.46%	0.17
	Yes	2	0	100.00%	

CKD: Chronic Kidney Disease.

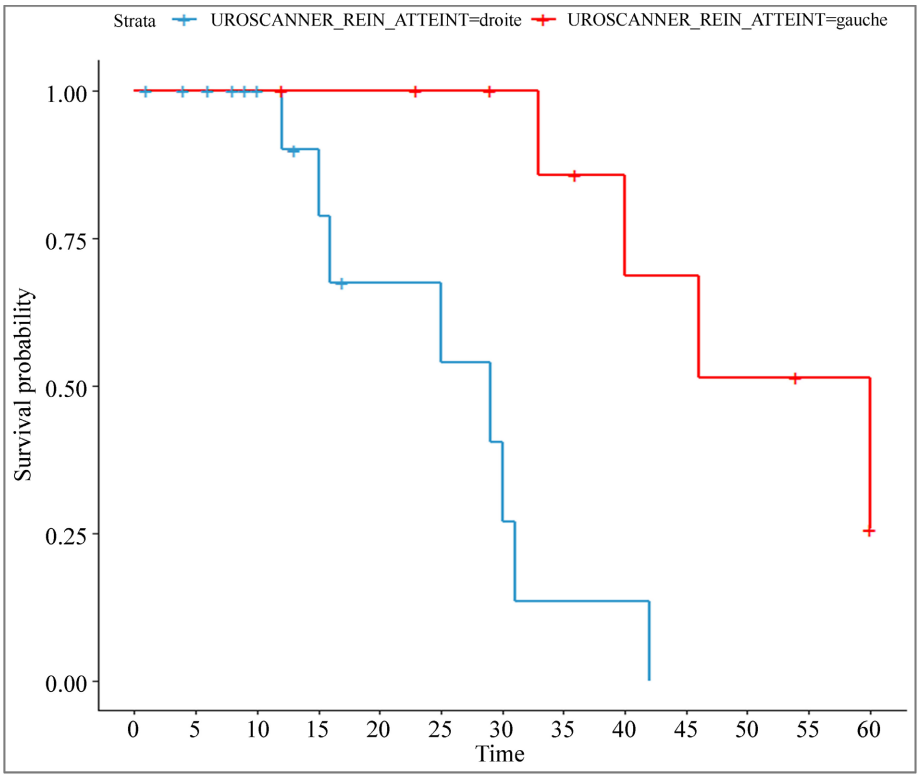


Figure 1. Survival rate according to kidney laterality.

3.7.4. Multivariate Analysis

In multivariate analysis, **right kidney involvement (reference: left kidney)** was independently associated with worse overall survival (HR = 6.25; 95% CI: [1.4 - 27.8]; p = 0.018), with an instantaneous risk of death of approximately 84% (HR = 0.16) (**Table 3**). The overall model was statistically significant (likelihood ratio test p = 0.00036), indicating tumor location as a prognostic factor associated with survival.

Table 3. Factors associated to survival rate (Cox's regression).

Variable	Estimation	HR	P-value
STAGE II	0.06	1.06	0.97
STAGE III	2.52	12.54	0.10
STAGE IV	−19.52	0.00	0.99
RIGHT KIDNEY INVOLVED	−7.28	0.16	0.036
Locoregional management	0.83	2.30	0.68
Tobacco Phytotherapy	−2.36	0.09	0.27
Diabetes	−21.30	0.00	0.99
Hypertension	−1.57	0.20	0.17

4. Discussion

4.1. Epidemiological Characteristics

We collected 623 cases of urological cancers, among which 30 patients had complete follow-up records, while 2 patients had died from causes other than kidney cancer. A total of 28 patients were retained, corresponding to a prevalence of 5.1%. This result is higher than that reported in the 2021 Cancer Report of MINSANTE [14], which found a prevalence of 3.6% among adults, and considerably higher than that reported by Mohamed *et al.* in 2022 [12] on renal carcinoma characteristics in Somalia, where a prevalence of 0.7% was observed. This statistical difference could be explained by the fact that our sample was not sufficiently representative of the general population compared to theirs, as it was derived from data collected in only two hospitals.

The mean age of our population was 49.93 ± 11 years. These results are similar to those of the 2021 MINSANTE Cancer Report, which found a mean age of 50 years [14], and to those of Ndiath *et al.* in 2020 in Dakar, Senegal, who reported a mean age of 49.5 years [15]. However, our findings differ from those of Doehn *et al.* (2020) in Germany, who reported a mean age of 68 years in men and 71 years in women [16], and Dudani *et al.* in the United States, who reported a mean age of 60 years [17]. This disparity could be explained by differences in age distribution, with a higher proportion of elderly individuals in Western countries compared to Africa [18].

In our study, 64.29% of patients were male and 35.71% were female, giving a male-to-female ratio of 1.8:1. This result is similar to those of Mohamed *et al.* in Somalia [12] and Avakoudjo *et al.* in Cotonou, Benin [19], who reported sex ratios of 2:1 and 1.6:1, respectively. However, it differs from those of Bafadni *et al.* in Sudan [13], Harir *et al.* in Dakar [1], and Dudani *et al.* in the United States [17], who reported sex ratios of 1.2:1, 1.3:1, and 2.6:1, respectively. These differences may be explained by variations in study sample sizes (N = 57; 189; 10,105), while our study had the smallest sample (N = 28).

4.2. Clinical and Paraclinical Characteristics

In our study, the classic symptomatic triad (flank pain-hematuria-lumbar mass)

was present in 35.7% of cases. Stages III and IV were found in 71.4% of patients (39.2% and 32.1%, respectively). These findings are comparable to those of Avakoudjo *et al.* in Cotonou [19] and Bafadni *et al.* in Sudan [13], who reported the symptomatic triad in 79.3% and 53% of cases, and advanced stages in 95% and 82.5%, respectively.

However, our results differ from those of Vasudev *et al.* in the United Kingdom [20], who reported incidental diagnosis in 60% of cases and stage Ia tumors in 87%, compared to only 36% for stages III and IV. These differences may be explained, on the one hand, by public and physician awareness campaigns regarding kidney cancer and, on the other hand, by widespread access to screening methods within resilient healthcare systems in the United Kingdom, leading to improved early diagnosis rates. In contrast, in our country, the relative rarity of kidney cancer makes it a lower public health priority, resulting in limited awareness campaigns.

The preferred tumor location in our series was the right kidney (60.1%), similar to findings by Salako *et al.* in Nigeria [21] (58.8%) and Avakoudjo *et al.* [19] (58%). However, this differs from Bafadni *et al.* in Sudan [13] and Mohamed *et al.* in Somalia [12], who reported preferential involvement of the left kidney in 52% and 57% of cases, respectively.

According to the literature, the most common histological type of renal cancer is clear cell carcinoma, accounting for approximately 85% of cases [1]. In our study, clear cell carcinoma was also the most frequent type (63.2%) among tested patients (n = 19). However, this proportion is lower than that reported by Bafadni *et al.* (73.5%) and Ndiath *et al.* (68%). This difference may be explained by the difficulty in obtaining histological confirmation in our context, often leading clinicians to rely on a combination of clinical and radiological arguments.

4.3. Therapeutic Characteristics

The main surgical procedure performed was open radical nephrectomy. Systemic treatment was administered in 28.5% of cases, with targeted therapy used in 10.7% and chemotherapy in 17.8% of systemic treatment cases.

These findings are similar to those of Bafadni *et al.* and Salako *et al.*, who reported radical nephrectomy rates of 66.7% and 78.4%, respectively, with targeted therapy administered in 0% and 7.3% of cases. However, they differ from Mohamed *et al.*, who reported radical nephrectomy in 32% and partial nephrectomy in 13% of cases.

These differences may be explained by limited technical resources and the high cost of systemic therapies, which restrict access, particularly in a context where 37.8% of the population lives on less than 813 CFA francs per day [22].

Radical nephrectomy was predominant in our series because the tumours were large, with a mean size of 11.1 cm compared to 6.34 cm in Mohamed *et al.* [12]. In accordance with the literature, although partial nephrectomy can be performed for T1 - T3 tumours, it is primarily recommended for localised T1

tumours [23].

4.4. Survival

The 5-year overall survival probability in our study was 12.5%, with a median survival of 32 months. These results are comparable to those of Bafadni *et al.*, who reported a 40% survival probability and a median survival of 24 months [13].

However, they differ significantly from Mohamed *et al.*, who reported a 5-year survival probability of 60.8% [12], and from Siegel *et al.* in the United States, who reported a 5-year overall survival of 77% [5].

This disparity may be explained by two main factors:

i) In our context, most cases are diagnosed at an advanced stage;

ii) The high cost of management makes optimal treatment inaccessible for many patients due to limited economic resources.

4.5. Associated Factors

Right-sided tumor location was associated with worse survival in our cohort. However, this finding should be interpreted with caution given the small sample size and the absence of similar observations in the literature. This may be explained by the anatomical proximity of the right kidney to critical structures such as the liver and the inferior vena cava, potentially facilitating rapid locoregional and metastatic spread.

4.6. Strengths and Limitations

The main limitation of our study was the difficulty in accessing medical records, which prevented us from achieving a larger sample size and conducting more in-depth analyses. Therefore, these results cannot be generalized to the entire Cameroonian population.

The strength of this study lies in its inclusion of all histological types of renal cancer over 10 years in first- and second-category hospitals, providing valuable data for these central healthcare structures.

5. Conclusion

The prevalence was 5.1%, with a mean age at diagnosis of 49.93 years, and a male predominance. Diagnosis was suggested by the classic triad of hematuria, lumbar mass, and flank pain. CT urography was the most commonly used diagnostic imaging modality. Most patients were diagnosed at stages III and IV, and clear cell carcinoma was the most frequent histological type. Extended radical nephrectomy was the most commonly performed therapeutic modality. The 5-year survival probability was low, estimated at 12.5%, with a median survival of 32 months. The factor associated with poor prognosis was right kidney involvement.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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