



## **Open Nephrectomy: Experience in a Nigerian Teaching Hospital**

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### **Authors' contributions**

*This work was carried out in collaboration between both authors. Author ONE conceived and designed the study, performed the statistical analysis, wrote the protocol and the first draft of the manuscript. Author OEA managed the analyses of the study and the literature searches. Both authors read and approved the final manuscript.*

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### **ABSTRACT**

**Background:** Nephrectomy is a surgical operation that requires removal of the kidney. Indications for nephrectomy vary across the globe. Scope of disorders, available human and material resources affect the type and method of nephrectomy offered in a centre.

**Aims:** To study the indications for nephrectomy and outcome of treatment in a resource limited tertiary hospital.

**Methods:** All patients who had nephrectomy between January 2007 and October 2017 were included in this retrospective study. Data obtained from the records departments, ward and theatre records were collated. Information gathered included the age, clinical and radiological features, indications for and type of nephrectomies as well as outcome of treatment. Data was analysed using SPSS version 20. (IBM SPSS Inc. Chicago, IL).

**Results:** Fifty seven patients had nephrectomy within the period. The mean age was 36.97+/-19.16 years. Twenty seven patients (47.37%) were male while 30 (52.63%) were female, with Male: Female ratio of 1:1.1.

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Benign and malignant conditions accounted for 42.11% and 57.89% respectively. The most common malignant condition was renal cell carcinoma. Abdominal pain and swelling as well as haematuria were the main clinical features. All the patients had ultrasound scan with majority have multiple findings. Renal cell carcinoma was diagnosed in 29 patients (50.88%) while 17 patients (29.82%) had renal stones with non-functioning kidney. Fifty two patients (91.23%) had good and satisfactory outcome.

**Conclusion:** Only open nephrectomies were performed in this centre. Though malignant conditions are more common, late presentation of benign conditions make nephrectomy inevitable in conditions that in more developed societies will not have led to irremediable renal damage.

*Keywords: Nephrectomy; renal masses; Nigeria.*

## 1. INTRODUCTION

The kidneys can be involved in pathological process which may require its removal either in whole or in part [1]. Nephrectomy is usually carried out for an irremediable renal condition. However, it can also be done in a normal kidney as in donor nephrectomy for kidney transplant [2].

Nephrectomy can be open through various incisions in the abdomen or through minimal access. Open nephrectomy is age long and common [3]. In recent years interest in nephrectomy by minimally invasive techniques has increased and it has become the mainstay in the technologically advanced countries [4]. Partial nephrectomy or nephron sparing nephrectomy has become a normal practice in most centres in advanced countries [1,5]. This can be carried out either through laparoscopy or robotic surgery [6].

Some urological diseases are more prevalent in some countries than others; this has made indications for nephrectomy to vary among institutions and regions [7]. The indications also differ between paediatric and adult populations. Vesico-ureteral reflux (VUR) is the leading indication in children while malignancy is the leading cause in adult [8].

Nephrectomy is a cornerstone therapy for renal cell carcinoma (RCC) [9]. This could either be radical in localized RCC with normal contralateral kidney or nephron sparing nephrectomy in selected patient [5,7]. Simple nephrectomy is a standard therapeutic urological procedure in patients with irreversibly damaged kidney due to chronic infection, obstruction, calculus disease and pyelonephritis [7,10].

Donor nephrectomy done on normal kidney (living or dead) during renal transplant could be open, hand assisted laparoscopy or wholly

laparoscopy. Laparoscopy and robotic nephrectomy are common in the developed countries with advantage of fewer complications and short hospital stay [4,11]. Open nephrectomy remains the main surgical approach for renal surgery in developing countries on account of lack of human resources and expertise [12].

Indications for nephrectomy in benign kidney conditions have been on the increase in developing countries [7,13]. Previous study in our centre showed the main indication for nephrectomy was renal cell carcinoma [14]. Recently there is an increase in nephrectomy for benign renal lesions. Despite advancement in technology, many centres in developing countries are yet to acquire the necessary human and material resources. The objective of this study was to present the clinical features, indications and outcome nephrectomy in a resource limited centre.

## 2. METHODS

The consecutive records of all patients who had nephrectomy performed by the Urology Division of our hospital were reviewed between January 2007 and September 2017. Approval for the study was obtained from the Hospitals Research Ethics Committee. Patients who presented with complaints of abdominal pain, swelling and haematuria and other features suggestive of renal pathologies were investigated. The patients whose benign renal conditions suggested non-function of the ipsilateral kidney and those with malignant renal conditions had open nephrectomy.

The investigations used in the evaluation of the renal pathologies included abdominal ultrasound, intravenous urography and abdomino – pelvic computerized tomography. Baseline complete blood counts, electrolytes, urea and creatinine levels, urine cultures were also carried out. Chest X-ray, electrocardiograms, lipid profiles and

fasting blood sugar levels were carried out as indicated. Patients with suspected tuberculosis cases were further evaluated with Mantoux test and acid fast bacilli in urine using Zeil Neelsen stain. Patients with stone had further checks of uric acid, calcium and phosphate levels.

Patients with benign renal lesions underwent simple nephrectomies while those with suspected malignant renal tumors and transitional cell carcinoma of the renal pelvis underwent radical nephrectomies and nephroureterectomies respectively. All patients were administered peri-operative antibiotics (usually a quinolone or cephalosporin) and pain relief as the case may be. Patients with tuberculosis were also given antituberculous therapy. Patients with Wilm's tumour also had neoadjuvant / adjuvant chemotherapy as the case maybe. The patients were followed up for two years at our outpatients' clinic.

An Excel worksheet (Microsoft office 2010) was used to gather data from our unit audit register, medical records department and theatre register. The data extracted included patients' age, gender and indication for and laterality of the nephrectomy. Also considered were the histology of the nephrectomy specimen and the peri-operative mortality. The data were analyzed using the Statistical Package for the Social Sciences (SPSS) for Windows (Version 20.0) (IBM SPSS Inc. Chicago, IL).

### 3. RESULTS

Fifty seven patients had nephrectomy during the study period. The mean age of the patients was 36.97+/-19.16 years (range 9 months to 80 years). Twenty seven patients (47.37%) were male while 30 (52.63%) were female, with male: female ratio of 1:1.1.

The main complaints were abdominal pain (35.46%), other presenting symptoms were shown in Table 1. Table 2 showed that 26 patients (24.07%) had abdominal masses while 11 patients (10.18%) presented with palpable kidneys, other significant signs were tenderness in 40 patients (37.03%) and pallor in 7 (1.70%). Nineteen patients (33.33%) had co-morbidities while 38 patients (66.67%) did not recorded any co-morbidities. Hypertension was the commonest co-morbidity; it was observed in 9 patients (15.79%), while 3 (5.26%) had hypertension and diabetes. Two patients (3.50%) had diabetes only. Fibroadenoma, bowel injuries,

polycythemia, abortion, and hepatorenal syndrome were found in 1 (1.75%) patient each.

**Table 1. Clinical presentation of patients I – symptoms**

Complaints (N=141)	Frequency	Percent
Abdominal Pain	50	35.46
Abdominal swelling	20	14.18
Fever	11	7.80
Haematuria	25	17.73
Other constitutional symptoms	25	17.73

All the patients had ultrasound scan and majority have multiple findings. Hydronephrosis was the commonest finding in 37 (31.10%) while renal mass was shown in 33 patients (27.73%). Eleven patients (9.24%) had renal cysts, 17 (14.28%) had renal calculus. Other findings were shrunken kidney in 2 patients (1.68), displaced bowel in 7 (5.89%) patients and 10 (8.40%) patients had nonspecific findings. Intravenous urography (IVU) was carried out in 36 patients (63.2%) while 21 patients (36.8%) had no IVU. Nonfunctioning kidney was shown in 16 patients (29.10%) on IVU, 11 (20.00%) had renal stones. Destruction and distortion of calyces were seen in 12 patients (21.82%), hydronephrosis in 9(16.36%), PUJ obstruction in 1 (1.81%). Others findings like mass effects, clubbing were seen in 6 patients (10.91%). Fig. 1 showed the result of computerized tomography (CT) scan. Twenty eight patients (49.121%) had CTSCAN while 29 (50.88%) did not do CT scan. Apart from 2 patients with bilateral renal stones, no radiological abnormalities were found on the contralateral kidneys.

**Table 2. Clinical presentation of patients II– signs**

Findings (N = 108)	Frequency	Percent
Abdominal mass	26	24.07
Palpable kidney	11	10.18
Tenderness	40	37.03
Pallor	7	1.07
Other signs	24	22.22

Table 3 showed the clinical diagnosis with adult renal tumours in 29 patients (50.88%) the commonest, nephrolithiasis with non-functioning kidney was diagnosed in 17 patients (29.82%). Other diagnoses include tuberculosis, PUJ obstruction, gunshot injury and nephroblastoma. One of the patients had Stauffer syndrome (hepatorenal syndrome in association with renal cell carcinoma).

Majority of the patients (40, (70.18%)) had general anaesthesia, while 17 (29.82%) had sub arachnoid block (spinal anaesthesia) either alone or in combination with epidural anaesthesia or total intravenous anaesthesia (TIVA). Emergency nephrectomy was performed in 1 patient (1.75%) while 25 (43.86%) and 31 (54.39%) had simple and radical nephrectomy respectively as shown in Fig. 2. Left nephrectomy was done in 21 patients (36.84) while 36 (63.16%) had right nephrectomy.

**Table 3. Clinical diagnosis**

Diagnosis (N = 57)	Frequency	Percent
Complex renal cyst	4	7.00
Gun-shot injury	2	3.50
Nephrolithiasis with non-functioning kidney	17	28.07
PUJ Obstruction	1	1.75
Pyonephrosis	1	1.75
Renal cell carcinoma	29	50.88
Renal TB	2	3.50
Nephroblastoma	1	1.75

Histological diagnosis was shown in Table 4; benign conditions were seen in 24 patients (42.11%) while malignant tumours were seen in 33 patients (57.89%). Fifty two patients (91.23%) had satisfactory outcome, 1 patient (1.75%) fair outcome while 4 (7.02%) died within the study period. Gross specimens of 2 patients with malignant renal tumour were shown in Figs. 3 and 4.

#### 4. DISCUSSION

Fifty seven surgeries were done during the period which was an increase in the number of

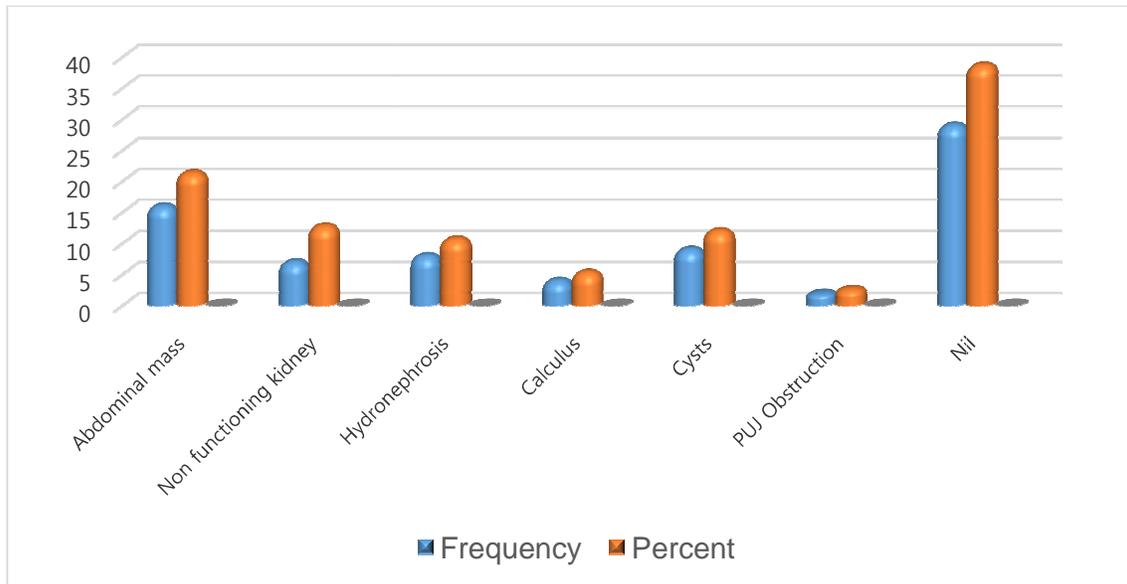
nephrectomies when compared with a previous study in the same centre [14]. This observation may be due to improvement in our diagnostic facilities as well as increase in hospital attendance. The mean age of 36.97±19.16 years is similar to mean age in other developing countries [7,15]. The male to female ratio of 1:1.1 was similar to our previous study about 2 decades ago in the centre [14], and also in developing countries like Pakistan, India where male to female ratio is 1:1.05 [7]. The mean age appears to be lower in the developing countries because more benign indications are encountered due to late presentation. Where mainly malignant conditions lead to nephrectomy, the modal age groups are expected to be older [8].

The most common presenting symptoms were abdominal pain in 50 patients, abdominal swelling in 20 patients and haematuria in 25 patients. Though these triads were associated with renal cell carcinoma; other benign conditions also presented with some of these symptoms, probably due to late presentation [7]. Weight loss was not common in this series as most patients with significant weight loss presented with inoperable tumour and were not part of this study.

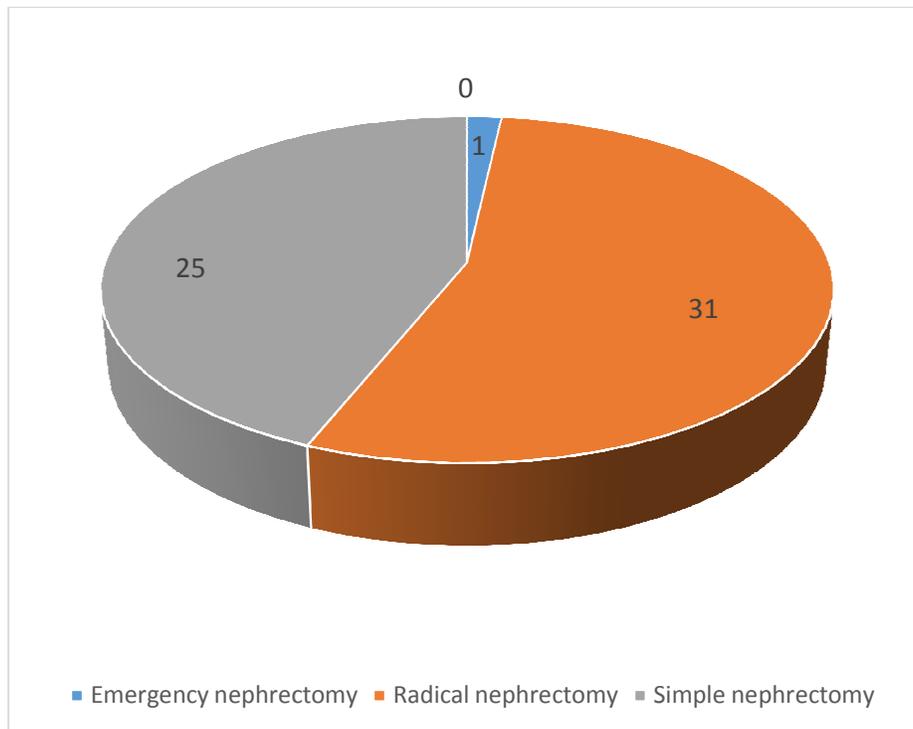
One third of the patients had co-morbidities. The common co-morbidities were hypertension, diabetes or combination of the two accounted for over 80% of co-morbidity. Hypertension may be due paraneoplastic syndrome from renal cell carcinoma [16]. One of the patients with hypertension had Stauffer syndrome (another paraneoplastic syndrome) leading to hepatic dysfunction thought to be due to release of interleukin 6 (IL-6) by the tumour cells.

**Table 4. Histological diagnosis of the patients**

Histology (N=57)	Type	Frequency	Percent
Benign		<b>24</b>	<b>42.11</b>
	Complex cysts	2	3.50
	Oncocytoma	1	1.75
	Renal Tuberculosis	2	3.50
	Chronic Pyelonephritis with kidney stone	16	28.08
	Gun-shot injury	2	3.50
	Polycystic kidney disease	1	1.75
Malignant		<b>33</b>	<b>57.89</b>
	Lymphoma	1	1.75
	Acute myeloid leukemia	1	1.75
	Teratoma	1	1.75
	Renal cell carcinoma	28	49.12
	Nephroblastoma	2	3.50



**Fig. 1. Computerized tomography (CT) scan presentations of patients**

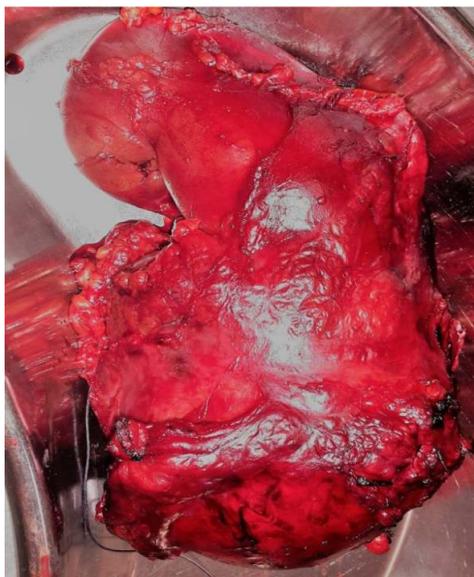


**Fig. 2. Type of nephrectomy**

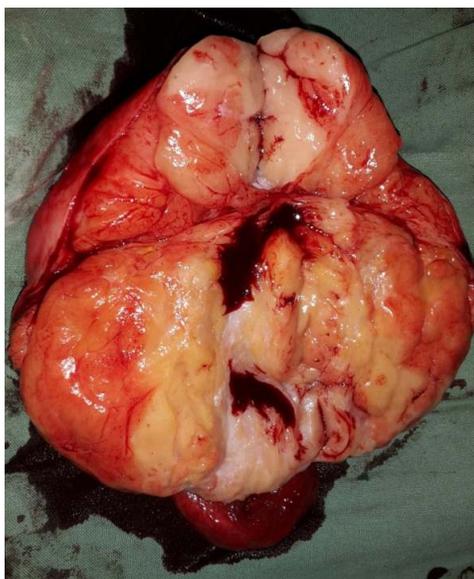
All patients had ultrasound scan because it is readily available and affordable [17]. Renal mass in 33 patients was the most common features; it also detected renal calculi in 17 patients. Hydronephrosis and renal cysts were also identified. This has proven to be effective in

diagnosis of renal pathology [17]. Though ultrasound imaging has limitations, it is invaluable in developing countries because of availability and affordability. Intravenous urography (IVU) was done in most patients; this was helpful in the diagnosis of non-functioning

kidney, PUJ obstruction and kidney stone. Both ultrasound scan and IVU have limitations in diagnosing benign and malignant conditions [18]. Intravenous urography is however, limited by contrast media sensitivity, exposure to radiations. We are doing less IVUs now that we have better imaging modalities.



**Fig. 3. Left lower pole renal tumour**



**Fig. 4. Cut surface of a malignant renal tumour**

Computerized tomography (CT) scan was done by 28 (49.12%) while 29 (50.88%) did not do CT scan. CT scan is the gold standard for

diagnosing renal pathology [18]. The high cost of this investigation and non-availability during the earlier part of this study could be accounted for percentage observed. Radio nuclide renal scan and angiography were not available in our region; therefore it was not part of our pre-operative assessment. However, some patients who were diagnosed of in-operable renal cell carcinoma were referred to other centres for arterial embolization.

Renal cell carcinoma was diagnosed in 29 patients (50.88%). This was the commonest indication for nephrectomy in this study; this observation is similar to findings in indication in other centres in Nigeria and other developing countries [7,19,20]. Benign indications for nephrectomy has declined tremendously in technologically advanced countries because of improved non-ablative therapies for inflammatory, calculous and hypertensive conditions [8]. However, nephrectomies for benign conditions are still reported to be commonly in the developing countries [12,14,15,20]. In this study 24 patients (42.1%) had various benign conditions. Renal stone with chronic pyelonephritis was recorded in 16 patients (28.06%) while 2 patients (3.50%) had renal tuberculosis that resulted in pyonephrosis. Late presentation of these conditions resulted in irreversible damage of the kidney that necessitated nephrectomy as has been commonly reported in other developing countries [7,20]. Late presentation of these conditions is due to poor health seeking behavior, ignorance and superstition. Poor funding due to limited resources especially in modern technology that also influence our diagnostic capabilities.

All nephrectomies were open. There was no case of donor nephrectomy in our centre as our transplant unit have not commenced. The restriction to only open method was because we lacked the necessary human and material resources required for minimally invasive procedures.

One patient (1.75%) was diagnosed as renal cell carcinoma but histology came out to be Lymphoma, this patient may have benefitted from chemotherapy if he had presented early without all the constitutional symptoms of renal cell carcinoma [21]. Also, 2 patients (3.50%) with bilateral kidney stone with one nonfunctioning kidney had nephrectomy and open nephrolithotomy. Two patients (3.5%) within the age of 9 months and 3 years had nephrectomy for nephroblastoma.

General anaesthesia (GA) was the commonest form of anaesthesia for these patients, 40 (70.18%) patients had GA either alone or in combination with regional block. This may be partly due to huge renal masses that were operated (Figs. 3 and 4) and limited resources for anaesthesia in developing countries [22]. Emergency nephrectomy was done in 1 patient (1.75%) with gun-shot injury and significant haematuria. Simple nephrectomy was done for all benign conditions while 31 (54.38%) had radical nephrectomy or nephroureterectomy for malignant lesions [4,7,8,12,14,23]. Nephrectomies for trauma and tumour were transperitoneal in order to assess other organs in the abdomen. The nephrectomies for benign conditions were extraperitoneal to minimize soiling the peritoneum. Most of our patients presented late and malignant lesions were not stratified using the RENAL nephrectomy scoring system that have been in use in many developed countries [24]. We did not see any patient with malignant condition that would have benefitted from nephron-sparing nephrectomy because of the sizes of the tumours and facilities to delineate the margins.

The average hospital stay was seven days. The patients with tuberculosis and pyonephrosis stayed much longer especially because of sepsis. There was good outcome as 52 patients (91.23%) had satisfactory outcome despite late presentation, though most of these conditions may not have resulted in nephrectomy if presented early. Four patients (7.02%) with renal cell carcinoma died during the period, 1 patient (1.75%) within the admission due to severe primary haemorrhage while 3 (5.25%) died during follow-up period from metastasis and sepsis. The follow up protocol included the check for renal function, co-morbidities and presence of any major complications. A lot of the patients with benign conditions were lost to follow-up. This is a reflection of our poor health seeking behaviour. A lot of people here do not seek help except when in pain.

## 5. CONCLUSION

Malignant conditions were the commonest indications for nephrectomy in our hospital. The decline in benign indications for nephrectomy in develop countries, was not observed in this study. A significant number of patients in this centre had nephrectomies for benign conditions. Despite the long hospital stay, the outcomes of the patients were satisfactory. Health education

and improved health seeking behaviour and early presentation to health facilities will reduce the proportion of benign condition being offered avoidable ablative therapies. Improved funding and acquisition of skill and equipment for minimal invasive therapies will reduce the morbidity associated with open nephrectomies and reduce the hospital stay.

## 6. LIMITATIONS OF THE STUDY

The small sample of study limits the application of the study. RENAL nephrectomy scores were not used to objectify decision making in choice of scope of nephrectomy.

## CONSENT

Both authors declare that written informed consent was obtained from the institution research ethics committee for publication of this paper and accompanying image.

## ETHICAL APPROVAL

As per international standard or university standard, written approval of Ethics committee has been collected and preserved by the authors.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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