

(RESEARCH ARTICLE)



Pattern of IVU among patients presenting with flank pain at a tertiary hospital in Rivers State

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Abstract

Background: Intravenous urography (IVU) is a contrast based radiological procedure for the investigation and imaging of the urinary system. It was the gold standard, not until the last two decades when CTU (computed tomography urography) took over. The latter is better because of its improved accuracy in the diagnosis of urinary tract pathologies. Flank pain is a sensation of discomfort or distress in the part of the body below the rib and above the ilium. The possible organs in the flank to be affected include kidney and ureter.

Aim This study is aimed at finding out the IVU findings in patients presenting with flank pain in a tertiary hospital in the southern part of Nigeria.

Study design and settings: A retrospective study was conducted in the Radiology Department of Rivers State University Teaching Hospital (RSUTH) from 1st February 2021 to 10th February 2023.

Data Analysis: Data was analyzed using SPSS 20.1 version. The level of statistical significance was set at $p < 0.05$.

Results: A total of 100 data was analyzed. Patients between the age of 5 years and 76 years with a mean age of 39.72 ± 14.33 years was used for this study. Majority of the age group was greater than 41 years of age with an equal male to female distribution. That is the ratio of female to male in this study is 1:1. The study shows that more patients had abnormal IVU patterns than normal. More females had normal IVU patterns while abnormal IVU patterns were more common in males. The study also shows that the ureters were more affected than the kidneys because we had more abnormal IVU pattern in the ureter than the kidney.

Conclusion: The age group with the highest abnormal IVU pattern is the greater than 41 years group, probably because they were more in number in the study population and again may be, we can say the frequency of diseases increases with increasing age.

Keywords: Intravenous Urography; Flank Pain; Kidney; Ureter

1. Introduction

Intravenous urography is a radiographic study of the renal parenchyma, pelvicalyceal system, ureters and urinary bladder using an intravenous contrast medium. This examination has been largely replaced by computed urography.

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The indications include: Trauma to any part of the urinary tract (kidney, ureter and or bladder), Infections like pyelonephritis and abscesses. Neoplasms-which could be renal, ureteral or bladder tumors. Structural abnormalities in the pelvicalyceal system like duplex collecting system, horse shoe kidneys and hydronephrosis. Others include papillary necrosis, calculi in the kidney, ureter or bladder paths. Hematuria and confirming the course of the ureters are also indications of an IVU examination.

Flank pain is a common symptom of renal and or ureteric pathologies. The various causes could range from the above mentioned.

Patient preparation includes fasting for at least 5 hours prior to the procedure is preferred. Laxatives to reduce fecal loading does not improve image quality¹, check glomerular filtration rate, check for allergies and contrast medium reactions and obtain written informed consent according to hospital guidelines. Emergency medications and equipment must be available to treat clinically significant contrast medium reactions.

1.1. Technique

A non-ionic water-soluble iodinated contrast agent is preferable because of a better safety profile. Exposures in the range of 65-75kV range with mA and exposure time of <0.180s are the parameters often used. The dose of contrast media of up to 1.5 ml/kg body weight is often well tolerated. Firstly, an intravenous (IV) access with an 18G or 19 G IV cannula is introduced into the patient's vein. A control supine (AP) radiograph of the kidneys, ureters and bladder is acquired to show any possible radio-opaque lesion e.g calculus as this may be obscured by contrast medium. An immediate post injection AP radiograph (0 minute) of the kidneys to show contrast medium in the renal parenchyma (nephrographic phase) is taken. Absent nephrogram indicates obstruction. Cortical/medullary nephrogram is well delineated by 3 minutes post injection, however, attenuation may be reduced if obstruction is present.

5 minutes radiograph shows the pelvi-calyceal system, 10minutes will show the pelvi-calyceal systems and ureters while the 20minutes (full length radiograph) shows KUB-kidneys, ureters and bladder. A bladder view is taken when patient indicates urge to micturate. Finally, a post micturition radiograph is done to assess bladder emptying, confirm ureteric obstruction if any, delineate lower ureter which can be obscured by contrast media in the bladder. Delayed radiographs of 1hour to ± 24 hours is advised if obstruction is severe as in the case of absent excretion and insufficient ureteric opacification. Lower abdominal compression band could be introduced at 5 minutes to distend upper urinary tracts.

This study is aimed at analyzing IVU findings in patients with flank pain sent to the Radiology department of Rivers State University Teaching Hospital (RSUTH), Port Harcourt. This study is also aimed at increasing the wealth of knowledge as it concerns IVU findings in flank because there is paucity of information as regards this concept.

2. Materials and methods

This study is a 2 years retrospective study and was conducted in department of Radiology, RSUTH between February 2021 and February 2023. A total number of 100 patients were gotten from the database of the Radiology department of RSUTH. Patients request forms and radiological reports were retrieved from the database, demographic indices, flank pain as indication and findings were documented in the data sheet.

Ethical approval was not obtained since it is secondary data.

Data obtained were analyzed using SPSS 21.0 version and statistical significance was set at <0.05.

3. Results

Mean age of the study population \pm SD Age = 39.72 \pm 14.33 years

Median age = 39.00 years

Minimum = 5.00 years

Maximum = 76.00 years

The mean age in this study is 39.72±14.33 years and with the age range from 5.00-76.00 year

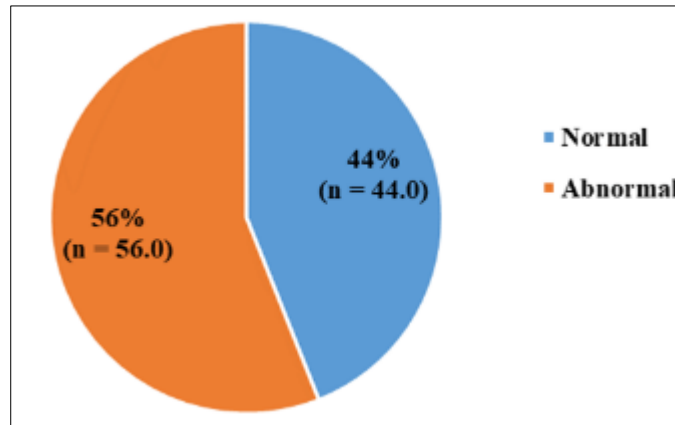


Figure 1 The prevalence of IVU in the study population. It showed that abnormal IVU is 56% while normal IVU is 44% in this study

Table 1 Age characteristics of the study population

Variables	Frequency	Percentage
Age Category		
< 20 years	7	7.0
21 – 30 years	14	14.0
31 – 40 years	35	35.0
≥ 41years	44	44.0
Total	100	100.0

Table 1 showed that greater than 41 years presented for IVU, followed by 31-40 years age category, then 21-39 years age category with less than 20 years been the least presenting for IVU in this study.

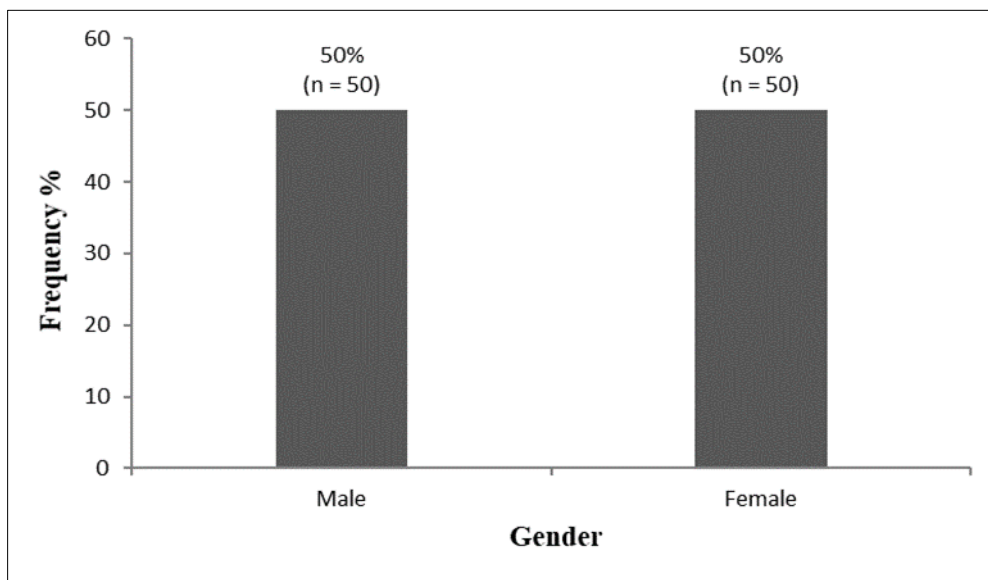


Figure 2 Gender distribution in the study population, which turned out to be 50% each that is equal occurrence

Table 2 Prevalence of IVU based on age and sex in the study population

Variables N = 100	Normal IVU n (%)	Abnormal IVU n (%)	Total n (%)
Age Category			
<20 years	4 (57.1)	3 (42.9)	7 (100.0)
21 – 30 years	8 (57.1)	6 (42.9)	14 (100.0)
31 – 40 years	17 (48.6)	18 (51.4)	35 (100.0)
≥ 41 years	15 (34.1)	29 (65.9)	44 (100.0)
	<i>Fisher's Exact = 3.589; p-value = 0.312</i>		
Gender			
Male	21 (42.0)	29 (58.0)	50 (100.0)
Female	23 (46.0)	27 (54.0)	50 (100.0)
	Chi-square = 0.162; p-value = 0.687		

The table above is showing the age and gender distribution in this study and it is not significant.

Table 3 IVU findings among the study population

Variable	Frequency	Percentage
Right kidney size		
Normal	83	83.0
Abnormal	17	17.0
Abnormal (n = 17)		
Large	15	88.2
Non visualized	1	5.9
Small	1	5.9
Left kidney size		
Normal	87	87.0
Abnormal	13	13.0
Abnormal (n = 13)		
Large	10	76.9
Non visualized	2	15.4
Small	1	7.7

Table 3 revealed the findings in the kidneys, which is mainly large sizes and is most common on the right.

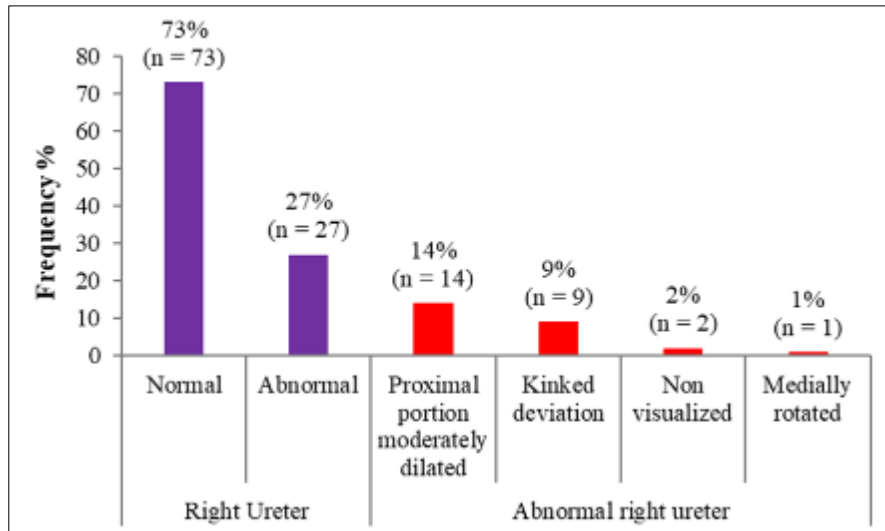
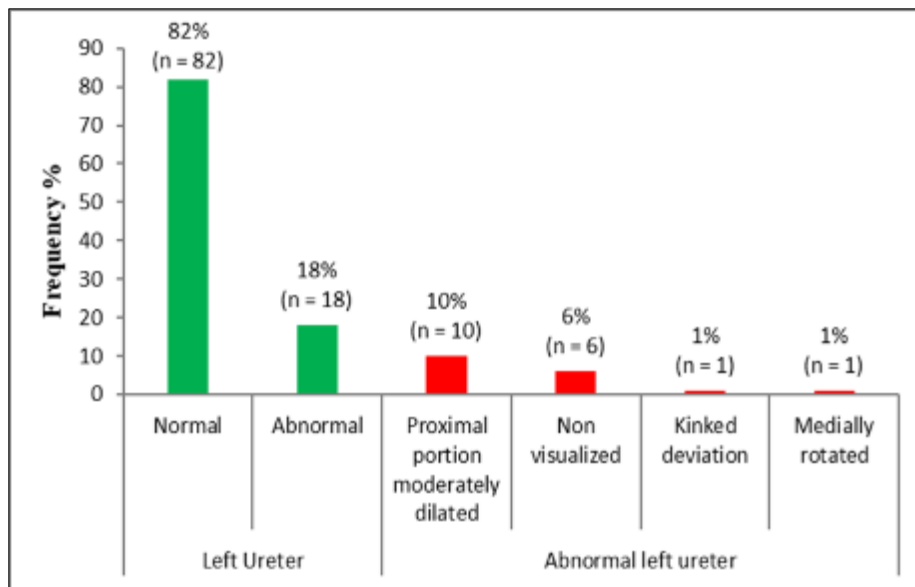


Figure 3 Right ureter and also abnormalities that were found among the study population

The above figure shows the various abnormality seen in the right ureter. Dilated proximal portion is the most frequent abnormality



Figures 4 Bar chart showing left ureter and also abnormalities that were found among the study population

The above figure revealed the abnormalities seen in the left ureter. The commonest abnormality is dilated proximal ureter.

Table 4 Other characteristics of the study population

Variables N = 100	Frequency	Percentage
Abnormalities		
Present	33	33.0
Absent	67	67.0
Location of abnormalities (N = 33)		
Kidney	20	60.6

Ureteric	9	27.3
Urinary bladder	3	9.1
PUJ	1	3.0
Side affected by calculus (N = 33)		
Right	18	54.5
Left	11	33.3
Both	4	12.1
Dilated pelvicalyceal systems		
Yes	34	34.0
No	66	66.0
Side affected in dilated pelvicalyceal systems (N = 34)		
Right	18	52.9
Left	9	26.5
Both	7	20.6
Delayed nephrogram		
Yes	10	10.0
No	90	90.0
Side affected in delayed nephrogram (N = 10)		
Left	6	60.0
Right	2	20.0
Both	2	20.0

Table 4 is showing the percentages of the abnormalities seen in the kidneys, ureters, pelvicultureteric junction and the urinary bladder. The kidneys are affected more, follow by ureteric and the least finding is seen in the PUJ. Right sided calculus is more common across all structures. Delayed nephrogram is seen more on the left side.

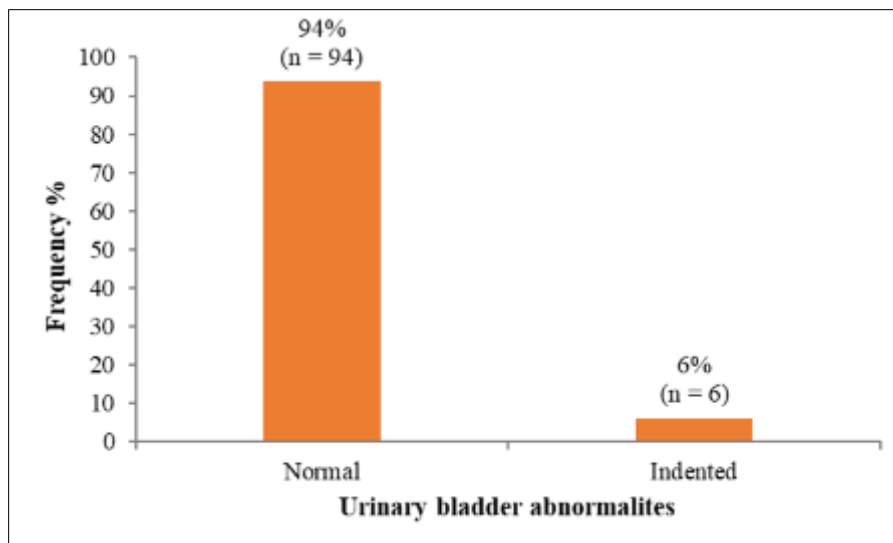


Figure 5 Urinary bladder abnormalities

The above figure is showing the abnormalities in the urinary bladder with outline abnormality.

3.1. Images

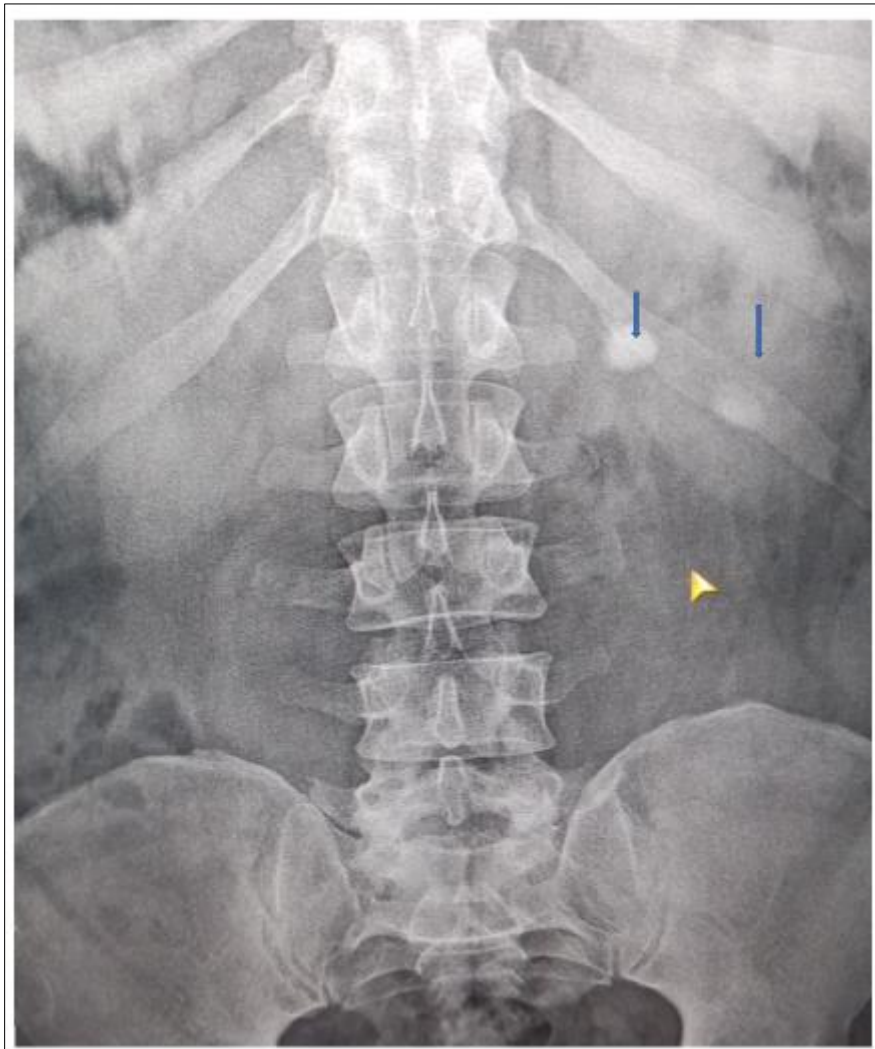


Figure 6a Calculi in the left kidney(inferior pole) and at the pelvoureteric junction



Figure 6b Is a close up view of image 6a



Figure 7 Nephrogram of the IVU series, purple thin arrow for right and blue slim arrow for the left kidneys respectively



Figure 8a Clubbing of the pelvicalyceal system on the left as shown by the blue slim arrow and the asterix arrow on the right is showing the normal configuration of the pelvicalyceal system.

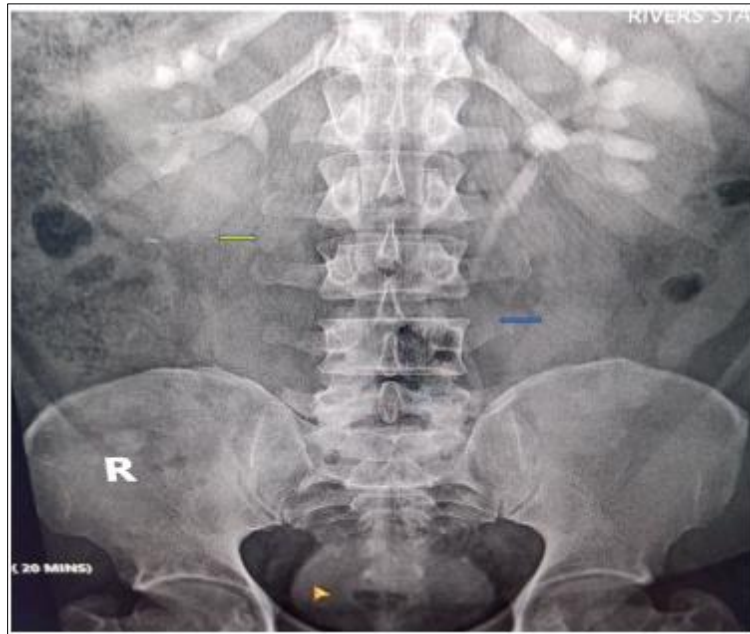


Figure 8b The kidneys, ureters and the urinary bladder, with mild dilatation of the proximal dilatation of the left ureter as shown by the blue slim arrow and the normal right ureter as shown by the yellow slim arrow



Figure 9a Is a spot film showing the full bladder with uniform outline



Figure 9b Is a spot film showing the complete emptying of the urinary bladder.

4. Discussion

The advent of CT and MRI has led to less use of the cheaper, less invasive and affordable radiological technique for the investigation of the urinary tract.² The present finding that the patients subjected to IVU showed equal number of males and females which is in contrast to those reported from Jordan and Pakistan as well as Hameed M. Aklan and Abdullah Mikhlafy^{3,4}, their study reported about two-thirds of the patients being males their figures are 60.0%, 63.0% and 66.8% respectively. However, it is in contrast to a study reported from United States, where most cases were females (73.0%)⁵. The higher proportion of female patients seen in the latter study could be attributed to the fact that most IVU requests were from the department of Obstetrics and Gynecology.

The IVU findings in this present study were normal in 44.0% of patients, this is in contrast to a study conducted in Ireland that gave a higher proportion of IVU findings 77.0%⁶ A study conducted in Pakistan and Brazil, Umar showed comparable results with the present study. Their values for normal IVU findings were 26.0% and 23.1% respectively. The age group with the least population in the present study is the <20 years age group (7.0%) which is consistent with a study done in Brazil (3.6%) and in Yemen (5.2%), as well as a study reported by Umar Mansur et al⁷, Aklan and Mikhlafy⁹ This case study reveals that urolithiasis is the most frequent IVU finding and could actually be the main indication for IVU referrals. The latter is consistent with Umar Mansur et al⁸, and Kunwar et al¹⁰. However only the former authors categorized into right and left as is the case in the present study, where it was found that the right kidney was more affected by calculus. Hydronephrosis is the most common structural abnormality as shown in this case study, more on the right kidney (52.9%) and left kidney is (26.5%) this is in contrast to what was reported by Umar Mansur et al⁸ in their study hydronephrosis is the least common. The case study reported more of ureteric structural abnormalities like proximal dilatation, medial rotation kinked ureter and non-visualization while Hameed et al⁷ in their study reported more of ureteric calculus (17.6%). No ureteric calculus was reported in the present study reason not properly understood.

5. Conclusion

The study shows that >41years age group has the most abnormal IVU patterns and the <20years age group has the least abnormal IVU patterns, this could probably be attributed to ageing as disease processes are commoner with age. Renal calculus was found to be the commonest abnormality with the right kidney been most affected

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

Authors contribution

VNA-Data collection, data analysis, conceptualization, review and editing; CW-Conceptualization, data analysis, literature search, review and editing.

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