Intravenous Urography Findings among Patients Presenting to Rivers State University Teaching Hospital-A Two Years Retrospective Study

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ABSTRACT

Background: Conventional intravenous urography (IVU) is an imaging modality of choice used in evaluating urinary system especially in the third world countries despite recent advancement in imaging
Aim: This study is aimed at analyzing the IVU findings in a tertiary center in South-South Nigeria.
Study design and settings: A retrospective, observational study was conducted in the Radiology Department of Rivers State University Teaching Hospital (RSUTH). From 1st February 2021 to 28th February 2023.
Data analysis: Data were analyzed using SPSS 21.0 version. The level of statistical significance was set at p<0.05.
Results: A total of 133 data were analyzed. The age of the study group was between 7 to 72years with a mean age of 39.29 ± 13.63 years. Majority of the age group was 36-46 years (n=49, 36.8%). Females presented more for IVU in this study. The commonest indication is uterine fibroids. Normal IVU was seen in 40(30.1%) of the patients and others had one pathology or the other. Commonest renal pathology was hydronephrosis. There was a significant association between indications and gender (*P*=0.0001).
Conclusion: This study shows that more female presented for IVU which tallies with uterine fibroids being the commonest indication. The commonest finding was hydronephrosis. There was significant association between gender and indications for the study (*P*=0.0001).
KEYWORDS: Intravenous Urography, findings, Kidneys

INTRODUCTION

Conventional intravenous urography (IVU) is an indispensable radiological investigation used in the evaluation of the structure and efficient state of the genitourinary system after administration of radio-opaque material[1].The IVU imaging progression is calculated to optimize illustration of definite part of the urinary tract during the maximal contrast media opacification. Urographic study could be modified and may afford diagnostic feature further than some present capabilities of other imaging modalities.[2] Occasionally IVU is limited by a number of changeable factors such as the level of bowel preparation, split renal function, radiographic factors and body mass index[3]. A major drawback for IVU investigation has been linked with nephrotoxicity and allergy to the radio-opaque material used during the procedure. Interestingly IVU has been the main stay investigation for the assessment of the urinary tract pathologies[2]. Computed tomography (CT), magnetic resonance imaging (MRI) and ultrasonography has gained ground in recent years in order to eliminate the shortfall of conventional IVU.[2,4]. These newer imaging modalities have their own high and low points just like conventional IVU. In third world countries conventional IVU is still relevant in the examination of urinary tract pathologies even with the present modern progress in imaging technologies.[5]

This study is aimed at analyzing IVU findings; the indications as well as usefulness of conventional IVU in the Radiology Department of Rivers State University teaching hospital (RSUTH). This will serve as a working document if IVU still has a role to play/ a place with the emergence of CT urography (CTU).

MATERIALS AND METHODS

This study is retrospective in design and conducted in the department of Radiology, RSUTH from 1st February 2021 to 28th of February 2023. A total of 133 patients information

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were obtained from the archives of the department. Patients request forms and reports were retrieved and sorted from the archive of the department. The demographic, indications and findings were obtained and documented in the data sheet. Ethical approval was not obtained since its secondary data. Data obtained were analyzed using SPSS 21.0 version and statistical significance was set at < 0.05.

RESULTS

Mean age of the study population ± SD Age = 39.29 ± 13.63 years

Median age = 38.00 years

Minimum = 7.00 years

Maximum = 72.00 years

Table 1: Age and gender characteristics of the study population

Variables N = 133	Frequency	Percentage
Age Category		
<25 years	13	9.8
25 – 35 years	40	30.1
36 – 46 years	49	36.8
47 – 57 years	15	11.3
≥58 years	16	12.0
Gender		
Male	48	36.1
Female	85	63.9

Table 1: Is showing the age and gender distribution in the study. Age range 36-46 years had the highest frequency and both extreme ranges had the least percentages. Females presented more for intravenous urogram than males in this study.

Table 2: Indications of Conventional IVU of the patients

Indications	Adult n (%) (n = 123)		Pediatric n(%) (n = 10)	
	Male n(%)	Female n(%)	Male n(%)	Female n(%)
Flank pain	18 (40.0)	17 (21.8)	1 (33.3)	2 (28.6)
Urinary symptoms	4 (8.9)	3 (3.8)		2 (28.6)
Stones	10 (22.2)	5 (6.4)	1 (33.3)	1 (14.3)
Hydronephrosis	8 (17.8)	6 (7.7)		
Uterine fibroid	0 (0.0)	40 (51.3)		
Post intervention				1 (14.3)
Urinary bladder injury	1 (2.2)	2 (2.6)		
Urinary bladder mass	1 (2.2)		1 (33.3)	
Kidney mass		3 (3.8)		
Others	3 (6.7)	2 (2.6)		1 (14.3)
Total	**45 (100.0)**	**78 (100.0)**	**3 (100.0)**	**7 (100.0)**

The table above is showing the distribution of the indications among the study group. Uterine fibroid is seen in only adult females and it is the commonest indication in this study. Flank pain is the commonest indication in adult males. In the pediatrics' age group flank pain and urinary symptoms are commoner in the female. The least indication in the study is post intervention.

Table 3: IVU findings among the study population

Variables	Frequency	Percentage
Right kidney size		
Normal	106	79.7
Abnormal	27	20.3
Type of right kidney size abnormality (N=27)		
Large	24	88.9

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Non–Visualized	3	11.1
Left kidney size		
Normal	108	81.2
Abnormal	25	18.8
Type of left kidney size abnormality (N=25)		
Large	16	64.0
Non-Visualized	7	28.0
Small	2	8.0
Right ureter		
Normal	101	75.9
Abnormal	32	24.1
Right ureter abnormality seen (N=32)		
Proximal portion moderately dilated	15	46.8
Medially rotated/deviated	5	15.6
Double proximal portion	4	12.5
Kinked	4	12.5
Non-Visualized	2	6.3
Cobra head appearance/ Blind ending	2	6.3
Left ureter		
Normal	106	79.7
Abnormal	27	20.3
Left ureter abnormality seen (N=27)		
Non-Visualized	12	44.4
Proximal portion moderately dilated	9	33.3
Kinked	3	11.1
Rotation	3	11.1

Table 3 showing IVU findings in the genitourinary tracts in the study population.

Table 4: Other characteristics of the study population (continuation)

Variables	Frequency	Percentage
Calculus		
Present	18	13.5
Absent	115	86.5
Organs affected by calculus		
Kidney	10	55.6
Ureter	4	22.2
Both	4	22.2
Side affected by calculus		
Left	13	61.1
Right	5	27.8
Side affected and organ		
Left Kidney	7	38.9
Left Kidney/ Ureter	4	22.2
Right Kidney	3	16.7
Right Ureter	2	11.1
Left Ureter	2	11.1
Hydronephrosis		
Yes	53	39.8
No	80	60.2
Side affected in hydronephrosis		
Right	26	49.1
Left	12	22.6
Both	15	28.3

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Delayed nephrogram		
Yes	17	12.8
No	116	87.2
Side affected in delayed nephrogram		
Both	8	47.1
Left	6	35.3
Right	3	17.6
Urinary bladder abnormalities		
Normal	92	69.2
Indented/depressed	32	24.1
Significant post voided urinary bladder volume	4	3.0
Extravasation	2	1.5
Calculus	2	1.5
Christmas tree	1	0.8

Table 4 revealed that the commonest finding is hydronephrosis and it is seen more on the right side followed by both side then the left side.
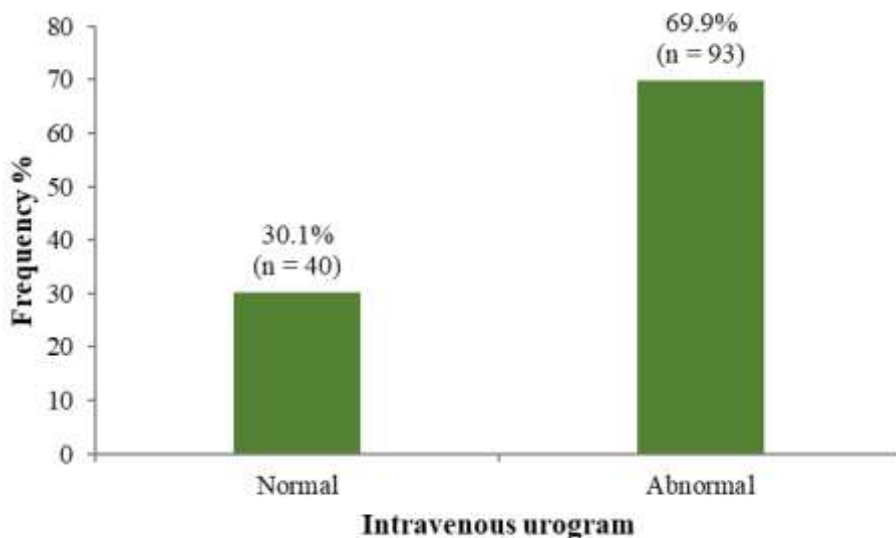

Fig.1: Chart showing the prevalence of the findings in IVU in a tertiary center in South region

Table 5: Correlation of indications with IVU results

Variables N = 133	Normal IVU n (%)	Abnormal IVU n (%)
Uterine fibroid *(n = 40)*	10 (25.0)	30 (75.0)
Flank pain *(n = 38)*	15 (39.5)	23 (60.5)
Stones *(n = 17)*	5 (29.4)	12 (70.6)
Hydronephrosis*(n = 14)*	2 (14.3)	12 (85.7)
Urinary symptoms *(n = 9)*	5 (55.6)	4 (44.4)
Urinary bladder injury *(n = 3)*	0 (0.0)	3 (100.0)
Kidney mass *(n = 3)*	1 (33.3)	2 (66.7)
Urinary bladder mass *(n = 2)*	0 (0.0)	2 (100.0)
Post intervention *(n = 1)*	0 (0.0)	1 (100.0)
Others *(n = 6)*	2 (33.3)	4 (66.7)
Total	**40 (30.1)**	**93 (69.9)**

Fisher's Exact = 8.381; p-value = 0.468

The above table revealed that no significant association exits between the indications for the study and the reports/outcomes.

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Table 6: Prevalence of IVU based on age and sex in the study population

Variables	Normal IVU n (%)	Abnormal IVU n (%)	Total n (%)
Age Category			
<25 years	4 (30.8)	9 (69.2)	13 (100.0)
25 – 35 years	14 (35.0)	26 (65.0)	40 (100.0)
36 – 46 years	19 (38.8)	30 (61.2)	49 (100.0)
47 – 57 years	1 (6.7)	14 (93.3)	15 (100.0)
≥58 years	2 (12.5)	14 (87.5)	16 (100.0)
	Fisher's Exact = 8.628; p-value = 0.066		
Gender			
Male	14 (29.2)	34 (70.8)	48 (100.0)
Female	26 (30.6)	59 (69.4)	85 (100.0)
	Chi-square = 0.029; p-value = 0.864		

The table showed that abnormal IVU is prevalent in 36-46 years age category, followed by 25-35 years age category, 47-57years and greater than or equal to 58 years age categories are equal and lesser than or equal to 25 years age category is the least. A Normal IVU report is higher in 36-46years age category, followed closely by 25-35 years age category and the least is greater than or equal to 58 years age category

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Table 7: Relationship between indications and genders in the study population.

Variables	Male n (%)	Female n (%)	Total n (%)
Flank pain	19 (50.0)	19 (50.0)	38 (100.0)
Urinary symptoms	4 (44.4)	5 (55.6)	9 (100.0)
Stones	11 (64.7)	6 (35.3)	17 (100.0)
Hydronephrosis	8 (57.1)	6 (42.6)	14 (100.0)
Uterine fibroid	0 (0.0)	40 (100.0)	40 (100.0)
Post intervention	0 (0.0)	1 (100.0)	1 (100.0)
Urinary bladder injury	1 (33.3)	2 (66.7)	3 (100.0)
Urinary bladder mass	2 (100.0)	0 (100.0)	2 (100.0)
Kidney mass	0 (0.0)	3 (100.0)	3 (100.0)
Others	3 (50.0)	3 (50.0)	6 (100.0)
Total	**48 (36.1)**	**85 (63.9)**	**133 (100.0)**

*Fisher's Exact = 49.25; p-value = 0.0001**

The above table the relationship between indications and gender and it is statistically significant (*P*-value=0.0001).

Figure 1: Is a control spot radiograph of an IVU series showing a calcific density oval shaped lesion in the region of the renal bed on the left (White arrow).

Figure 2 is a contrast series of figure 1 image, spot film showing the mildly dilated pelvis from the calculus lodged in it (Red color arrow). Note mild-moderate dilatation of the calyceal system on the left. The pelvicalyceal system is normal in configuration.
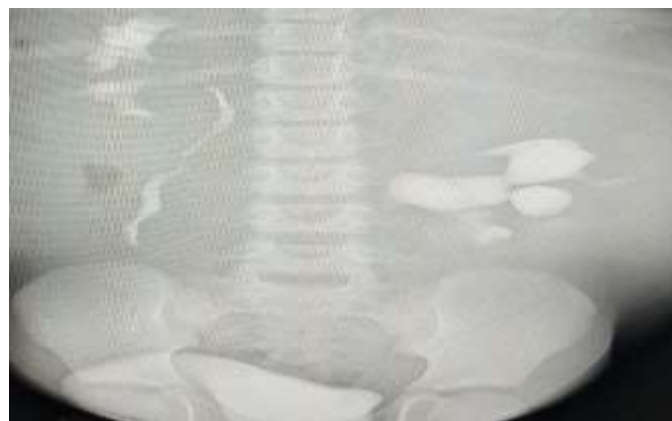

Figure 3 is a spot film showing a distended flank bilaterally worse on the left. Superior to the left kidney is a soft tissue density haze displacing the ipsilateral kidney inferiorly with moderate to marked pelvicalyceal system. The right kidney and its pelvicalyceal system is normal.

DISCUSSION

The initiation of technology has led to loss of the value of some older techniques and their replacement with newer ones that are more sensitive and specific, less invasive, and cheaper.[6] Even though CT scan has been introduced in the management of urinary tract diseases/pathology, IVU still has a role to play in the diagnosing/management of urinary tract pathologies in our clime, since it is cheaper and readily available in most centers than CT scan (CT urography).

In this present study the females presented more for IVU. This finding corroborates with a study done in United States by Hale et al[7] and Kumar et al[2] respectively. This could be attributed to the fact that more gynaecological cases were referred for IVU in this study. In contrast to our finding,[5,8-9] documented more males than females presenting for IVU in their respective studies. This difference might be linked to the location/methodology.

With regards to age, adults are more than pediatrics in this study, this is in tandem with Aklan and Mikhlafy[5] and Umar San et al[9]. This is possible simply because adult presented more for IVU than the paediatric age group.

In this index study, normal IVU is 30.1% (n=40), this is near 31.2%, 26.0% and 23.1% in Yemen, Brazil and Pakistan[5-6,8] respectively. This contradicts a report submitted by Little MA et al[3] (77.0%). Also in this current study abnormal IVU was 69.9% (n=93), this is in agreement with previous studies.[5,8,10.]

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This could be explained away by being carried out in developing countries/low resource region of the world.

The commonest finding in this present study is hydronephrosis (n=53, 39.8%), with right sided hydronephrosis more common than both or left sided hydronephrosis respectively. This is contrary to reports of renal calculi as the commonest finding documented by earlier studies. [2,10] This difference may be attributed to the most common indication in this study being uterine fibroid, which could be a cause of back pressure renal changes.

With regards to kidney size abnormality, right kidney is more affected than the left kidney. The most common abnormalities are large size and non-visualized kidney is seen more on the left. Renal calculi are commoner than calculi along the ureteric paths and urinary bladder. Overall calculi were seen more in male than female in this current study.

The right ureter has more pathology than the left ureter.

CONCLUSION

This study shows that more female presented for IVU which tallies with uterine fibroids being the commonest indication. The commonest finding was hydronephrosis. There is significant association between gender and indications for the study (*P*=0.0001).

LIMITATION OF STUDY: Retrospective study
FUNDING: None
CONFLICT OF INTEREST: None

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

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