Original research article

The Overview of Ureteral Colic in Ureterolithiasis Patients Based on the Location of Stones Observed on Urographic CT-scan

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ABSTRACT

Background: Ureterolithiasis is a crystal concretion formed within the ureter that can lead to obstruction. Ureteral colic is one of the most common clinical manifestations with different characteristics depending on the location of the stone in the ureter. This research aims to determine the overview of ureteral colic in ureterolithiasis patients based on the location of stones that appeared on the urographic CT-Scan examination at RSUD Raden Mattaher Jambi. **Methods:** This research uses a qualitative study with a descriptive observational design, with 43 samples from the medical record data of ureterolithiasis patients in RSUD Raden Mattaher Jambi for January-December 2022. **Results:** The most incidence was male (69.8%) with age 41-60 years (44.2%). Ureteral colic predominates on the right side (53.5%), with the most radiating to the umbilical (44.2%). The most location was in the proximal ureter (44.2%), with hounsfield units <1000 HU (53.5%), and stone sizes were 5-10 mm and >10 mm (41.9%). **Conclusion:** Based on this research, the overview of ureteral colic in ureterolithiasis patients at RSUD Raden Mattaher Jambi was more common on the right side with the colic radiating to the umbilicus and the location stones in the proximal ureter.

Keywords: ureterolithiasis; CT-scan urography; colic

INTRODUCTION

Ureterolithiasis is the second most common disease after nephrolithiasis in the incidence of urolithiasis. According to the Indonesian Association of Urologists (IAUI), urolithiasis is the formation of stones in the urinary tract. These stones can occur in urinary organs such as the kidneys (nephrolithiasis), ureters (ureterolithiasis), bladder (vesicolithiasis) and urethra (urethrolithiasis). Urolithiasis is the third most common case in the urology department after urinary tract infections and benign prostate enlargement.[1]

The incidence and prevalence of urolithiasis continues to increase. Life-threatening cases are rare, but the disease often causes severe pain and adversely affects the patient's quality of life. In Asia, approximately 1%-19.1% of the population suffers from urolithiasis. In West Asia, Southeast Asia, South Asia and some

developed countries such as South Korea and Japan the prevalence of urolithiasis is 5%-19%, while in most of East Asia and North Asia the prevalence is 1%-8%.[3,4] According to Mohammad Shazib's study in India, the prevalence of urolithiasis is around 5.7%-10.8% with the highest incidence of nephrolithiasis, followed by ureterolithiasis.[5] In some countries, the incidence of urolithiasis is 1%-20% males are more common than females with a ratio of 3:1 and the highest incidence occurs in patients aged 40-50 years.[1] According to research by Haryadi et al. at Dr. H Abdul Moeloek Hospital, Bandar Lampung in 2018-2019 showed that the highest incidence of urolithiasis was nephrolithiasis around 60%, followed by ureterolithiasis around 55% with more incidence in men, around 21 patients (52.5%) compared to women, around 19 patients (47.5%) cases.[6]

One of the most common clinical manifestations in urolithiasis is ureteral colic which can be caused by the body's physiological reaction to remove stones from the urinary tract which causes excessive smooth muscle peristalsis in the urinary tract.[7] Urethral colic in ureterolithiasis has different characteristics depending on the location of the stone in the ureter. Stones located in the proximal ureter have typical colicky pain that continues to increase according to peristaltic activity in the ureter, with colic radiating to the umbilicus. Stones located in the medial ureter have colic radiating to the right lower quadrant (mcburney point) or left lower quadrant. Stones located in the distal ureter are characterized by radiating to the medial thigh.[11] Menurut penelitian Sajeel Saeed et al. serta penelitian Jonah Himelfarb et al. CT-scan merupakan gold standard untuk mendeteksi adanya batu di saluran kemih karena memiliki sensitivitas sekitar 95%-98%.[11,12] Saat ini, penelitian terkait penjalaran kolik ureter pada pasien ureterolitiasis di kota Jambi masih sedikit.

Based on this description, research was conducted The Overview of Ureteral Colic in Ureterolithiasis Patients Based on The Location of Stones Seen on Urographic CT-Scan Examination at RSUD Raden Mattaher Jambi.

METHODS

This research method is descriptive research, with the sample taken is medical record data at Raden Mattaher Jambi Hospital. The population from January to December 2022 was 64 patients. 43 patients became inclusion criteria and 21 patients became exclusion criteria due to lack of data related to manifestations, Urographic CT-Scan data were not available, and patients had tumor and cancer diseases. The variables studied were age, sex, side of ureteral colic, characteristics of ureteral colic spread, location of ureteral stones seen on CT-Scan Urography, Hounsfield Unit, and Stone Size. Data collection was secondary data using medical records on ureterolithiasis patients at Raden Mattaher

Hospital Jambi in the period January-December 2022.

RESULTS

In this study, the population was 64 patients with 43 patients being the study sample. Samples were grouped based on variables. **Table 1** shows that ureterolithiasis patients at Raden Mattaher Jambi Hospital were more prevalent in the 41-60 years age group compared to other age groups. The proportion of male sex is more than female. Furthermore, right-sided ureteral colic is more than the left side.

Table 1. Characteristics of age, sex, and side of colic

Characteristics		Frequency	Percentage (%)
Age (years)	21-40	14	32.6
	41-60	19	44.2
	>60	10	23.3
Sex	male	30	69.8
	female	13	30.2
Side of colic	right	23	53.5
	left	20	46.5

Table 2. Characteristics of colic spreading from the onset of colic

Colic spreading	Right side	Left side	Total	Percentage (%)
Umbilicus	12	7	19	44.2
Lower abdomen	6	5	11	25.6
Genital/inner thigh	3	4	7	16.3
Lower abdomen and genital	1	-	1	2.3
Lower abdomen and umbilicus	-	4	4	9.3
Genital and umbilicus	1	-	1	2.3

In **Table 2**, it was found that the spread of ureteral colic in the study sample mostly spread towards the umbilicus. Then, in **Table 3**, it was found that the location of stones in the study sample occurred more in the proximal part of the ureter than other parts of the ureter. **Table 4** shows more Hounsfield unit values with HU < 1000 and the largest stone sizes are 5-10 mm and > 10 mm.

Table 3. Characteristics of stone location observed on CT-scan Urography

Stone location observed on CT-scan Urography	Right	Left	Total	Percentage (%)
Proximal	12	7	19	44.2
Medial	6	5	11	25.6
Distal	3	4	7	16.3
Medial dan distal	1	-	1	2.3
Proximal dan medial	-	4	4	9.3
Proximal dan distal	1	-	1	2.3

Table 4. Characteristics of Hounsfield unit and stone size

Stone characteristics		Frequency	Percentage (%)
Hounsfield Unit	<1000 HU	23	53.5
	>1000 HU	7	16.3
	No Data Available	13	30.2
Stone Size	<5 mm	4	9.3
	5-10 mm	18	41.9
	>10 mm	18	41.9
	No Data Available	3	7

DISCUSSION

This study found that the most common age group was 41–60 years (44.2%), followed by the 21–40 years group (32.6%). This is consistent with research by Kiki Maulana et al. at Dr. H. Abdul Moeloek General Hospital in Lampung, where the highest incidence of urolithiasis occurred in the 41–60 years age group.[27] In addition, these results are also in line with research by Poniyah Simanullang at Martha Friska Hospital Pulo Brayan Medan where the highest incidence occurred in the age group of 30-50 years.[28] This can occur because with increasing age, the amount of content in the kidneys will also increase so that the process of deposition in the loop of henle will increase, so that the process of stone formation in the urinary tract will occur more easily. In contrast to children, the deposition of stones in the urinary tract is less common because the nephrons are still not fully developed. In addition, late adulthood is more susceptible to urolithiasis because there are more activities than other age groups, so that fluid needs increase and

often the fluid entering the body is less than needed.

Ureterolithiasis patients at Raden Mattaher Jambi Hospital are more common in men (69.8%) than women (30.2%). This is in accordance with research by Haryadi et al. at Dr. H Abdul Moeloek Bandar Lampung Hospital in 2018-2019 which describes the incidence of urolithiasis is more common in men (21 patients) compared to women (19 patients).[6] In addition, research by Reza Kurniawan et al. at Dr. Soetomo Hospital in Surabaya described the incidence rate in men was more (33 patients) compared to women (29 patients).[20] Similarly, a study by Indra Alini at Putri Bidadari General Hospital described the incidence of ureterolithiasis and nephrolithiasis was more prevalent in men (32 patients) than women (23 patients).[35] The incidence of ureterolithiasis in men can occur because urinary calcium levels as a stone-forming material in women are lower than men and urinary citrate levels as an inhibitor of stone formation in women are higher than men. In addition, the role of hormones can also affect, namely the hormone estrogen in women which acts as an inhibitor of calcium salt aggregation, and reduces oxalate excretion and plasma oxalate concentration. In contrast, the testosterone hormone in men has the opposite role to the estrogen hormone, which increases endogenous oxalate which facilitates crystallization.

The manifestation of ureteral colic in this study sample occurred more on the right side (53.5%). This is in accordance with research by Indra Alini at Putri Bidadari Stabat General Hospital which describes that the incidence of colic in patients with ureterolithiasis and nephrolithiasis is more on the right (29 patients) than the left (19 patients).[35] Similarly, a study by Shintya et al. at Al-Islam Bandung Hospital in 2017 described that the incidence of urolithiasis was more unilateral right than left.[29] In addition, Odoemene Ca in his study described that the incidence of ureterolithiasis was more on the right ureter with an incidence of 43 patients compared to the left ureter with an incidence of 29 patients.[32] Urethral colic is an acute pain in the waist that usually originates from the costovertebral angle. It is caused by a stone obstruction in the urinary tract. The degree of pain is usually related to the degree of obstruction that occurs in a person's urinary tract.

Of the total sample, it was found that the most spread of colic was towards the umbilicus (44.2%). According to Chirag N Dave, the spread of colic can occur due to dilation, stretching, and spasm caused by ureteral obstruction. Muscle spasm, increased peristalsis, local inflammation, and edema at the site of obstruction that causes pain and suppresses the nervous system in the ureter so that transmission occurs according to the nerves that are suppressed.[30] This is in line with the explanation related to ureteral innervation

put forward by Herman A. Lescay et al. who explained in his journal related to ureteral anatomy that the ureter is innervated by nerves T12 to L2, so that the spread that arises will refer to the T12-L2 dermatome. Patients with stones in the proximal ureter have colic spread to the umbilicus, while stones in the medial ureter have colic spread to the right lower abdomen or left lower abdomen, and stones in the distal ureter have colic spread to the genitalia or inner thigh.[15,32]

In this study, it was found that the location of stones that appeared on urographic CT-Scan examination was more in the proximal part of the ureter (44.2%). This is in line with research by Hidayah et al. at An Nur Hospital Yogyakarta which describes that the location of ureteral stones that occur in ureterolithiasis patients is more in the proximal ureter (27 people) compared to distal ureteral stones (13 people).[31] Similarly, Seid Mohammed in his research described that the incidence of ureteral stones was most prevalent in the proximal ureter with an incidence of 28 patients, followed by the medial part of about 27 patients and the least was the distal ureter of 7 patients.[33] In contrast to research by Indra Alini at Putri Bidadari Stabat General Hospital which describes the incidence of ureterolithiasis more in the distal part of the ureter (20 patients), followed by the proximal ureter (12 patients), and the medial ureter (4 patients).[35] Palak Thakore menyebutkan dalam jurnalnya alasan lokasi batu yang paling sering tersumbat di ureter bagian proksimal dekat ureteropelvic junction karena di wilayah ini diameter ureter sangat sempit. lokasi kedua yang cukup sering terjadi sumbatan akibat batu adalah di bagian distal di dekat ureterovesical junction.[9]

In this study, the Hounsfield unit value in the entire sample was dominated by HU less than 1000 (53.5%). Research by Heshmatollah et al. mentioned that the Hounsfield unit in each case must be different, in his research the most HU value was 500-700 HU (79 patients), followed by 700-900 HU (42 patients) and the least was >900 HU (30 patients). [36] Sriharsha Bokka in his research stated that hounsfield unit is one of the values that can be considered in addition to stone size to predict appropriate management in ureterolithiasis patients because HU can be used to predict the density and composition of stones. SWL action can be performed in patients with HU <1000, the success rate of SWL decreases after reaching a value of 1000 HU. The higher the HU value, the denser the stones in the patient.[34]

In this study, it was found that the stone size in the entire sample was dominated by the size group of 5-10 mm (41.8%) and >10 mm (41.8%). This is in line with research by Odoemene Ca which states that the most common stone size in the incidence of ureteral stones is the 5-10 mm size group, as many as 62% of the total sample with an average size of 7.2 mm.[32] In addition, Sriharsha Bokka in his research

also found that the most common stone size in cases of distal ureterolithiasis was 5-10 mm.[34] Similarly, research by Indra Alini at Putri Bidadari Hospital described that the most common ureteral stone size was a stone with a size of less than 10 mm (20 patients) followed by a stone size of 10-20 mm (15 patients).[35]

Stone size can be used as an indicator in determining initial management. About 86% of stones in the urinary tract can pass spontaneously within 30-40 days. This is determined by the size of the stone in the patient's urinary tract. Stones with a size of less than 5 mm have a greater chance of spontaneous discharge with pharmacological assistance than stones above 5 mm in size. Pharmacological therapies that can be given include NSAIDs as first-line treatment for pain and medication expulsion therapy (MET) such as alpha-blockers (tamsulosin) to help expel smaller stones spontaneously. If medical therapy is unsuccessful, pain is not relieved, or the stone size is larger than 5 mm, active ureteral stone removal such as SWL and URS can be performed.

CONCLUSION

Based on this research, the overview of ureteral colic in ureterolithiasis patients at RSUD Raden Mattaher Jambi was more common on the age group 41-60 years, male sex, right side colic with spread towards the umbilicus, stone location in the proximal part of the ureter, HU less than 1000, and stone size 5-10 mm and >10 mm. the right side with the colic radiating to the umbilicus, and the location stones in the proximal ureter.

RECOMMENDATIONS

Further research is needed regarding the correlation between the location of ureteral stones seen on urographic CT-Scan examination with the manifestation of ureteral colic that radiates to one part of the body.

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