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**SURGICAL TREATMENT OPTIONS AND ITS ADVERSE OUTCOMES AMONG PATIENTS WITH UROLITHIASIS AT KCMC, 2014 TO 2018**

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**ABSTRACT**

***Purpose:*** The study aimed to evaluate surgical treatment options and its adverse outcomes among patients with urolithiasis at Kilimanjaro Christian Medical Centre (KCMC). All patients who were diagnosed with urolithiasis and underwent surgical intervention from January 2014 to December 2018 were enrolled.

***Method and material:*** This was a hospital based descriptive cross-sectional study conducted at the institute of urology, KCMC, Moshi, Tanzania. Urology theatre registry was used to obtain patients' registration numbers then the files were retrieved from medical records. Relevant information was extracted using structured data collection tool. STATA version 14.1 was used for analysis and a P value of 0.05 was regarded to be statistically significant.

***Results:*** Among seventy-eight subjects, sixty-two were males and sixteen were females with male to female ratio of 3.8:1. Patients aged 4 years to 90 years. Majority 57 (73.1%) underwent open surgery treatment and only 17 (21.8%) had adverse outcome after treatment. In multivariate analysis patients treated with endoscopy had more than six times higher odds of adverse outcomes compared to counterpart though this was not statistically significant (OR: 6.65; 95% CI: 0.82, 53.87)

***Conclusion:*** Open surgeries have been observed to have better outcome compared to endoscopy surgeries among urolithiasis patients as most of the adverse outcomes were more observed among patients treated with endoscopy.

## INTRODUCTION

Urolithiasis is an ancient disease with global distribution and among the cause of urinary system obstruction(1). The epidemiological profile of urolithiasis varies from one part of the world to another according to food habit and mostly environmental factors and is a problem that is generally increasing in tropical African countries(2). It is a common urological condition affecting about twelve percent of global population with a male to female ratio of 1.3:1. The affected population peaks at second decade and is a rare disease among children(3,4)

The current available treatment options for urolithiasis have a great variability in outcomes with respect to the type of surgical intervention and are significantly dependently upon age, sex, type of surgery, stone location, stone composition, available equipments and expertise(5,6)

Urolithiasis is a common urological condition, it ranks sixth at KCMC urology institute (Top ten diseases in Urology, KCMC, 2018), however in most parts of Africa including East Africa there is scarce published information regarding the outcomes that may arise after surgical intervention of urolithiasis and majority of studies are older.

Therefore having a set of factors that contribute to the outcome of treatment and their impact in further patient management and due to the fact that surgical treatment outcomes have not been fully evaluated for many years in most African countries we decided to conduct this study so as we can have a reflection of the effect of different treatment modalities among patients with urolithiasis patients treated at KCMC for the number of years ago. This will enable to act as a wakeup call for urologists in many parts of Africa especially East Africa but also will help in the improvement of patient care and management of urolithiasis patients.

## MATERIALS AND METHODS

*Study setting:* The study was conducted at KCMC consultant hospital that is located in Kilimanjaro region in northern part of Tanzania. The hospital serves almost all private and government hospitals in Northern zone. There are approximately 600 beds at KCMC hospital. The hospital serves about all-important medical services and counseling. Also, KCMC is the only consultant referral hospital in the Northern Zone, which serves the entire population of the Northern zone of Tanzania as well as patients from nearby countries (East Africa) such as Kenya, Rwanda, Burundi and Uganda.

As a consultant hospital in the northern zone, KCMC has a well-established department of Urology that provides services to patients referred from regions and districts within and outside its catchment area. The institute serves as a referral, training and research center for all urological diseases and complications from all over Tanzania and neighboring countries. It has a bed capacity of 48.

*Design, sample and sampling:* This was a hospital-based single centered retrospective study from 1<sup>st</sup> of January 2014 to 31<sup>st</sup> December 2018. The study utilized all urolithiasis patients admitted and then operated at the hospital in the specified study period. A total of 86 patients were registered and only 78 were eligible for study. Among 8 patients who were excluded 6 received both open surgery and endoscopic surgery during treatment and 2 patients neither had open surgery nor endoscopy surgery.

*Data collection:* The tools used were structured data extraction sheet, notebooks and theatre registry books. Patients' files were retrieved after obtaining patients registration numbers from urology theatre

registry books, then handed to medical records. Relevant Information from patients' files was extracted using structured data sheet. The information collected included patient's socio-demographic, clinical history, type of surgical intervention offered and the adverse outcome after surgery. All data were entered on the data extraction sheet by specifying each patient by using hospital number.

*Data processing and analysis:* Data were checked for possible errors and missing data using frequencies and histogram. Categorization was done based on the previous literatures and clinical indications.

Statistical analysis was performed using Stata version 14.1 (Stata Corp LP®, College Station, Texas, USA). In this study the outcome of interest was adverse outcome (binary outcome -YES/NO) generated from adverse events which included presence of residual stones, wound infection, recurrence of symptoms, failure of resolution of symptoms and failure of stone removal. The response was YES if the participant had experience at least one among these specified adverse outcomes and NO if participant did not experience any of the mentioned adverse outcomes.

The primary exposure was type of surgical treatment offered (open surgery/endoscopy surgery) while other independent variables were age, sex, marital status, location of stone, present with fever and present with hematuria.

Descriptive statistics were summarized by using frequency and proportional for categorical variables while measures of central tendency and its respective measure of dispersion were used for continuous variables.

Chi-square was used to evaluate the association between the exposures and adverse outcomes. Potential confounders were explored using Mantel-Hanzel. An exposure with equal or more than 15%

change in odds ratio of the main exposure from crude to adjusted was considered as confounder.

Logistic regression was used to determine the odds ratio and the 95% CI of the exposures and outcome. In multivariate analysis only exposures that have been found to have significant association with the outcome variable and those considered as potential confounders of the association between type of surgery and the adverse outcome were entered in the development of the final model. After adjusting for confounders and testing for goodness of fit, the final model that shows the association between type of surgery and adverse outcome among urolithiasis was obtained. The magnitude of association was interpreted using adjusted odds ratio, 95% confidence interval and p-value of <0.05 was considered significant.

*Study Limitation:* Some of the variables like Body mass index and stone size characterization that might have confounded the association were not captured since the study was retrospective.

Loss to follow up of patients.

*Strength of the study:* The population was well presented age wise as the youngest patient was four years old and the oldest was ninety years. Also, in Africa and especially Eastern part of Africa, there is scarce of studies on urolithiasis.

## RESULTS

*Socio-demographic and clinical characteristics of the study participants:* Among 78 studied participants majority 62 (79.5%) were male, 53 (68.0%) aged above 40 years with mean age (SD) of 50.7 (19.8). Furthermore, more than half 40 (51.3%) presented with hematuria and 57 (73.1%) underwent open surgery treatment while only 17 (21.8%) had adverse outcome after treatment. (Table 1.)

**Table 1***Socio-demographic and clinical characteristics of the study participants (N=78)*

Characteristics	n	%
<b>Sex</b>		
Male	62	79.5
Female	16	20.5
<b>Age group (years)</b>		
<19	4	5.1
19-40	21	26.9
>40	53	68.0
<i>Mean ± SD (50.7±19.8)</i>		
<b>Marital status (n=73)</b>		
Single	8	11.0
Married	57	78.1
Widow/Divorced/Widower	8	10.9
<b>Stone location (n=69)</b>		
Kidney	9	4.4
Ureter	27	39.1
Bladder	38	55.0
Urethra	1	1.5
<b>Present with fever</b>		
Yes	5	6.4
No	73	93.6
<b>Presented with hematuria</b>		
Yes	38	48.7
No	40	51.3
<b>Surgical type</b>		
Open surgery	57	73.1
Endoscopy surgery	21	26.9
<b>Adverse outcome</b>		
Yes	17	21.8
No	61	78.2

***Proportional of adverse surgical outcomes among study participants:***

The difference in proportional of adverse outcome was observed to be significant in sex, stone location and presence of hematuria only. Female 62.5% (36.6%-82.8%) had higher proportional of adverse

outcome than male 11.3% (5.4%-22.2%). While treated by endoscopy surgery had 28% (13.0, 51.7%) higher proportional of adverse outcome compared to those treated by open surgery 19.3% (10.8%-31.9%) though the different was not statistically significant. (Table 2.)

**Table 2***Proportional of adverse surgical outcomes among study participants (N=78)*

Variables	Total	Adverse surgical outcome			Chi-square	p-value
		n	%	(95% CI)		
<b>Sex</b>						
Female	16	10	62.5	(36.6, 82.8)	19.57	<0.001
Male	62	7	11.3	(5.4, 22.2)		
<b>Age group (years)</b>						
<19	4	2	50.0	(9.1, 90.0)	2.58	0.275
19-40	21	3	14.3	(4.4, 37.3)		
>40	53	12	22.6	(13.1, 36.2)		
<b>Marital status</b>						
Single	8	3	37.5	(11.2, 74.0)	1.82	0.402
Married	57	10	17.5	(9.6, 30.0)		
Widow/Divorced/Widower	8	2	25.0	(5.5, 65.5)		
<b>Stone location</b>						
Kidney	9	5	55.6	(23.2, 83.8)	17.53	0.001
Ureter	27	9	33.3	(17.9, 53.4)		
Bladder	38	1	2.63	(0.3, 17.2)		
Urethra	1	0	0.0	(-)		
<b>Present with fever</b>						
No	73	14	19.2	(11.5, 30.1)	4.58	0.066
Yes	5	3	60.0	(16.4, 92.0)		
<b>Presented with hematuria</b>						
No	40	14	35.0	(21.6, 51.2)	8.40	0.004
Yes	38	3	7.9	(2.5, 22.4)		
<b>Surgical type</b>						
Open surgery	57	11	19.3	(10.8, 31.9)	0.774	0.379
Endoscopy surgery	21	6	28.6	(13.0, 51.7)		

***Association between type of surgical treatment and its adverse outcome among urolithiasis patients:***

In crude analysis adverse outcome was not significantly associated with our primary exposure (type of surgery) and all other independent variables except sex.

After adjusting for other factors type of surgery remains to be not significant associated with adverse outcome. After adjusting for other factors, patients treated

with endoscopy (PCNL,URS, Cystolitholapaxy, PCCL) had more than six time higher odds of adverse outcome compared to those treated with open surgery though this was not statistically significant (OR: 6.65; 95% CI: 0.82, 53.87). While patients presented with hematuria 89% had lower odds of adverse outcome compared to those with no hematuria and this association was statistically significant (OR: 0.11; 95% CI: 0.01, 0.98) (Table 3.)

**Table 3**

Association between type of surgical treatment and its adverse surgical outcome among urolithiasis patients at KCMC (N=78)

Variables	cOR (95% CI)	p-value	aOR (95% CI)	p-value
<b>Sex</b>				
Female	1		1	
Male	0.08 (0.02, 0.28)	<0.001	0.06 (0.01, 0.68)	0.022
<b>Age group (years)</b>				
<19	1		-	-
19-40	0.17 (0.02, 1.68)	0.128	-	-
>40	0.29 (0.04, 2.30)	0.243	-	-
<b>Marital status</b>				
Single	1		1	
Married	0.35 (0.07, 1.73)	0.200	0.20 (0.01, 3.03)	0.245
Widowed/Divorced	0.56 (0.65, 4.76)	0.592	0.12 (0.01, 3.77)	0.205
<b>Stone location</b>				
Kidney	1		1	
Ureter	0.40 (0.09, 1.86)	0.243	0.28 (0.03, 2.35)	0.241
Bladder	0.02 (0.01, 0.23)	0.002	0.04 (0.01, 0.69)	0.026
Urethra	-	-	-	-
<b>Present with fever</b>				
No	1		1	
Yes	6.32 (0.96, 41.50)	0.055	1.46 (0.04, 57.73)	0.839
<b>Presented with hematuria</b>				
No	1		1	
Yes	0.16 (0.04, 0.61)	0.007	0.11 (0.01, 0.98)	0.048
<b>Surgical type</b>				
Open surgery	1		1	
Endoscopy surgery	1.67 (0.53, 5.30)	0.382	6.65 (0.82, 53.87)	0.076

\*Note (-) omitted

## DISCUSSION

In this retrospective study majority of the patients were males 62(79.5%). Many were above forty years 53(68%) with mean age SD 50.7(19.8). Stones were mainly found in the urinary bladder 38(55%). Open surgery was performed more in 57(73.1%) which was similar to the study conducted in United Kingdom on the role of open stone surgery especially in developing countries where open surgery plays a great role in urinary stones extraction(7). Although it was contrary to a study in Egypt where open surgery was only done in 533 patients out of 5172(8). Also, overall adverse outcomes in our study was 17(21.8%).

The difference in proportional of adverse outcomes was observed to be significant in sex, stone location and presence of pre-operative hematuria only while age had no association with adverse outcomes which was similar to a study done in China where age had no effect on treatment outcomes in patients undergoing treatment for renal stones, although the difference in sample size between this study and ours was very high, 6000 and 78 respectively(9). Female 62.5% (36.6%-82.8%) had higher proportional of adverse outcomes than male 11.3% (5.4%-22.2%). While those treated by endoscopy surgery had 28% (13.0, 51.7%) higher proportional of adverse outcomes compared to those treated by open surgery

19.3% (10.8%-31.9%) though this was not statistically significant. This was similar to a study done in North Carolina for Spinal Bifida patients with upper tract Calculi. Urolithiasis procedures in patients with spinal bifida were associated with a significantly higher risk of in-hospital postoperative complications although compared to our study the complications post urolithiasis surgery were studied in a non-spinal bifida patients(10).

### CONCLUSION

In this study it was observed that open surgeries have a better outcome compared to endoscopic surgeries among urolithiasis patients as most of the adverse outcomes were more observed among patients treated with endoscopic intervention. Therefore, despite the fact that the world is heading towards endoscopic and minimal invasive surgeries, it is interesting based on this study that open surgery may also play a pivotal role especially in developing countries where sophisticated endoscopic equipments are not widely used due to various setbacks. Similar prospective study is recommended in the future.

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