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Baseline Characteristics and Diagnostic Accuracy of Urinary Cytology for Bladder Cancer Detection in Patients at the University Teaching Hospitals

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Abstract

The general objective of this study was to document the baseline characteristics of patients with suspected bladder cancer and determine the diagnostic accuracy of urine cytology in the diagnosis of bladder cancer. A total of 59 respondents were recruited at the University Teaching Hospital urology clinic. A cross-sectional study design was used and respondents were selected by purposeful sampling. Participants were patients suspected of bladder cancer undergoing cystoscopy and biopsy in the outpatient clinic. They were asked to submit urine before cystoscopy and biopsy. Cytology results were compared with biopsy results. Univariate and bivariate analysis was conducted to describe the baseline characteristics of respondents and determine the diagnostic accuracy of urine cytology. The study found that out of the 59 recruited, a total of 57 had bladder cancer. The study results showed that the majority of the respondents were female and above 50 years. 58 percent of the respondents had SCC, 38.6 had TCC while 3.5 had Adenocarcinoma. The overall sensitivity of urine cytology was 28 percent while the specificity was 50 percent. The sensitivity of urine cytology for TCC, SCC and AC were 28.5, 30.3 and 33.3 percent respectively. The study found low sensitivity and high specificity of urine cytology. urinary cytology was 21 and 50 percent respectively. The low sensitivity therefore means it may not provide the clinician with reliable results for the detection of bladder cancer that could be helpful in daily practice.

Keywords: Urine cytology; Bladder cancer; Specificity; Sensitivity

Introduction

Bladder cancer refers to malignant neoplasm affecting the urinary bladder. Globally, bladder cancer is the 11th most common cancer [1]. In Zambia, bladder cancer is the 9th most common cancer contributing 3.7 percent of all cancer cases [2]. It has three histo-pathological types namely Squamous cell cancer (SCC), Transitional cell cancer (TCC) and Adeno-carcinoma (AC). Biopsy is the gold standard for diagnosis of bladder cancer which is obtained by cystoscopy [3]. Bladder cancer can also be detected by cytological examination of voided urine. This is a non-invasive procedure and aims to detect tumor cells through microscopic examination of urine. However, due to the limited availability of cystoscopy, need for anesthesia if rigid instruments are used and technical expertise required, this has resulted in most health facilities in low resource settings such as Zambia unable to offer cystoscopy services and diagnose early to give a chance for cure. In addition, the possibility of post cystoscopy infection is another potential disadvantage of this procedure. On the other hand, Urine cytology requires less expertise, does not require special cystoscopy instruction or anesthesia and can be easily performed in most low resource settings by non-urologists. Urine cytology is fairly sensitive in detecting bladder cancer. However, the present literature is based on TCC and not SCC. The purpose of the study was to establish how useful cytology is in this part of the world where SCC is most common.

Methodology

The study was conducted at the University Teaching Hospital with the study population including all in and out patients undergoing Cystoscopy for suspected bladder cancer. The study design was a cross-sectional study. The sampling method that was used was purposeful sampling. Specimens were collected from patients who were scheduled for cystoscopy and biopsy for suspected bladder cancer after obtaining consent. Patients were asked to void in order to empty the bladder. 500 mls of water was given to them and were told to wait until they felt the urge to pass urine. They were then asked to submit 20 mls of urine in a sterile specimen container which was taken for cytology immediately. Thereafter the patient proceeded for the scheduled cystoscopy and biopsy by the attending doctor. The collected urine sample was centrifuged, after which the slide was prepared, stained using Papanicolaou stain and submitted to the cytologist for interpretation. The biopsy samples were submitted for histopathology as per standard practice. The independent variables in the study were age, occupation, sex, history of hematuria, duration of hematuria, history of smoking and exposure to water bodies. Cytology results and histopathology results were the dependable variables. The data collection was done after obtaining ethical clearance and department permission to carry out the study. Data was entered and analyzed using SPSS version 20. Uni-variate analysis of the data was done to determine the frequencies of the variables. Bi-variate analysis to cross tabulate the cytology result and the corresponding histo-pathological result.

Results

A total of 59 participants successfully completed the study; therefore, a 100 percent response rate was achieved (59/59). The study revealed that the majority of the respondents (66.1 percent) were more than 50 years of age. In relation to the gender of the respondents, 52.5 percent of the respondents were female and the rest were male. 79.7 percent did not have a history of smoking while the remainder (20.3 percent). All of the participants reported a history of hematuria and 88 percent reported duration of hematuria greater than 6 months as shown in (Table 1). The study found that out of samples collected for urine cytology, the true positives were 17, false positive was 1, true negative was 1 and false negatives 40. The results for histopathology (gold standard) showed 57 were malignant and 2 were benign. This gave a sensitivity of 28 percent and specificity of 50 percent. The results are shown in (Table 2). The breakdown of positive cytology results based on histological subtype found that 10 were SCC, 6 were TCC and 1 was AC (Table 3). The sensitivity based on different histological subtypes was 28.5 for TCC, 30.3 for SCC and 33.3 for AC (Table 4).

Table 1: *Baseline Characteristics of Participants.*

Variable	Category	Number (N)	Proportion (%)
Age	40-50	20	33.9
	> 50	39	66.1
Sex	Male	28	47.5
	Female	31	52.5
History of smoking	Yes	12	20.3
	No	47	79.7
Occupation	Industrial	15	25.4
	Non-Industrial	44	74.6
Exposure to water bodies	Yes	35	59.3
	No	24	40.7
History of hematuria	Yes	59	100
	No	0	0
Hematuria duration	< 6/12	7	11.9
	> 6/12	52	88.1

Table 2: *Diagnostic Accuracy of Urine Cytology.*

	Disease (Bladder Cancer)	
	Present	Absent
Cytology Result	17 (True Positive)	1 (True Negative)

	40 (False Negative)	1 (False Positive)
	57	**2**
Sensitivity = True Positive / (True Positive + False Negative) = (17/57) x 100= 28 percent Specificity= True Negative / (True Negative + False Positive) = (1/2) x100= 50 percent.		

Table 3: *Breakdown of Positive Cytology Result Based on Histological sub-type.*

Sub-type	Positive cytology
Squamous cell Cancer (SCC)	10
Transitional Cell Cancer (TCC)	6
Adenocarcinoma (AC)	1
Total	17

Table 4*: Sensitivity of Cytology based on Histopathological Sub-type.*

Sub-type	Positive cytology	Total	Sensitivity
Squamous cell Cancer (SCC)	10	33	30.3
Transitional Cell Cancer (TCC)	6	21	28.5
Adenocarcinoma (AC)	1	3	33.3
Total	17	57	100
Sensitivity of SCC = (10/33) x 100= 30.3 percent Sensitivity of TCC = (6/21) x 100= 28.5 percent Sensitivity of AC = (⅓)x100 = 33 percent.			

Discussion

A total of 59 participants were recruited in this study to determine the diagnostic accuracy of urinary cytology for bladder cancer detection. Out of this, the majority were female (52.5 percent) and above 50 years (66.1 percent). This could be explained by the fact that increased exposure of women compared to men especially in rural areas to water bodies such as streams and rivers as part of their daily chores such as washing and drawing water which would put them at greater risk of schistosoma infection and subsequently bladder cancer. The majority of participants reported exposure to water bodies such as rivers (59.3 percent) which is consistent with other studies done by Rambau [4] which found that This is commonly encountered in developing countries in areas with a high prevalence of schistosomiasis, Squamous Cell Cancer is more common than Transitional Cella cancer. Chronic cystitis associated with Schistosoma haematobium has been linked to squamous cell carcinoma of urinary bladder in many studies. Squamous cell carcinoma is more common in areas with a high prevalence of schistosomiasis compared to areas of low prevalence. Among the participants, the majority reported no history of smoking (79.7 percent). A study by Wahenya and Mugai [5] found that 70 percent of those with Squamous Cell Cancer were smokers compared to 30 percent with Transitional cell cancer which is in sharp constrast where SCC was more common and the mrjority of the participants were nonsmokers. All study participants reported a history of hematuria which is consistent with other study by El Sabaie [6] which found that hematuria was the most common clinical presentation in patients with bladder cancer. The most common histopathological subtype was Squamous cell cancer (57.8 percent), Transitional cell cancer (36.8 percent) and Adenocarcinoma (5.3 percent). This showed that Squamous cell cancer was the most common subtype as opposed to developed countries where Transitional cell cancer was the most common [7,8].

The result in this study showed increased prevalence of TCC compared to previous studies locally to 36.8 percent from 30.2 percent [8]. This could be explained by increased industrialization leading to greater exposure to pesticides and painting, increased westernized lifestyles and increased control of helminth programs. The study also showed decreased prevalence of SCC from 60.4 to 57.8 percent [9,10]. This could be increased by improved control of helminth programs leading to better control of Schistosoma infection. The study found that sensitivity of urine cytology was 28 percent and specificity was 50 percent. This finding of lower sensitivity and higher specificity was consistent with other a study by Talwar [11] which found that sensitivity was 21 and specificity of 98.6 percent. The study found that sensitivity was highest for Adenocarcinoma at 33.3, followed by SCC at 30.3 and Transitional Cell cancer at 28.5 percent. This is consistent with a study by Abdi El Gawadi [12] who found that sensitivity for Squamous Cell cancer was higher than Transitional Cell cancer [13,14].

Conclusion

The study found that most of the respondents were female, older than 50 years, nonsmokers with a history of exposure to water bodies. Additionally, the study found that diagnostic accuracy (specificity and sensitivity) of urinary cytology was 21 and 50 percent respectively. The low sensitivity therefore means it may not provide the clinician with reliable results for the detection of bladder cancer that could be helpful in daily practice.

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