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ORIGINAL RESEARCH

The patterns of primary male genitourinary cancers in a tertiary referral hospital in northern Ghana

EM Der,[1,2] **AJM Muntaka,**[3,4] **EMT Yenli**[3,4]

[1] *Department of Pathology, School of Medicine, University for Development Studies, Ghana*
[2] *Department of Pathology, Tamale Teaching Hospital, Ghana*
[3] *Department of Surgery, School of Medicine, University for Development Studies, Ghana*
[4] *Department of Surgery, Tamale Teaching Hospital, Ghana*

Corresponding author, email: edmunder1869@gmail.com

Purpose: There is a lack of published data on male genitourinary cancers (MGUCs) in northern Ghana. We aimed to examine MGUC patterns, the histopathological subtypes, and their clinical presentations to form a basis for further research.

Materials and methods: A review of MGUCs at the Tamale Teaching Hospital (TTH) was conducted from 1 January 2012 to 31 December 2021. Data were collected on the age (years), anatomic sites, and clinicopathological characteristics of MGUCs. Statistical Package for the Social Sciences (SPSS) software version 23 was used to enter and analyse the data. A double-tailed Fisher's exact test was used to identify associations between variables, while a *p*-value of 0.05 or less was regarded as statistically significant.

Results: We found 178 malignant tumours of the male genitourinary tract with a mean age of 60.5 ± 12.4 years. Many (66.9%) were 60 years or older. Cancers of the prostate, urinary bladder, and penis were diagnosed in males older than 40 years. The common cancers by anatomic sites were the prostate gland (66.3%), urinary bladder (25.7%), kidneys (5.1%), and penis (4.5%). The common site-specific presentations were prostate (lower urinary tract symptoms [LUTS], 65.0%), urinary bladder (haematuria, 79.0%), kidney (flank mass, 89.0%), and penis (ulcer, 87.5%). The prevalent histological subtypes were prostatic adenocarcinoma (63.5%) and urinary bladder transitional cell carcinoma (TCC) (9.6%).

Conclusion: MGUCs were commonly diagnosed in males older than 40 years, with the prostate and urinary bladder as the common anatomic sites. The common histopathological subtypes were adenocarcinoma, TCC, and squamous cell carcinoma (SCC). A future prospective study of the management and survival rates of MGUCs is recommended.

Keywords: male, genitourinary, cancer, Northern Region, Ghana

Introduction

Male genitourinary cancers (MGUCs) are prevalent cancer-related causes of morbidity and mortality worldwide.[1-4] These cancers are reported to be common among older males.[1-6] Recently, available data from the African continent listed these cancers among the top 10 common diseases in Africa.[5,6] However, the data may have underreported the incidence in some countries. The MGUC spectrum varies little among studies and countries.[4-6] For instance, Klufio found the pattern to be prostate (63.7%), bladder (21.3%), kidney (10.4%), testis (2.4%), penis (1.8%), and one case each of the ureter and urethra at the Korle-Bu Teaching Hospital in Accra, Ghana.[4] Similarly, Ouedraogo et al.[5] reported that prostate cancers made up 45.6% of cases at the Tenkodogo Regional Hospital in Burkina Faso, followed by bladder cancers, kidney cancers, testicular cancers, and cancers of the male external genitalia (3.7%). The clinicopathological characteristics of MGUCs reflect the anatomic sites.[4,5] The common histological subtypes of these cancers are invasive adenocarcinoma of the prostate and transitional cell carcinoma (TCC) of the urinary bladder.[4-6]

Tamale Teaching Hospital (TTH) is the only tertiary referral hospital covering northern Ghana and beyond. However, there aren't many published baseline cancer data on male genitourinary malignancies in northern Ghana. Thus, documentation is required. This histopathological review aimed to identify the patterns, relative proportions, and clinicopathological characteristics of male genitourinary malignancies at the TTH and recommend further research.

Materials and methods

Study design and site

This descriptive retrospective histological evaluation of primary MGUCs was conducted at TTH in the Department of Pathology from 1 January 2012 to 31 December 2021, spanning ten years. This referral hospital serves most of northern Ghana's regions and beyond, especially neighbouring Burkina Faso.

Case selection

The records of histologically confirmed male genitourinary system neoplastic lesions in the TTH's pathology department were included.

Exclusion criteria

We excluded all poorly fixed specimens, those with incomplete records, and all benign childhood and adolescent tumours.

Data collection, entry, and analysis

A total of 561 histopathology request forms and the corresponding histopathological reports of male patients diagnosed with genitourinary tract neoplasms were retrieved and reviewed. Of these, 178 (31.7%) samples were histopathologically confirmed as malignant; this was the number of participants included in the

study's sample. The age (years) at presentation, pertinent clinical history (symptoms, duration, laterality, and kind of surgery), and surgical specimen type were all recorded. Data on the various histological subtypes of cancer were also gathered.

The Statistical Package for the Social Sciences (SPSS) program version 23 (Chicago) was used to enter data. In addition to computing frequencies and percentages for categorical variables, means for continuous variables were also computed. Frequency tables were used to present the results. Associations between variables were determined using Spearman's correlation coefficient. A 95% confidence interval was chosen, and a *p*-value less than 0.05 was statistically significant. For grouped variables (two columns or rows), statistically significant association(s) were determined using a double-tailed Fisher's exact test (GraphPad Prism version 5).

Results

During the study period, 178 male genitourinary tract malignant tumours were reviewed. The mean age (years) of males diagnosed with genital tract cancers was 60.5 ± 12.4, with 60–69 (28.7%) as the modal age group. The cancers were common in 119 (66.9%) males aged 60 years and older (Table I). The common anatomic sites were the prostate (66.3%), urinary bladder (25.7%), and kidneys (5.1%) (Table I). The prevalent histological subtypes of MGUCs were prostatic adenocarcinoma (63.5%) and urinary bladder TCC (9.6%) (Table II).

Prostate carcinoma (n = 118)

The great majority of 98 (83.0%) males diagnosed with prostate carcinoma were aged 61 years and older (Table III). No case was recorded in males younger than 40 years. The most typical clinical manifestation was lower urinary tract symptoms (LUTS) (65.0%). A total of 52.5% had no stated prostate-specific antigen (PSA) results, whereas 47.5% had stated PSA values at the time of histological diagnosis. Prostate cancer was commonly diagnosed in transurethral resection of the prostate (TURP) (62.0%), performed to alleviate obstructive symptoms in those with advanced/metastatic disease, followed by transrectal ultrasound (TRUS)-guided prostate

Table I: The age groups, anatomic sites, and MGUC symptoms

Parameter	Frequency (*n*)	Percentage (%)
Age group (years)		
≤ 19	10	5.6
20–29	8	4.5
30–39	5	2.8
40–49	13	7.3
50–59	23	12.9
60–69	51	28.7
70–79	40	22.5
≥ 80	28	15.7
Total	**178**	**100.0**
Anatomic sites		
Prostate	118	66.3
Urinary bladder	28	15.7
Kidney	9	5.1
Testis	8	4.5
Penis	8	4.5
Scrotum	5	2.8
Groin	2	1.1
Total	**178**	**100**
Clinical symptoms		
LUTS*	77	45.3
Haematuria	29	17.1
Mass/swelling	29	17.1
Urine retention	27	15.9
Ulcers	7	4.1
Infertility	1	0.6
Total	**170**	**100.0**

LUTS – lower urinary tract symptoms
* A total of eight cases had no available data on clinical presentation.

Table II: Age characteristics of histopathological subtypes of MGUC

	≤ 20		21–40		41–60		≥ 61		Total	
n	%	*n*	%	*n*	%	*n*	%	*n*	%	
Adenocarcinoma	0	0.0	0	0.0	19	10.7	94	52.8	113	63.5
Embryonal carcinoma	1	0.6	2	1.1	0	0.0	0	0.0	3	1.7
Embryonal rhabdomyosarcoma	2	1.1	0	0.0	0	0.0	0	0.0	2	1.1
Gonadoblastoma	0	0.0	1	0.6	0	0.0	0	0.0	1	0.6
Leydig cell tumour	1	0.6	1	0.6	3	1.7	0	0.0	5	2.8
Nephroblastoma	4	2.2	0	0.0	0	0.0	0	0.0	4	2.2
Renal cell carcinoma	1	0.6	3	1.7	2	1.1	0	0.0	6	3.4
Spindle cell sarcoma	0	0.0	0	0.0	2	1.1	4	2.2	6	3.4
Squamous cell carcinoma	0	0.0	1	0.6	8	4.5	4	2.2	13	7.3
Sertoli cell tumour	0	0.0	2	1.1	1	0.6	0	0.0	3	1.7
Small cell neuroendocrine carcinoma	0	0.0	0	0.0	1	0.6	0	0.0	1	0.6
T-cell lymphoma	0	0.0	0	0.0	1	0.6	0	0.0	1	0.6
Transitional cell carcinoma	0	0.0	3	1.7	5	2.8	9	5.1	17	9.6
Verrucous carcinoma	0	0.0	0	0.0	2	1.1	1	0.6	3	1.7
Total	**9**	**5.1**	**13**	**7.3**	**44**	**24.7**	**112**	**62.9**	**178**	**100.0**

Table III: Age and clinical presentation of histological subtypes of male urinary tract cancer

	Prostate *n* (%)	Urinary bladder *n* (%)	Kidney *n* (%)	Testis *n* (%)	Penis *n* (%)	Scrotum *n* (%)	Groin *n* (%)
Age group (years)							
≤ 20	0 (0.0)	2 (7.0)	4 (44.5)	2 (25.0)	0 (0.0)	2 (40.0)	0 (0)
21–40	0 (0.0)	3 (11.1)	3 (33.3)	4 (50.0)	0 (0.0)	2 (40.0)	2 (100.0)
41–60	20 (16.9)	12 (43.0)	2 (22.2)	2 (25.0)	5 (62.5)	1 (20.0)	0 (0.0)
≥ 61	98 (83.1)	11 (39.9))	0 (0.0)	0 (0.0)	3 (37.5)	0 (0.0)	0 (0.0)
Total	118 (100.0)	28 (100.0)	9 (100.0)	8 (100.0)	8 (100.0)	5 (100.0)	2 (100.0)
Clinical presentation							
LUTS	77 (65.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Haematuria	4 (3.0)	22 (79.0)	1 (11.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Mass/swelling	0 (0.0)	4 (14.0)	8 (89.0)	5 (62.5)	1 (12.5)	5 (100.0)	2 (100.0)
Urine retention	27 (23.0)	2 (7.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Ulcer	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	7 (87.5)	0 (0.0)	0 (0.0)
Infertility	1 (0.8)	0 (0.0)	0 (0.0)	1 (12.5)	0 (0.0)	0 (0.0)	0 (0.0)
Not stated	9 (8.0)	0 (0.0)	0 (0.0)	2 (25.0)	0 (0.0)	0 (0.0)	0 (0.0)
Total	118 (100.0)	28 (100.0)	9 (100.0)	8 (100.0)	8 (100.0)	5 (100.0)	2 (100.0)

LUTS – lower urinary tract symptoms

Table IV: Anatomic site of MGUCs and surgery type

	Kidney		Penis		Prostate		Testis		Urinary bladder	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
Cystoscopy and biopsy	0	0.0	0	0.0	0	0.0	0	0.0	17	61.0
Small incisional biopsy	0	0.0	5	62.5	0	0.0	2	25.0	0	0.0
Resection	0	0.0	0	0.0	0	0.0	0	0.0	7	25.0
Nephrectomy	6	67.0	0	0.0	0	0.0	0	0.0	0	0.0
Penectomy	0	0.0	3	37.5	0	0.0	0	0.0	0	0.0
Radical cystectomy	0	0.0	0	0.0	0	0.0	0	0.0	4	14.0
Radical orchidectomy	0	0.0	0	0.0	0	0.0	6	75.0	0	0.0
Radical prostatectomy	0	0.0	0	0.0	2	2.0	0	0.0	0	0.0
Transvesical prostatectomy	0	0.0	0	0.0	2	2.0	0	0.0	0	0.0
Tru-Cut biopsy	3	33.0	0	0.0	0	0.0	0	0.0	0	0.0
TRUS-guided biopsy	0	0.0	0	0.0	41	35.0	0	0.0	0	0.0
TURP	0	0.0	0	0.0	73	62.0	0	0.0	0	0.0
Total	**9**	**100.0**	**8**	**100.0**	**118**	**100.0**	**8**	**100.0**	**28**	**100.0**

TRUS – transrectal ultrasound, TURP – transurethral resection of the prostate

biopsy (35.0%) (Table IV). The most common histological subtype was invasive adenocarcinoma (95.8%) (Table V).

Urinary bladder (n = 28)

Cancer of the urinary bladder was commonly diagnosed in males aged 41–60 years (43.0%), followed by those aged 61 years and older (39.9%) (Table III). The most typical clinical presentation was haematuria (79.0%) (Table III). Cancer of the urinary bladder was commonly diagnosed in cystoscopy and biopsy samples (61.0%) (Table IV). TCC was the most common histological subtype (61.0%) (Table V).

Kidney (n = 9)

Renal cancers were common among males aged 20 years or younger (44.5%) (Table III). The most frequent clinical occurrence was a flank mass (89.0%) (Table III) involving the left (56.0%) and the right (44.0%). Cancers of the kidneys were commonly diagnosed in nephrectomy specimens (67.0%), with 33.0% in Tru-Cut samples (Table IV). The most common histological subtype was renal cell carcinoma (56.0%) (Table V).

Penis (n = 8)

Penile cancers were common among males aged 41–60 years (62.5%), and all the patients presented with ulcers (Table III). The cancers were commonly diagnosed in small incisional biopsies (62.5), with three (7.5%) in penectomy samples (Table IV). The most common histological subtype was invasive squamous cell carcinoma (SCC) (50.0%) (Table V).

Table V: Anatomic sites and histopathological subtypes of MGUC

	Kidney		Penis		Prostate		Testis		Urinary bladder	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
Adenocarcinoma	0	0.0	0	0.0	113	95.8	0	0.0	0	0.0
Embryonal rhabdomyosarcoma	0	0.0	0	0.0	0	0.0	3	37.5	2	7.0
Gonadoblastoma	0	0.0	0	0.0	0	0.0	1	12.5	0	0.0
Leydig cell tumour	0	0.0	0	0.0	0	0.0	1	12.5	0	0.0
Nephroblastoma	4	44.0	0	0.0	0	0.0	0	0.0	0	0.0
RCC	5	56.0	0	0.0	0	0.0	0	0.0	0	0.0
Sarcoma	0	0.0	0	0.0	5	4.2	0	0.0	0	0.0
SCC	0	0.0	4	50.0	0	0.0	0	0.0	8	29.0
Sertoli cell tumour	0	0.0	0	0.0	0	0.0	3	37.5	0	0.0
Neuroendocrine carcinoma	0	0.0	0	0.0	0	0.0	0	0.0	1	4.0
T-cell lymphoma	0	0.0	1	12.5	0	0.0	0	0.0	0	0.0
TCC	0	0.0	0	0.0	0	0.0	0	0.0	17	61.0
Verrucous carcinoma	0	0.0	3	37.5	0	0.0	0	0.0	0	0.0
Total	**9**	**100.0**	**8**	**100.0**	**118**	**100.0**	**8**	**100.0**	**28**	**100.0**

RCC – renal cell carcinoma, SCC – squamous cell carcinoma, TCC – transitional cell carcinoma

Testis (n = 8)

Most testicular cancers were diagnosed in males younger than 41 years, with seven (87.5%) presenting with testicular mass (Table III), involving five (62.5%) on the right and three (37.5%) on the left. The most common histological subtypes were embryonal rhabdomyosarcoma (37.5%) and Sertoli cell tumour (37.5%) (Table V).

Discussion

The most recent histological assessment undertaken in northern Ghana's main referral hospital found that MGUCs are more common in older people, with a mean age of 60.5 ± 12.4 years, and that 66.9% were aged 60 years and older. The age characteristics of MGUCs reported in this study support previous research findings that MGUCs were commonly diagnosed in older men.[1-7] For instance, Abomelha noted that those older than 60 years made up 43% of all patients with genitourinary cancers among Saudis.[7]

LUTS and haematuria are frequent manifestations of MGUCs. This is probably because 82.6% of the cancers originated from the prostate and bladder. Haematuria was the next common genitourinary cancer presenting symptom, accounting for 16.9%. Haematuria is a common presentation for both upper and lower urinary tract cancers; thus, our finding conforms with others' research reported decades ago.[4,8,9]

The MGUC spectrum by anatomic sites observed in this study in descending frequency was the prostate gland (66.3%), urinary bladder (25.7%), kidney (5.1%), testis (4.5%), penis (4.5%), and scrotum (2.8%). The pattern in this study is consistent with earlier investigations conducted in Africa.[4-6] For instance, Klufio at the Korle-Bu Teaching Hospital reported the pattern as follows: prostate (63.7%), bladder (21.3%), kidney (10.4%), testis (2.4%), penis (1.8%), and one each of the ureter and urethra.[4] Similarly, Ouedraogo et al.[5] reported that prostate cancers (45.6%), bladder cancers (33.1%), kidney cancers (10.6%), testicular cancers (6.9%), and cancers of the male external genitalia (3.7%) were the most common types of malignancies diagnosed at Burkina Faso's Tenkodogo Regional Hospital. Like earlier studies' findings, invasive adenocarcinoma, SCC, and urothelial cancer (UC) were the most prevalent histological subtypes of MGUCs.[4-6,9]

In this northern Ghana study, cancer of the prostate is the leading male urological cancer, more so in males aged 60 years and older. This finding is consistent with earlier research showing that the primary cause of cancer-related morbidity and mortality in males worldwide is prostate cancer, but more so in African Americans and black Africans.[10-15] This study, undertaken in the largest tertiary referral hospital in northern Ghana, found that prostate cancer is the most frequent male urological malignancy. According to the World Health Organization (WHO), sub-Saharan African men have an exceptionally high prevalence of prostate cancer.[14] Men from this region are also more likely to develop prostate cancer at any age and earlier in life than men from other racial or ethnic groups.[14]

Likewise, the high incidence of prostate cancer observed in this study is consistent with data from earlier studies conducted in Ghana and Burkina Faso.[4,5] However, the finding of prostate cancer as the leading MGUC sharply contrasts with Sharma et al.[16] in India, who reported cancer of the urinary bladder as the most common male urological cancer (29.52%). Although the causes of prostate cancer's high prevalence in this study are unknown, they may be complex and include genetic and environmental factors, low socioeconomic status, increased awareness of the disease, and the use of PSA testing, as reported in earlier studies.[13,17,18]

Prostate cancer, as a component of MGUCs, was commonly diagnosed in older adults in this study, with 83.5% of the males aged 61 years or older. The age distribution of men with prostate cancer confirmed earlier research conclusions that prostate cancer is an old age illness.[9,19] In their study conducted in Nigeria, Ugwumba et al.[19] reported a mean age of 69.8 ± 8.0 years. Earlier researchers described LUTS as the most typical clinical

manifestation of prostate cancer.[8,9,19] Also, our study observed that most histopathological subtypes are invasive adenocarcinoma, which agrees with published literature from decades ago.[4,20]

Urinary bladder cancers were the second most common MGUC in this study (28, 15.7%), similarly observed by Klufio (21.3%) in Accra, Ghana, and Sow et al.,[21] (19.2%) in Cameroon.[4] However, this finding differs from the 34.8% reported among Saudi Arabian men by Abomelha and the 29.5% reported in India by Sharma et al.[7,16] Both reports suggested urinary bladder cancer was more common than prostate cancer, contrary to our findings. In Zambia, Bowa et al.[25] indicated that cancer of the urinary bladder was frequently detected in older males.

In our study, TCC (61.0%) and SCC (29.0%) were the two most prevalent histological variants of bladder cancer. The pattern of the histopathological subtypes of urinary bladder cancers disagreed with previous studies in Ghana that traced the prevalence of urinary bladder SCC to its associations with *Schistosoma haematobium* infections in rural areas of the country years ago.[22-24] The reasons for the disparity are not obvious presently. Still, they may be due to the location of the study site, which received patients from urban, peri-urban, and rural communities. However, the current findings align with the studies of Bowa et al.[25] in Zambia and Sanni et al.[12] in Nigeria, who identified the most prevalent histological subtype of urinary bladder cancer as UC.

Renal cancers have been reported in Ghana by previous researchers.[4,27] In this review, renal cancers constituted 6.2% of all MGUCs, with the majority (77.8%) in a younger age group (< 40.0 years). Approximately 63.6% involved the left kidney, and renal cell carcinoma was the predominant histopathological subtype (54.5%). The histopathological characteristics of renal cancers in this study support some previous studies but equally differ from other research findings in Africa.[4,27-30] For instance, Mohamed et al.[29] in Somalia reported it as a disease of older men (mean age of 53.74 years). While Muhammed et al.[30] in Zaria, Nigeria, found cancer to be commonly involved in the right kidney (68.9%).

In this review, in northern Ghana, testicular cancers accounted for 4.5% of all MGUCs. Most cancers (75.0%) were diagnosed in males aged 40 years and younger. The young age at diagnosis with testicular cancer in this study supports previous findings in which populations with germ cell tumours (GCTs) are more common.[31,32] However, the relative proportion of 4.5% of all male cancers is far higher than the 1–2% reported in previous studies.[33,34] As previously reported, the most familiar presentation of testicular cancer was a scrotal mass (87.5%), with approximately 62.5% involving the right testis in our study.[32-34] In this study, embryonal rhabdomyosarcoma (37.5%) was the most common histological subtype, a finding that differs from studies that reported GCTs as the common variants.[31,32,33]

Globally, penile cancers are rare, but the current study reported a relative proportion of 4.5% among all male MGUCs.[35,36] Invasive SCC is the most prevalent histological subtype (50.0%). These malignancies are diagnosed among males older than 40 years (62.5%). This study's clinical pathological characteristics of penile tumours are consistent with those described in earlier investigations.[35-37] However, the high relative proportion of penile cancers among MGUCs needs further investigation concerning identifiable risk factors and causes.

Study limitations

In this study, all MGUCs were diagnosed based on haematoxylin and eosin histological features, and no case had immunohistochemical confirmation. Additionally, not all male genitourinary biopsy samples were reported in TTH's Department of Pathology; some were reported in other centres outside Tamale.

Conclusion

MGUCs in this review were commonly diagnosed in males older than 40 years, with the prostate, urinary bladder, and kidney as the common anatomic sites. The common histopathological subtypes were adenocarcinoma, TCC, and SCC. A future prospective study of the clinical features, imaging, diagnosis, management, and MGUC survival rates is recommended.

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Conflict of interest

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ORCID

EM Der https://orcid.org/0000-0002-1773-4356
AJM Muntaka https://orcid.org/0000-0002-6219-5574
EMT Yenli https://orcid.org/0000-0002-0823-1263

References

1. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2019. CA Cancer J Clin. 2019;69(1):7-34. https://doi.org/10.3322/caac.21551.
2. Dy GW, Gore JL, Forouzanfar MH, Naghavi M, Fitzmaurice C. Global burden of urologic cancers, 1990–2013. Eur Urol. 2017;71(3):437-46. https://doi.org/10.1016/j.eururo.2016.10.008.
3. Ferlay J, Colombet M, Soerjomataram I, et al. Cancer incidence and mortality patterns in Europe: estimates for 40 countries and 25 major cancers in 2018. Eur J Cancer. 2018;103:356-87. https://doi.org/10.1016/j.ejca.2018.07.005.
4. Klufio GO. A review of genitourinary cancers at the Korle-Bu Teaching Hospital Accra, Ghana. West Afr J Med. 2004;23(2):131-4. https://doi.org/10.4314/wajm.v23i2.28104.
5. Ouedraogo S, Traore MT, Kambire JL, et al. Primary urological cancers in a context of limited resources: epidemiology and treatment. Bull Cancer. 2019;106(10):868-74. French. https://doi.org/10.1016/j.bulcan.2019.06.003.
6. Hamdi Y, Abdeljaoued-Tej I, Zatchi AA, et al. Cancer in Africa: the untold story. Front Oncol. 2021;11:650117. https://doi.org/10.3389/fonc.2021.650117.
7. Abomelha MS. Trend of genitourinary cancer among Saudis. Arab J Urol. 2011;9(3):199-202. https://doi.org/10.1016/j.aju.2011.10.006.
8. Raabe NK, Fosså SD, Bjerkehagen B. Carcinoma of the renal pelvis: experience of 80 cases. Scand J Urol Nephrol. 1992;26(4):357-61. https://doi.org/10.3109/00365599209181226.
9. Ramirez D, Gupta A, Canter D, et al. Microscopic haematuria at time of diagnosis is associated with lower disease stage in patients with newly diagnosed bladder cancer. BJU Int. 2016;117(5):783-6. https://doi.org/10.1111/bju.13345.
10. Ferlay J, Shin H-R, Bray F, et al. Estimates of worldwide burden of cancer in 2008: GLOBOCAN 2008. Int J Cancer. 2010;127(12):2893-917. https://doi.org/10.1002/ijc.25516.
11. Ons.gov.uk [Internet]. Cancer registration statistics, England: 2017: cancer diagnoses and age-standardised incidence rates for all types of cancer by age, sex and region including breast, prostate, lung and colorectal cancer. Office for National Statistics; 2019. Available from: https://www.ons.gov.uk/

peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/bulletins/cancerregistrationstatisticsengland/2017.

12. Sanni DA, William OO, Soyemi SS, Abolarinwa AA, Popoola AO. Histopathology of bladder carcinomas: an eight year retrospective study at Lagos State University Teaching Hospital, Ikeja, Nigeria. Int J Res Med Sci. 2020;8(5):1619-23. https://doi.org/10.18203/2320-6012.ijrms20201489.
13. Cook MB, Wang Z, Yeboah ED, et al. A genome-wide association study of prostate cancer in West African men. Hum Genet. 2014;133(5):509-21. https://doi.org/10.1007/s00439-013-1387-z.
14. Sung H, Ferlay J, Siegel RL, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2021;71(3):209-49. https://doi.org/10.3322/caac.21660.
15. Chu LW, Ritchey J, Devesa SS, et al. Prostate cancer incidence rates in Africa. Prostate Cancer. 2011;2011:947870. https://doi.org/10.1155/2011/947870.
16. Sharma S, Nath P, Srivastava AN, Singh KM. Tumours of the male urogenital tract: a clinicopathologic study. J Indian Med Assoc. 1994;92(11):357-60, 372.
17. Seraphin TP, Joko-Fru WY, Kamaté B, et al. Rising prostate cancer incidence in sub-Saharan Africa: a trend analysis of data from the African Cancer Registry Network. Cancer Epidemiol Biomarkers Prev. 2021;30(1):158-65. https://doi.org/10.1158/1055-9965.EPI-20-1005.
18. Chornokur G, Dalton K, Borysova ME, Kumar NB. Disparities at presentation, diagnosis, treatment, and survival in African American men, affected by prostate cancer. Prostate. 2011;71(9):985-97. https://doi.org/10.1002/pros.21314.
19. Ugwumba FO, Nnabugwu II. Prostate cancer characteristics: a descriptive analysis of clinical features at presentation in the last decade in a black African community. Ann Afr Med. 2022;21(2):153-7. https://doi.org/10.4103/aam.aam_101_20.
20. Gilliland FD, Key CR. Male genital cancers. Cancer. 1995;75(1 Suppl):295-315. https://doi.org/10.1002/1097-0142(19950101)75:1+%3C295::AID-CNCR2820751313%3E3.0.CO;2-U.
21. Sow M, Nkégoum B, Oyono J-LE, Garoua, Nzokou A. Epidemiological and histological features of urogenital tumours in Cameroon. Prog Urol. 2006;16(1):36-9. French.
22. El-Bolkainy MN, Mokhtar NM, Ghoneim MA, Hussein MH. The impact of schistosomiasis on the pathology of bladder carcinoma. Cancer. 1981;48(12):2643-2648. https://doi.org/10.1002/1097-0142(19811215)48:12%3C2643::AID-CNCR2820481216%3E3.0.CO;2-C.
23. Chen MC, Chang PY, Chuang CY, et al. Colorectal cancer and schistosomiasis. Lancet. 1981;1(8227):971-3.
24. Der EM, Quayson SE, Mensah JE, Tettey Y. Tissue schistosomiasis in Accra Ghana: a retrospective histopathologic review at the Korle-Bu Teaching Hospital (2004-2011). Pathol Discov. 2015;3:1. https://doi.org/10.7243/2052-7896-3-1.
25. Bowa K, Mulele C, Kachimba J, et al. A review of bladder cancer in sub-Saharan Africa: a different disease, with a distinct presentation, assessment, and treatment. Ann Afr Med. 2018;17(3):99-105. https://doi.org/10.4103/aam.aam_48_17.
26. Lagacé F, Ghazawi FM, Le M, et al. Incidence and mortality of prostate cancer in Canada during 1992–2010. Curr Oncol. 2021;28(1):978-90. https://doi.org/10.3390/curroncol28010096.
27. Der EM, Abantanga FA. Histopathological review of childhood and adolescent cancers in northern Ghana. West Afr J Med. 2022;39(12):1229-37.
28. Cassell A, Jalloh M, Yunusa B, et al. Management of renal cell carcinoma—current practice in sub-Saharan Africa. J Kidney Cancer VHL. 2019;6(2):1-9. https://doi.org/10.15586/jkcvhl.2019.122.
29. Mohamed AH, Abdullahi IM, Eraslan A, Mohamud HA, Gur M. Epidemiological and histopathological characteristics of renal cell carcinoma in Somalia. Cancer Manag Res. 2022;14:1837-44. https://doi.org/10.2147/CMAR.S361765.
30. Muhammed A, Bello A, Yusuf MH, et al. Pathologic characteristics and management of renal cell carcinoma in Zaria, Nigeria. Sub-Saharan African Journal of Medicine 2015;2(1):1 – 4. DOI:10.4103/2384-5147.151559
31. Stephenson A, Eggener SE, Bass EB, et al. Diagnosis and treatment of early stage testicular cancer: AUA guideline. J Urol. 2019;202(2):272-81. https://doi.org/10.1097/JU.0000000000000318.
32. Ugwumba FO, Aghaji AE. Testicular cancer: Management challenges in an African developing country. S Afr Med J. 2010 Jul 5;100(7):452-5. doi: 10.7196/samj.3871. PMID: 20822594.
33. Albers P, Albrecht W, Algaba F, et al. EAU guidelines on testicular cancer: 2011 update. Eur Urol. 2011;60(2):304-19. https://doi.org/10.1016/j.eururo.2011.05.038
34. Greenlee RT, Murray T, Bolden S, Wingo PA. Cancer statistics, 2000. CA Cancer J Clin. 2000;50(1):7-33. https://doi.org/10.3322/canjclin.50.1.7.
35. Christodoulidou M, Sahdev V, Houssein S, Muneer A. Epidemiology of penile cancer. Curr Probl Cancer. 2015;39(3):126-36. https://doi.org/10.1016/j.currproblcancer.2015.03.010.
36. Moch H, Cubilla AL, Humphrey PA, Reuter VE, Ulbright TM. The 2016 WHO classification of tumours of the urinary system and male genital organs—part A: renal, penile, and testicular tumours. Eur Urol. 2016;70(1):93-105. https://doi.org/10.1016/j.eururo.2016.02.029.
37. Ahmed ME, Khalil MI, Kamel MH, Karnes RJ, Spiess PE. Progress on management of penile cancer in 2020. Curr Treat Options Oncol. 2020;22(1):4. https://doi.org/10.1007/s11864-020-00802-3.