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ORIGINAL RESEARCH

Assessment of knowledge among healthcare workers and resource availability for diagnosing Wilms tumour in northern Tanzania

JF Mpelumbe,[1] E Majaliwa,[1,2] F Bright,[1,3] J Mbwambo,[1,3] KA Mteta,[1,3] Z Cheyo,[1] J Bogdanowicz,[3] BN Ngowi,[1,3] OJ Mbwambo[1,3]

[1] *Faculty of Medicine, Kilimanjaro Christian Medical University College, Tanzania*
[2] *Department of Oncology, Kilimanjaro Christian Medical Centre, Tanzania*
[3] *Department of Urology, Kilimanjaro Christian Medical Centre, Tanzania*

Corresponding author, email: jmpelumbe@gmail.com

Background: Survival rates of Wilms tumour patients in northern Tanzania are low (32.6%), largely due to late-stage diagnoses compounded by a lack of knowledge about Wilms tumour among healthcare workers. This study aimed to assess healthcare workers' knowledge and resource availability for diagnosing Wilms tumour.

Methods: This study employed a cross-sectional, quantitative design, encompassing healthcare facilities in northern Tanzania. The study population was doctors, nurses, and radiographers directly involved in paediatric care. The sample size was 121, chosen through purposive sampling to ensure data saturation. Structured questionnaires covered demographics, knowledge assessment, and resource availability. Data analysis was conducted using IBM SPSS Statistics version 25.

Results: Healthcare workers exhibited varying knowledge levels about Wilms tumour. Doctors had a good grasp of the tumour's characteristics and treatment options, but had gaps in their understanding of prognosis. Nurses displayed reasonable knowledge, but needed improvement in understanding prognosis and some treatment options. Radiographers had limited knowledge, particularly regarding treatment options. Ultrasound, a critical diagnostic tool, was consistently available at all healthcare facilities.

Conclusion: Overall, the healthcare workers had good knowledge, and resources such as ultrasound were available, which is an initial tool for early Wilms tumour diagnosis. We recommend strengthening ultrasound use through targeted training and protocols to improve early diagnosis of Wilms tumour. Furthermore, Wilms tumour-focused modules should be incorporated into continuing medical education, with expanded access to advanced imaging, such as computed tomography (CT)/magnetic resonance imaging (MRI).

Keywords: Wilms tumour, knowledge, healthcare workers

Introduction

Wilms tumour, the most common paediatric urologic tumour, presents a significant global health challenge, particularly in low- and middle-income countries (LMIC) where 56% of cases occur annually.[1] Despite its high curability rate of 85–90% in developed countries, disparities persist, with one-year recurrence-free survival rates as low as 32.6% reported in LMICs, like northern Tanzania.[2,3]

Delayed Wilms tumour diagnosis and poor treatment outcomes are influenced by several factors, such as healthcare workers' limited knowledge, late patient presentation, and inadequate diagnostic resources.[4-6] Timely diagnosis is crucial for effective treatment, while a lack of knowledge of screening and diagnostic services hampers the suspicion, screening, and diagnosis of childhood cancers, including Wilms tumour.[7,8]

In Tanzania, Wilms tumour ranks as the second most common childhood malignancy, with substantial morbidity and mortality.[9] Despite the establishment of paediatric oncology units, like the one at Kilimanjaro Christian Medical Centre (KCMC), many patients still present with advanced disease.[7] Additionally, patient factors, such as age, socio-economic status, and residence, contribute to delays in diagnosis and management.

This study aimed to assess healthcare workers' knowledge levels and resource availability regarding Wilms tumour at primary and secondary health facilities across northern Tanzania. We hypothesise that identifying knowledge and resource gaps will enable informed, targeted interventions to improve early diagnosis and management, ultimately enhancing patient outcomes in the region.

Study design and method

A cross-sectional, quantitative study design was chosen to comprehensively evaluate knowledge levels, diagnostic understanding, and resource availability among healthcare workers in northern Tanzania.

Study area

The study included hospitals and health centres in the Kilimanjaro, Arusha, Tanga, and Manyara regions to ensure a representation of the diverse healthcare settings in northern Tanzania.

Study population

Healthcare workers (doctors, nurses, and radiographers) directly involved in paediatric care at primary and secondary health facilities across northern Tanzania were included in the study. Inclusion criteria encompassed health workers in outpatient and inpatient

departments, including medical doctors, nurses, and radiographers directly involved in paediatric care. Exclusion criteria were healthcare workers not directly involved in paediatric patient care.

Variables

Independent variables focused on the level of knowledge of renal tumours. Dependent variables included demographic information, professional cadre, years of experience, paediatric cancer seminar attendance, and resource availability for diagnosing Wilms tumour.

Sampling technique

Purposive sampling was used. The catchment area of patients with Wilms tumour is referred to the KCMC referral zonal hospital. The sampling of health facilities was estimated as the number of hospitals equal to the sample size divided by the average number of healthcare workers (162 ÷ 240 = 0.675), yielding a value of ~ 1. Therefore, in each region, one secondary-level hospital was included in data collection.

However, in the Kilimanjaro region, St. Joseph Hospital and Pasua Health Centre were purposively selected, as mentioned above, due to more referrals of Wilms tumour patients. Sampling of healthcare workers' allocation was estimated based on the diversity of healthcare workers in Tanzania: 40% of doctors were estimated to be at the regional, district, and health centre levels, 40% of nurses were also distributed, and 20% of radiographers were included.

Data collection tools, methods, and procedures

A structured questionnaire, adapted from previous studies, was used to collect quantitative data through face-to-face interviews with healthcare workers across various departments. Data collection occurred in outpatient, emergency, radiology, and inpatient paediatric departments.

Data management and analysis

Descriptive statistics summarised categorical variables, chi-square tests estimated *p*-values, and knowledge levels were categorised based on scores. Tabulations were created to present the frequencies and percentages of correct responses for each question in the knowledge assessment section of the questionnaire. This allowed for a comprehensive understanding of healthcare workers' understanding of Wilms tumour characteristics, treatment options, signs and symptoms, and radiology findings. Each tabulation highlighted the distribution of correct responses across different demographic groups and healthcare facilities, enabling a thorough examination of knowledge levels.

Proportions and percentages were used to summarise categorical variables. The participants' correct knowledge was presented as a sum, mean, percentage, and chi-square to estimate the *p*-value for each professional cadre. In response to the primary objective of knowledge levels, general knowledge among healthcare workers was presented as percentages (Table I).

The closed questions were analysed as follows, with a designed formula ($n \div$ total question numbers $\times$ 100%) to obtain the percentage for each individual. The score was adapted and modified, whereby n is obtained as the most correct answer of one mark from a five-point Likert scale with coded responses: strongly agree (5), and agree (4), which are awarded one mark each, and neither agree or disagree (3), disagree (2), and strongly disagree (1), which are all awarded zero marks.[10]

The correct answer varied from question to question, depending on the participant's correct answer. The limit on correct answers was set by the principal investigator based on the questions, but participants were not limited in their responses. The scores were presented in the form of correct answers for each question in the knowledge section of the questionnaire.

Table I: Scale of knowledge levels

Score (%)	Knowledge level
> 60	Good
40–59	Average
< 39.9	Poor

Furthermore, tabulations were utilised to summarise the availability of resources for diagnosing Wilms tumour at various healthcare facilities. This included tabulating the presence of laboratory tests, imaging modalities, and trained personnel necessary for diagnosing and managing the tumour. The tabulations provided a clear overview of resource availability across different facility levels and geographical regions within northern Tanzania.

Cross-tabulation analyses were also presented in tabular form to explore relationships among knowledge levels, resource availability, and demographic factors. These cross-tabulations enabled comparisons across variables, such as knowledge levels among healthcare workers of varying professional cadres and resource availability at different healthcare facility types. Presenting the data in tabular form made the findings easily accessible and interpretable, facilitating a comprehensive analysis of the factors influencing Wilms tumour diagnosis and management in the study area.

Ethical considerations

Ethical approval was obtained (number PG118/2022), informed consent was secured from participants, and confidentiality and data protection regulations were followed throughout the study. Participants retained the right to withdraw from the study at any time without consequences.

Results

A total of 121 healthcare workers participated in the study, comprising 57 doctors, 51 nurses, and 13 radiographers.

Socio-demographic characteristics

Most participants were aged 20–34 years (66.9%). Their educational backgrounds varied: 52.9% had degrees, 41.3% had diplomas or certificates, and 5.8% had master's degrees. A significant proportion of participants (68.1%) had five or more years of practice. Only 5.8% of participants attended paediatric cancer seminars. Table II presents the study participants' characteristics, including age,

gender, health facility level, education level, professional cadre, unit of work, years of practice, duration of rotation in the pediatric unit, and pediatric cancer seminar attendance.

Table II: Characteristics of study participants (*n* = 121)

Variable	*n*	%
Age (years)		
20–34	81	66.9
35–49	27	22.3
50–64	13	10.7
Gender		
Male	51	42.1
Female	70	57.9
Health facility level		
Regional referral	79	65.3
District hospital	20	16.5
Health centre	22	18.2
Education level		
Master's degree	7	5.8
Degree	64	52.9
Diploma/certificate	50	41.3
Professional cadre		
Medical	57	47.1
Nurse	51	42.1
Radiology	13	10.8
Unit of work		
OPD	69	57
IPD	52	43
Years of practice		
< 5	74	61.2
> 5	47	38.8
Rotation duration in paediatric unit (months)		
< 3	88	72.7
> 3	33	27.3
Paediatric cancer seminar attendance		
Yes	7	5.8
No	114	94.2

IPD - Inpatient Department, OPD - Outpatient Department

Participants' correct knowledge of Wilms tumour

Tables III and IV present doctors' and nurses' correct knowledge about Wilms tumour. Regarding the general characteristics of Wilms tumour, both doctors and nurses had good knowledge of the organ involved (94.5% and 80.4%) and the age at presentation (89.5% and 72.5%). However, they had poor knowledge of Wilms tumour prognosis (40.4% and 15.4%).

Overall, radiographers demonstrated good knowledge of the most common ultrasonographic features of Wilms tumour, such as heterogeneous appearance (92.3%) and presence of hydronephrosis (84.6%). However, they had poor knowledge of treatment options, as 100% of respondents considered surgery the only treatment (Table V).

Table III: Doctors' correct knowledge about Wilms tumour (*n* = 57)

Variable	*n*	%
General characteristics of Wilms tumour		
Usually presents with the child < 5 years	51	89.5
May be associated with congenital anomalies	48	84.2
Understanding of prognosis	23	40.4
It is a disease affecting the kidneys	55	96.5
It can spread to other sites (liver, lungs)	40	70.2
Both kidneys may be affected	43	75.4
Signs and symptoms		
Asymptomatic abdominal swelling	51	89.5
Usually presents with hypertension	34	59.6
Usually presents with failure to thrive	37	64.9
Abdominal swelling increases with time	52	91.2
Usually presents with anaemia	43	75.4
Palpable mass on the abdomen	54	94.7
Microscopic haematuria on urinalysis	43	75.4
Treatment options		
Treated with surgery alone	46	80.7
Treated with surgery and chemotherapy	49	86.0
Radiotherapy may be part of the treatment	39	64.4

Table IV: Nurses' correct knowledge about Wilms tumour (*n* = 51)

Variable	*n*	%
General characteristics of Wilms tumour		
Usually presents with the child < 5 years	37	72.5
May be associated with congenital anomalies	31	58.8
Understanding of prognosis	8	15.7
It is a disease affecting the kidneys	41	80.4
It can spread to other sites (liver, lungs)	33	64.7
Both kidneys may be affected	38	74.5
Treatment options		
Treated with surgery alone	43	84.3
Treated with surgery and chemotherapy	40	78.4
Radiotherapy may be part of the treatment	33	64.7

Table V: Radiographers' correct knowledge about Wilms tumour (*n* = 13)

Variable	*n*	%
Radiological findings		
Heterogeneous solid mass on ultrasound	12	92.3
May have hydronephrosis on ultrasound	11	84.6
Large soft tissue opacity displacing bowels on X-ray	8	61.5
Treatment options		
It is treated with surgery alone	13	100
It is treated with surgery and chemotherapy	3	23.1
Radiotherapy may be part of the treatment	3	23.1

Table VI: Association between years of practice and knowledge levels among healthcare workers in northern Tanzania (*n* = 121)

Years of practice	Knowledge level		Odds ratio	*p*-value
	Good/average	Poor	95% CI	
≤ 5	69	5	0.61 (0.17 to 2.23)	0.45
> 5	42	5		

CI – confidence interval

Table VII: Investigations available at each studied health facility

Facility	FBP	Urinalysis	BP measurement		Weighing scale	KUB ultrasound	X-ray	CT scan	MRI
Mawenzi	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Bombo	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Mount Meru	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
St. Joseph	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Pasua	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No

BP – blood pressure, CT – computed tomography, FBP – full blood picture, KUB – kidney, ureter, and bladder, MRI – magnetic resonance imaging

Table VIII: Human resources as healthcare workers at the studied health facilities, the number of trainees, and the duration of KUB ultrasound training

Facility	Clinical officers	Assistant medical officers	Medical doctors	Specialists and super specialists	Registered nurses	Enrolled nurses	Number of radiographers	Number of KUB ultrasound performed	Duration of KUB ultrasound training (months)
Mawenzi	5	7	32	11	112	40	8	5	3
Bombo	7	14	41	16	15	149	5	4	12
Mount Meru	3	4	30	21	106	90	4	3	6
St. Joseph	8	3	11	4	46	32	4	4	6
Pasua	5	6	3	0	19	26	1	1	12

KUB – kidney, ureter, and bladder

Association between years of practice and level of knowledge

There was no significant association between the years of practice and the knowledge levels among healthcare workers in northern Tanzania ($p = 0.45$), as shown in Table VI.

Resource availability

All studied health facilities had necessary investigations for Weight assessment, Blood pressure measurements, Full blood picture assessment, Urine analysis, KUB-ultrasound scan and X-ray machine. Only the Regional referral facilities had CT-scan machines, and none of them had MRI machine (Table VII). Regarding human resources, there are variations in numbers of radiographers with most of them being found in Regional referral facilities compared to other facilities (Table VIII).

Discussion

This research provides fresh perspectives on healthcare professionals' understanding and the accessibility of healthcare resources for paediatric cancers, particularly Wilms tumour, in northern Tanzania. The lack of prior studies addressing this issue in Tanzania highlights the importance of our investigation.

Healthcare workers' socio-demographic characteristics

Most respondents in this study were female (57.9%), with doctors comprising the largest professional cadre (47.1%). This contrasts with a study in Kenya, where most healthcare workers were also female (69.5%), but predominantly nurses.[8] The predominance of female healthcare workers in both studies reflects a broader trend of increasing female representation in the healthcare workforce.

Correct knowledge among doctors

Respondents were able to pick most of the correct answers on the renal tumour's general characteristics (they all knew it affected the kidney), with the highest proportion (96.5%) also recognising asymptomatic abdominal swelling as a sign (89.5%). This correlates with a study in Brazil that noted the correct answer (a lump in the stomach can be a sign of childhood cancer) in 60.7%.[11] These results suggest that healthcare providers are becoming aware of the signs and symptoms of childhood cancers. Regarding knowledge of treatment options, 86% knew about chemotherapy and surgery as the gold standard for Wilms tumour, especially in our setting in Tanzania.

Furthermore, 72% of healthcare workers exhibited good knowledge, with doctors leading at 85%, followed by nurses (73%) and radiographers (15%). This indicates that nurses, as the primary caregivers at healthcare facilities, possess adequate knowledge to recognise Wilms tumour symptoms and signs. The improvement in nurses' knowledge levels may be attributed to factors such as attendance at seminars or workshops and ongoing learning opportunities.

While most respondents correctly identified palpable abdominal masses as a common symptom of Wilms tumour, radiographers demonstrated poorer knowledge overall. Despite, their excellence in understanding radiological findings (92.3%), they demonstrated poor understanding of treatment option. All (100%) acknowledged surgery alone as the treatment option, and only 23% recognised the combination of surgery and chemotherapy or radiotherapy as part of treatment. This highlights the importance of multidisciplinary collaboration in the diagnosis and management of paediatric cancers.

Resource availability

The availability of resources is crucial in facilitating early diagnosis and intervention for Wilms tumour. While there is limited literature on this topic, a study in Tanzania reported that paediatric cancer diagnoses often rely on imaging findings and clinical presentations, with an average diagnosis time of 49.1 days.[12] After the completion of Wilms tumour treatment, routine imaging plays a role in the early identification of recurrence, which most often occurs within two years.[13] Additionally, imaging helps detect late therapy complications, including injury to the remaining kidney and the development of other abdominal cancers.[14]

In this study, essential diagnostic tools, such as ultrasound machines, weighing scales, and laboratory investigations, were available at health facilities. However, the presence of trained radiographers varied, with some facilities having inadequate staffing levels. The absence of MRI machines at all facilities limits comprehensive diagnostic capabilities, particularly in detecting early-stage renal tumours.

Conclusion

Overall, healthcare workers had good knowledge, and resources such as ultrasound were available, which is an initial tool for early Wilms tumour diagnosis. We recommend strengthening ultrasound use through targeted training and protocols to improve early diagnosis of Wilms tumour. Furthermore, Wilms tumour-focused modules should be incorporated into continuing medical education, with expanded access to advanced imaging, such as CT/MRI.

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Conflict of interest

The authors declare no conflict of interest.

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Ethical approval

Ethical approval was obtained from the Kilimanjaro Christian Medical University College Research Ethics Committee (number PG118/2022).

ORCID

JF Mpelumbe https://orcid.org/0009-0006-8497-5981
E Majaliwa https://orcid.org/0000-0003-4941-4290
F Bright https://orcid.org/0009-0005-8290-3493
J Mbwambo https://orcid.org/0000-0003-1754-3346
KA Mteta https://orcid.org/0000-0002-1826-4405
Z Cheyo https://orcid.org/0009-0004-0333-1320
J Bogdanowicz https://orcid.org/0009-0009-0828-0565
BN Ngowi https://orcid.org/0000-0002-1898-9772
OJ Mbwambo https://orcid.org/0000-0001-6689-3452

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