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ORIGINAL RESEARCH

Healthcare workers' knowledge and practice of proper adult male urethral catheterisation and resource availability at district hospitals in Kilimanjaro

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Background: Urethral catheterisation is a common, standard and sterile procedure used to drain the urinary bladder through the urethra. The procedure is done with caution and care, since complications arising from it may be devastating. In Tanzania, the number of iatrogenic urethral catheterisation injuries resulting in urethral stricture disease is increasing. Consequently, healthcare workers (HCWs) need to know the appropriate techniques for male urethral catheterisation.

Objectives: This study aims to determine HCWs' levels of knowledge and practice in adult male urethral catheterisation, and whether the district hospitals in the Kilimanjaro region in Tanzania have adequate resources for the procedure.

Methodology: This is an analytical, cross-sectional study conducted from January to June 2024. A questionnaire was used to obtain information from HCWs.

Results: A total of 354 HCWs participated, of which 73.4% were nurses and 26.6% were doctors. Of the participants, 76% had a low level of knowledge; nurses had 7.25 times the odds of having a low knowledge level. A poor level of practice was found in 92.4% of the participants. Nurses had 2.02 times the odds of having poor practice. A statistically significant positive correlation of 0.112 was seen between the levels of knowledge and practice. Equipment for catheterisations was available in all district hospitals.

Conclusion: HCWs in district hospitals have a low level of knowledge and poor practice of proper adult male urethral catheterisation. A statistically significant positive correlation was observed between HCWs' levels of knowledge and practice. Most district hospitals have appropriate equipment for proper adult male urethral catheterisation.

Keywords: male urethra, urethral catheterisation, traumatic urethral catheterisation

Introduction

Urethral catheterisation is a common, standard and sterile procedure used to access the urinary bladder through the urethra to drain it. This particular procedure should be done with proper precautions, care, and guidelines, since the complications arising from it can be devastating and life-threatening.[1]

The male urethra is a narrow fibromuscular tube that conducts urine from the bladder and semen from the ejaculatory ducts. The male urethra is estimated to be 15–25 cm long in adult males and forms a "S" curve. The male urethra has two parts: the posterior part, which is composed of the prostatic and membranous urethra, and the anterior part, which is covered with corpus spongiosum, comprised of the bulbous, penile and glanular urethra. The anterior urethra is responsible for stricture formation once traumatised and heals by fibrosis.[2] Due to the complexity and sensitivity of the male urethra, the male urethral catheterisation procedure should be done with proper precautions and care based on appropriate indications for the procedure. The indications are either therapeutic or diagnostic.[3]

After having an appropriate indication for urethral catheterisation of a male patient, the standard operating procedure for proper adult male urethral catheterisation should be followed.[4] The patient should be in the supine position, with an adequate amount of lubricant placed in the urethra while the position of the penis is held upright at 90 degrees, ensuring the catheter is inserted to the "Y" bifurcation before ballooning it.[5,6]

About a quarter of all patients admitted to the hospital are catheterised. In the United States, an estimated four million patients are catheterised annually, with about 15–20% of patients having a catheter at some point during their hospital stay.[7] Therefore, performing proper adult male urethral catheterisation will help prevent numerous possible complications.[8] Moreover, iatrogenic complications are more costly and recurrent in terms of management.[9,10]

In Tanzania, cases of urethral stricture caused by traumatic urethral catheterisation have increased, estimated at 80.9% for adult males aged ≥ 45 years.[11] The number of patients with indwelling urinary catheters has also increased, necessitating adequate knowledge, proper practice, and suitable resources to enable proper adult male urethral catheterisation.[12] Our study aimed to assess healthcare workers (HCWs') knowledge and practice of proper adult male urethral catheterisation and resource availability at Kilimanjaro's district hospitals.

Methodology

Study site, population, and methods

The study was an analytical, cross-sectional study conducted from January to June 2024 at the district hospitals in the Kilimanjaro

region, Tanzania. The Kilimanjaro region is in the northeastern part of Tanzania, where Mount Kilimanjaro is located. The Kilimanjaro region has seven districts: Same, Mwanga, Rombo, Moshi District, Moshi Municipal, Hai, and Siha. The study population was HCWs at district hospitals; mainly doctors (specialists, medical officers, assistant medical officers, and clinical officers) and nurses (nursing officers, enrolled nurses, and assistant nurse officers) fulfilling the inclusion criteria.

Sampling method and sample size estimation

The sampling method was convenience sampling. The sample size was estimated by Fisher's formula. The prevalence of knowledge about catheterisation was obtained from the study among nurses in Ethiopia by Teshager et al.[13] Therefore, the sample size for this study was estimated to be 351.

Eligibility criteria

The inclusion criteria were **doctors and nurses** treating **adult male patients**. The exclusion criteria were doctors and nurses who were not full-time employees of the district hospitals.

Data collection tools and methods

Data were collected using an adapted, structured questionnaire from the study by Teshager et al.[13] The questionnaire was self-administered, with three sections containing a total of 24 questions. The questionnaire was provided to HCWs who consented and were present during the study to assess their knowledge and practice of proper adult male urethral catheterisation. A separate checklist was used to assess resource availability.

Data processing and analysis

Knowledge and practice levels were assessed by score, and the participants were categorised accordingly, as adapted from the study by Opina et al.[8] The level of knowledge was scored as "low" (0–8), "average" (10–12), and "high" (14–18). The level of practice was scored as "poor" (0–9) and "good" (10–18). Data from the questionnaires were first rechecked, then entered, cleaned, and analysed using the Statistical Package for the Social Sciences (SPSS) version 25. Continuous data were summarised by measures of central tendency (mean, median, and mode) and measures of dispersion. Proportion and frequency tables were used to summarise categorical variables. A single-tailed Spearman correlation coefficient was used to assess the correlation between the levels of knowledge and practice. A p-value < 0.05 was considered statistically significant.

Results

Response rate

A total of 359 questionnaires were distributed to HCWs, and a total of 354 questionnaires were collected, giving a response rate of 98.6% assessed in the study.

Participant characteristics

A total of 354 HCWs participated in the study. Of the 354, 73.4% were nurses, 26.6% were doctors, 64.7% were female, 35.3% were male, and 68.4% had a diploma-level education. Participants' ages ranged from 20 to 59 years, with a mean age of 35.09 (standard deviation 9.10). Table I shows other sociodemographic characteristics of the participants.

Table I: HCWs' characteristics (n = 354)

Characteristics	*n*	%
Age (years)		
20–29	124	35
30–39	132	37.3
40–49	57	16.1
50–59	41	11.6
35.09 ± 9.10*		
Gender		
Male	125	35.3
Female	229	64.7
District		
Hai	47	13.3
Moshi District	52	14.7
Moshi Municipal	53	15
Mwanga	52	14.7
Same	49	13.8
Siha	51	14.4
Rombo	50	14.1
Profession		
Doctor	94	26.6
Nurse	260	73.4
Level of profession		
Certificate	42	11.8
Diploma	242	68.4
Degree	68	19.2
Master	2	0.6
Years of experience		
< 5	158	44.6
5–10	113	32.0
> 10	83	23.4
Catheterisation training		
Yes	148	41.8
No	206	58.2
Marital status		
Single	147	41.5
Married	198	56.0
Widow/widower	6	1.7
Divorced	3	0.8

* Mean age of participants and the standard deviation.
HCW – healthcare worker

HCWs' level of knowledge of proper adult male urethral catheterisation

About 76% of the participants had a low knowledge level, 22% had an average knowledge level, and only 2% had a high knowledge level of proper adult male urethral catheterisation (Table IIa). Cadre, level of profession, and prior training on adult male urethral

Table IIa: HCWs' knowledge levels of proper adult male urethral catheterisation (*n* = 354)

Knowledge level		*n*	%
Low	0–8	269	76
Average	10–12	78	22
High	14–18	7	2
	7.1 ± 2.85*		

* Mean knowledge score.
HCW – healthcare worker

Table IIb: Factors associated with poor/average knowledge levels of proper adult male urethral catheterisation among HCWs (*n* = 354)

Factor		Knowledge level		Crude OR	Adjusted OR	*p*-value
		Poor/average	High	95% CI	95% CI	
Cadre	Nurse	258 (72.9)	2 (0.6)	7.25 (1.38 to 38.02)	2.57 (0.44 to 15.12)	0.297*
	Medical doctor	89 (25.1)	5 (1.4)			
Level of profession	Non-degree holder	283 (79.9)	1 (0.3)	0.04 (0.004 to 0.32)	0.06 (0.01 to 0.52)	0.011*
	Degree holder	64 (18.1)	6 (1.7)			
Procedure training	Untrained	201 (56.8)	5 (1.4)	0.55 (0.11 to 2.88)	-	0.479
	Trained	146 (41.2)	2 (0.6)			

* *p*-value is for the adjusted odds ratio.
CI – confidence interval, HCW – healthcare worker, OR – odds ratio

catheterisation were factors that affected participants' knowledge levels. Nurses had 7.25 times the odds of having a poor/average knowledge level; this association was statistically insignificant. Non-degree holders had 0.06 times the odds of a poor/average knowledge level, which was statistically significant (Table IIb).

HCWs' practice of proper adult male urethral catheterisation

Most participants (92.4%) had a poor level of practice (Table IIIa). Determinants assessed for poor practice were cadre, level of profession, year of practice, and procedure training. Nurses had 2.02 times the odds of having poor practice, which was statistically insignificant. Participants with < 10 years of practice had 1.38 times the odds of having poor practice, which was also statistically insignificant. Non-degree holders and untrained participants had odds of 0.56 and 0.46, respectively, to have poor practice, which were also statistically insignificant (Table IIIb).

The correlation between HCWs' levels of knowledge and practice of adult male urethral catheterisation was positive, with a correlation coefficient of 0.112 (single-tailed correlation), which was statistically significant (Table IIIc).

Table IIIa: HCWs' practice levels of proper adult male urethral catheterisation (*n* = 354)

Practice level		*n*	%
Good	10–18	27	7.6
Poor	0–9	327	92.4
	6.30 ± 3.35*		

* Mean score in the level of practice.
HCW – healthcare worker

Table IIIb: Determinants of poor practice of adult male urethral catheterisation among HCWs (*n* = 354)

Determinant		Practice level		OR	*p*-value
		Poor	Good	95% CI	
Cadre	Nurse	244 (68.9)	16 (4.5)	2.02 (0.90 to 4.53)	0.09
	Medical doctor	83 (23.4)	11 (3.1)	1.0	
Level of profession	Non-degree holder	265 (74.9)	19 (5.4)	0.56 (0.23 to 1.33)	0.19
	Degree holder	62 (17.5)	8 (2.3)	1.0	
Year of practice	≤ 10	249 (70.3)	22 (6.2)	1.38 (0.51 to 3.76)	0.53
	> 10	78 (22)	5 (1.4)	1.0	
Procedure training	Untrained	186 (52.5)	20 (5.6)	0.46 (0.19 to 1.12)	0.09
	Trained	141 (39.8)	7 (2)	1.0	

CI – confidence interval, HCW – healthcare worker, OR – odds ratio

Table IIIc: Correlation between HCWs' levels of knowledge and practice of proper adult male urethral catheterisation (*n* = 354)

Levels of knowledge and practice correlation		
	Knowledge level	
Practice level	Spearman correlation	0.112
	Significant *p*-value	0.018

HCW – healthcare worker

Resource availability for proper adult male urethral catheterisation

All district hospitals in the Kilimanjaro region had catheters of different sizes, from 16 Fr to 24 Fr, as well as kidney dishes, gallipots, sponge-holding forceps, sterile swabs, urine bags of 2 000 ml, povidone-iodine, water for injection, syringes of 10 cc and 5 cc, and Kly gel. Therefore, equipment for proper adult male urethral catheterisation was adequately available at the district hospitals.

Discussion

A total of 354 HCWs participated in our study. Of the 354 participants, 73.4% were nurses and 26.6% were doctors. About 76% of the participants had a low level of knowledge of proper adult male urethral catheterisation. Nurses had 7.25 times the odds of having a poor knowledge level. Most participants (92.4%) had a poor level of practice. Nurses had 2.02 times the odds of having poor practice. The correlation between HCWs' levels of knowledge and practice of proper adult male urethral catheterisation had a positive correlation coefficient of 0.112, which is statistically significant.

In this study, the knowledge level was low, with 76% of participants having a low level, 22% having an average level, and 2% having a high level. A study by Abdelmoaty et al.[14] reported that 50% of participants had a low level of knowledge.[14] the studies have a similar high number of low-knowledge HCWs; however, the sample size differs (*n* = 190 in the Abdelmoaty et al.[14] study, and *n* = 354 in our study). The environments of these studies are dissimilar (a university hospital in the Abdelmoaty et al.[14] study versus district hospitals in our study).

In our study, a few participants responded correctly to a few questions, such as catheter insertion and when to balloon the catheter. The study by Eziyi et al.[7] showed very high correct responses on definition, catheter level of insertion, and when to balloon the catheter. The differences in results are attributed to 98% of HCWs having prior training on urethral catheterisation compared with 41.8% of HCWs having prior training in our study.[7] Nurses had 7.25 times the odds of having a poor knowledge level, similar to the study by Opina et al.,[8] which showed that nurses had a higher chance of having poor knowledge, possibly due to a lack of proper training.[8]

Our study had a high number of HCWs (92.4%) with poor practice, while only 7.6% had a good level of practice. Our results are similar to those of a study by Abdelmoaty et al.[14] in Egypt, where 33% of participants had poor practice prior training. Our study showed a low correct response rate to a few critical questions, such as the amount of lubricant used and when to balloon the catheter. However, our results differ from those of Opina et al.[8] and Mukakamanzi et al.,[15] which reported that most participants had good practice. This might be due to the prior training in their studies, whereas our study had no prior training.

In this study, the correlation between the levels of knowledge and practice was 0.112, which was statistically significant. However, the study by Green et al.[16] showed a correlation between levels of knowledge and practice at -0.105, which was statistically insignificant. This difference might result from the difference in sample size, where our study had a larger sample size (*n* = 354) and, therefore, more power than their study (*n* = 137).

Most equipment for catheterisation was available in most district hospitals. Contrary to this finding, the study by Ndomba et al.[17] in northwest Tanzania found that the equipment required by HCWs visiting patients in rural areas (home visits) was inadequate. Additionally, one of the challenges in rural areas was the availability and accessibility of resources.[17] However, these studies were conducted in different settings: a home-based visit study and a study conducted at district hospitals, where most equipment is available.

Study limitations, strengths, and recommendations

Due to the nature of our study, the environment, and time factors, it is challenging to establish the origin of poor knowledge and practice. We can only ascertain the associated factors that possibly contributed to the outcomes reported in this study.

This is the first study to analyse the knowledge, practice, and available resources in northern Tanzania, providing preliminary evidence regarding proper adult male urethral catheterisation practices at district hospitals in northern Tanzania. Moreover, the study boasts a high response rate and large sample size and, hence, a high study power.

We recommend using educational images and videos to demonstrate the proper method of adult male urethral catheterisation, while addressing potential risks and frequent mistakes to boost HCWs' confidence and reduce the likelihood of complications. These educational materials should be evidence-based, readily available, and tailored to the various levels of clinical expertise.

Conclusion

Most HCWs at district hospitals have low levels of knowledge and poor practice of proper adult male urethral catheterisation, with a statistically significant positive correlation between their levels of knowledge and practice. There are adequate resources for proper adult male urethral catheterisation at district hospitals in northern Tanzania. We recommend continuous medical education among HCWs at district hospitals to equip them with the proper techniques for adult male urethral catheterisation.

Conflict of interest

The authors declare no conflict of interest.

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Ethical approval

Approval was granted by the College Research Ethics and Review Committee of the Kilimanjaro Christian Medical University College (PG.07/2023). Written informed consent was obtained from all participants.

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