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Instituting Sustainable Geriatric Care in Africa: The Roles of Sociocultural Constructs

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ABSTRACT

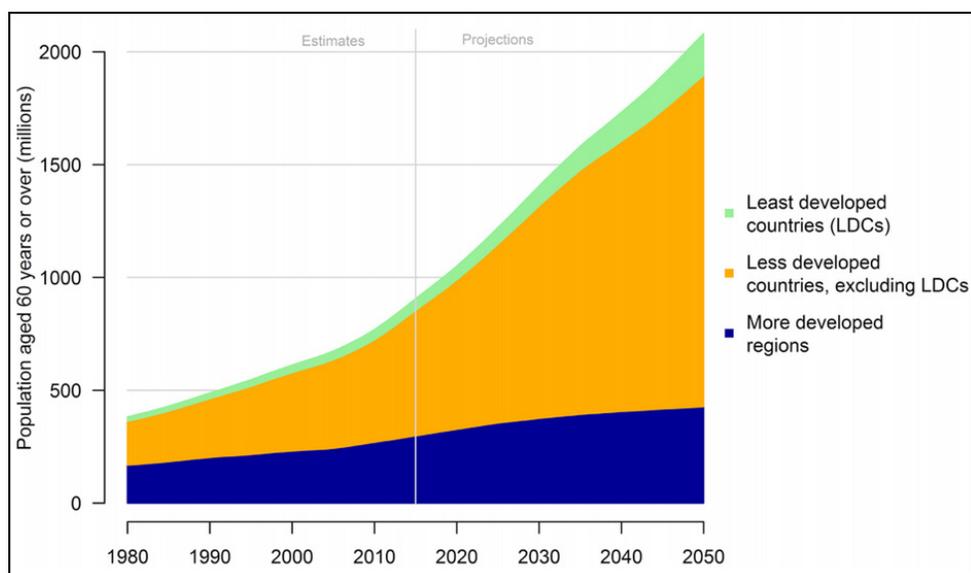
The demographic shift in Africa is seeing more people make it to old age (60 years or over), a state associated with an increased risk of acquiring communicable and non-communicable diseases, and demand for specialised health care. With many African health systems still struggling with infectious diseases, inadequate funding, poor infrastructure and lack of skilled human resource for health, how best can they provide quality, sustainable geriatric care services to their ageing population? This commentary highlights “Africa’s social-cultural structure” as an opportunity health policy makers could tap into, to design patient-centred, sustainable, inexpensive, and socially acceptable geriatric interventions.

INTRODUCTION

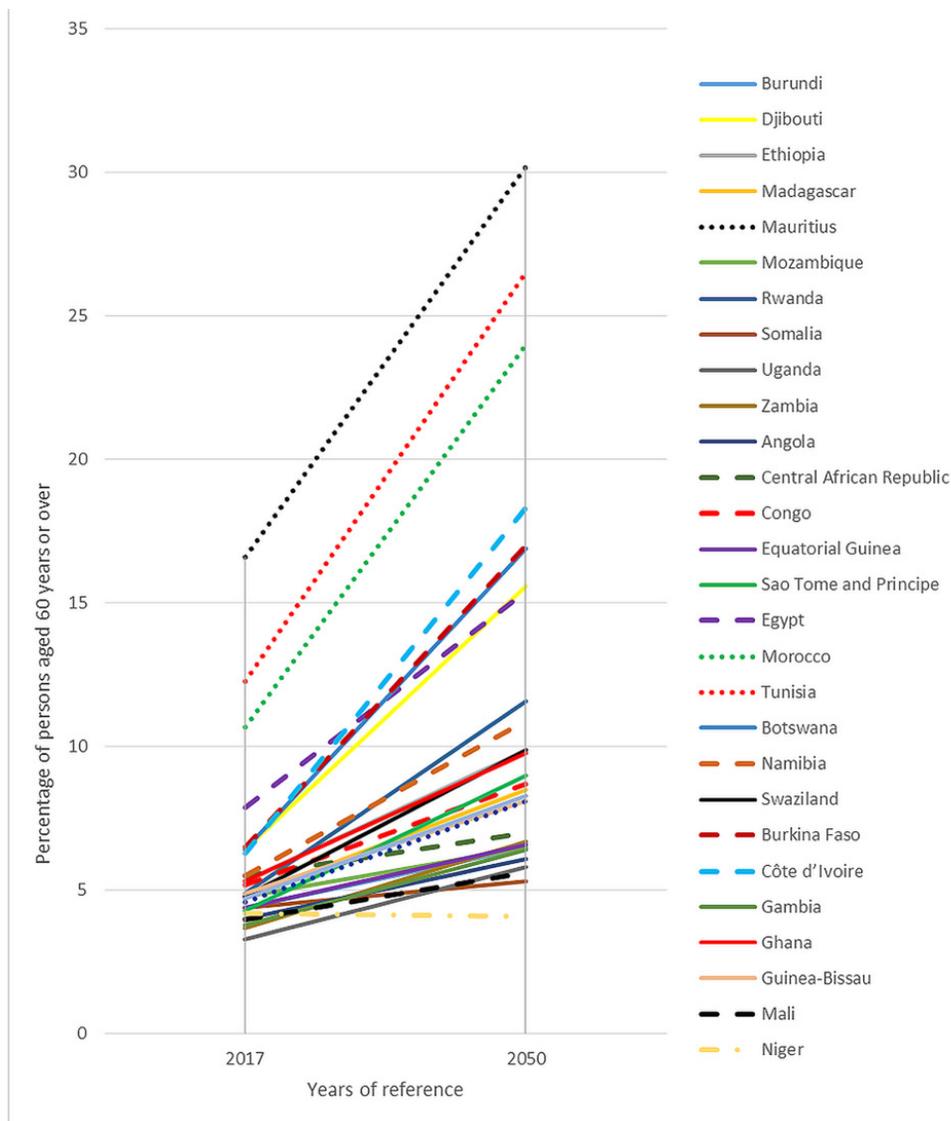
With an improvement in the quality of life, security and health services, Africa is experiencing a demographic shift. This transition comes with a rising

number of old persons (people above 60 years). By 2050, the world will be home to 2.1 billion elderly people, with over 76% of them living in the developing world (Figure 1). Africa expects more than 10% of its population to be aged by then.¹ To highlight the urgency for action,

FIGURE 1. Number of Persons 60 Years and Over by Development Group (1980-2050)



Copyright © 2017, Population Ageing 2017- Highlights³

FIGURE 2. Percentage of Persons 60 Years and Over Across Select African Countries (2017-2050)

Adapted from: Population Ageing 2017- Highlights³

in 2016, the World Health Organisation (WHO) and member states through the sixty-ninth World Health Assembly, passed resolution 69.3. This resolution formed the backbone of the WHO's global strategy and plan of action on ageing and health, whose objectives were to call on all member governments to institute sustainable policies and measures that promote the wellbeing and health of old persons.²

However, how prepared is developing Africa that continues to struggle with the burden of infectious diseases to face its next public health challenge of ageing, and what strategies are countries in Africa leveraging to ensure healthy ageing

for old persons?^{4,5} In the developed world, the more than a century old geriatrics specialisation has metamorphosed into a complex practice, and residential and community-based care models for supporting old persons to live healthy and productive lives have been developed.⁶⁻⁸ On the other hand, there is little knowledge and information on how geriatric care and support can be best established in Africa's health systems, where the record number of people living to at least 60 years of age is predicted to continue increasing for at least the next 50 years (Figure 2).

FIGURE 3. Supporting the Elderly in Africa is a Transgenerational Communal Role



Photo by Nayiga Maria, Center for Innovations in Health Africa (CIHA, Uganda)

Based on previous health programming experiences, the easiest alternative would be to directly replicate already existing western models like building geriatric homes and setting up long-term care insurance programmes like what is practised in Japan.⁹ However, this would imply that Africa is unaware of the social-cultural, logistical and long-term economic implications of setting up such systems in countries already struggling with poor health infrastructure, inadequate equipment and logistics, and inadequate skilled human resource for health.¹⁰⁻¹³

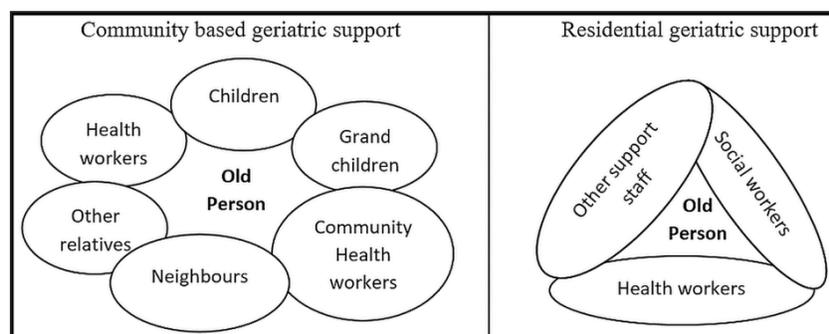
COULD AFRICA'S SOCIOCULTURAL STRUCTURES BE THE GAME-CHANGER?

Although the influence of Westernisation and globalisation continue to take root in Africa, the continent is known and continues to thrive on strong community-based sociocultural structures. Herein, relatives of different ages and generations, neighbours and friends tend to live together in communities, sharing common social services and resources, supporting each other, and making collective decisions regarding their health and other social obligations.¹⁴⁻¹⁷ This experience is stronger in rural settings, home to the majority

of old persons, who culturally are the central pillars of such communities, are held in high esteem, and all community members work towards their wellbeing.^{14,18} The question is, could this paradigm provide a framework for geriatric researchers to come up with sustainable Community-Based Geriatric Care (CBGC) models for Africa?

SUPPORTING THE ELDERLY IN AFRICA IS A TRANS-GENERATIONAL COMMUNAL ROLE

Community or home-based geriatric care models have successfully improved health outcomes of the elderly in the developed world, tailored on system approaches where geriatricians, doctors, nurses, social care workers, and volunteers visit older adults in homes to provide nursing, psychosocial and home support services.^{7,19} On the other hand, although there are no published works on CBGC in Africa's context, anecdotal evidence suggests an already existing but unexplored "community-led elderly care" model, where relatives and friends are the primary players tending to the health, personal, and psychosocial needs of the elderly (Figure 3). For example, it is common to find children, grandchildren, relatives, friends, and neighbours reminding the elderly when to take their medicines and taking them out for walks and other physical engagements.

FIGURE 4. Key Players in Community-based Versus Residential-based Geriatric Support

Tailoring geriatric care to Africa's existing social-cultural context is more likely to be acceptable and sustainable, given that it avails an opportunity for patient-centred care, where family and community members directly take part in caring for their loved ones, thus minimising costs of care, and psychological effects like depression, already known to be prevalent among old persons staying in geriatric homes.^{7,20,21} Relatedly, with human resources for health in Africa continuing to be inadequate, training relatives, neighbours and friends in basic community based geriatric care would provide a viable alternative, given that engaging community based health volunteers with no medical background has been documented to help reduce childhood mortality and morbidity, and improve postnatal care and HIV care services.²²⁻²⁴

That said, CBGC models for Africa should be cognizant of and fit into its changing dynamics with regard to rural-urban migration, urbanisation, and socioeconomic transformation. There is also a lot to learn from the developed world with regard to planning for, and mitigating challenges such as physical stress on the caregivers, economic losses associated with time lost in providing such care, and most importantly setting up quality monitoring and assurance systems for better geriatric care delivery.

As geriatric professionals and health policy makers continue to contemplate the best strategies for instituting geriatric care in developing Africa, it is our view that these existing social norms and practices are explored as possible key pillars for designing socially, culturally acceptable, and economically sound geriatric care models.

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Unpacking Loss to Follow-Up Among HIV-Infected Women Initiated on Option B+ In Northern Tanzania: A Retrospective Chart Review

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ABSTRACT

Background: In 2014, Tanzania adopted the Option B+ policy for the prevention of mother-to-child transmission of HIV (PMTCT), which stipulates lifelong antiretroviral therapy (ART) for HIV-infected pregnant, postpartum and breastfeeding women, irrespective of CD4 count or WHO clinical staging. Loss to follow-up (LTFU) during pregnancy and the postpartum period may undermine the effectiveness of Option B+. Factors associated with no follow-up (NFU) care, may differ from those associated with LTFU at later time points. This study aimed to identify factors associated with NFU and LTFU among women who initiate ART under Option B+ in Moshi, Tanzania.

Methods: We conducted a retrospective chart review of patients initiating ART on Option B+ between February 2014 and December 2015 in Moshi Municipality, Tanzania. Multivariable log-binomial regression was used to analyse factors associated with NFU. Kaplan-Meier survival functions were used to estimate time to LTFU. Multivariable Cox proportion hazards regression models were used to evaluate variables associated with time to LTFU.

Results: Among 468 women initiating ART under the option B+ programme, 109 (23.3%) had NFU after the initial appointment. Factors associated with increased risk of NFU were: age < 25 years (adjusted hazard ratio [aRR] 1.7; 95% CI, 1.2 to 2.3), initiating ART at a hospital compared to a lower level health facilities (aRR 2.9; 95% CI, 2.1 to 3.9), and having no treatment supporter (aRR 1.5; 95% CI, 1.1 to 2.1). LTFU was higher in women aged < 25 years (aHR 1.4; 95% CI, 1.1 to 1.9), and in women with no treatment supporter (aHR 1.8; 95% CI, 1.4 to 2.3). In women who returned to the clinic after ART initiation, no factor was significantly associated with LTFU.

Conclusion: The factors associated with NFU (being young, not having a treatment supporter, and being diagnosed at hospitals) reflect a vulnerable and potentially highly mobile population. Additional interventions are needed to support and retain this group at ART initiation on Option B+.

INTRODUCTION

In 2013, the World Health Organization (WHO) updated the guidelines for the prevention of mother-to-child transmission of HIV (PMTCT), recommending that all HIV-infected pregnant, postpartum and breastfeeding women initiate lifelong antiretroviral treatment (ART) as soon as they are diagnosed, irrespective of their CD4 count or WHO clinical staging.¹ This policy, known as Option B+, was adopted in Tanzania in 2013; implementation began in 2014, and national rollout was achieved by December 2014. In 2015, the PMTCT nation-

al programme reported significant improvements in all indicators compared to the prior year. In 15 (55.6%) of the country's 27 regions, the national target of ≥90% ART provision to pregnant women was achieved, and mother-to-child transmission of HIV (MTCT) was reduced from 6% in 2014 to 4.5% in 2015. By 2017, 80% of pregnant women living with HIV in Tanzania were receiving ART, a significant increase from 2010, when only 51% of pregnant women were receiving ART.²

Option B+ policy was intended to simplify treatment protocols and promote task shifting and service decentralisation in order to increase PMTCT coverage and ac-

celerate progress towards the elimination of perinatal HIV infections.³ However, studies have demonstrated suboptimal retention among women initiating ART under Option B+.⁴⁻¹⁰ In particular, loss to follow-up (LTFU) has been reported immediately after HIV diagnosis, with women being initiated on ART, but never returning to the clinic for follow-up appointments.^{10,11} In routine data from Tanzania, rates of LTFU in PMTCT care among women initiating ART under Option B+ were 26%, 30% and 33% at 3, 6, and 12 months respectively.²

Several individual factors are associated with retention in PMTCT care, including older age, higher income, higher education level, psychosocial support (including a treatment supporter), and lower levels of stigma and discrimination.^{5,7,12} Health system factors associated with retention include the accessibility and quality of PMTCT services, the attitudes of health facility staff members and the level of the health facility where ART is initiated.^{9,11,13} The influence of these factors on LTFU may vary across time points in pregnancy and the postpartum period.

With the continued scale-up of Option B+, it is important to understand the nuances of care engagement across the PMTCT cascade. Data regarding when LTFU occurs and what influences it can inform strategies that target women most at need and at the most appropriate time. This study aimed to estimate rates of LTFU among women presenting for PMTCT services in Moshi, Tanzania and to identify factors associated with LTFU. In particular, we evaluated factors associated with having no follow-up (NFU) after initial presentation at PMTCT, as well as with LTFU among the women who returned to care at least once after ART initiation.

METHODS

Study Setting

This study was conducted in northern Tanzania in Moshi Municipality, an urban setting with a population of 184,292, of which 51.6% and 48.4% are female and male, respectively.¹⁴ In 2015, there were 60,283 women of reproductive age in the municipality; adult HIV prevalence was estimated to be 3.8%.¹⁴ Moshi Municipality has a total of 53 health facilities, of which 29 provide PMTCT services. Thirteen of these PMTCT service providers only conduct HIV testing and referral to care. The remaining 16 facilities (of which 3 are hospitals, 3 are health centres, and 10 are dispensaries) provide ART to pregnant women in accordance with Tanzania's national PMTCT programme. PMTCT services provided by Tanzania's PMTCT programme include routine HIV testing and counselling, antiretroviral (ARV) treatment and prophylaxis for mothers and children, safer delivery practices, counselling and support for safer infant feeding practices, long-term follow-up care for mother and child and family planning. PMTCT services are available at antenatal clinics during and after pregnancy until the child is 24 months of age, after which the mother and child are transferred to routine ART care.

Study Design and Participants

This was a retrospective cohort study, based on routinely collected clinical data of HIV-infected women who initiated Option B+ between February 2014 and December 2015 at any of the 16 PMTCT facilities in Moshi Municipality. The study observation period was from ART initiation until June 30, 2016; thus, all patients included in the analysis had at least 6 months of follow-up data. Eligible patients were those initiated Option B+ because of pregnancy or breastfeeding, irrespective of their clinical or immunological stage. Exclusion criteria for the study were: ART initiation prior to pregnancy, ART initiation at another facility, or missing clinical records. All patients meeting the eligibility criteria were included in the final sample.

Data Collection and Variable Definitions

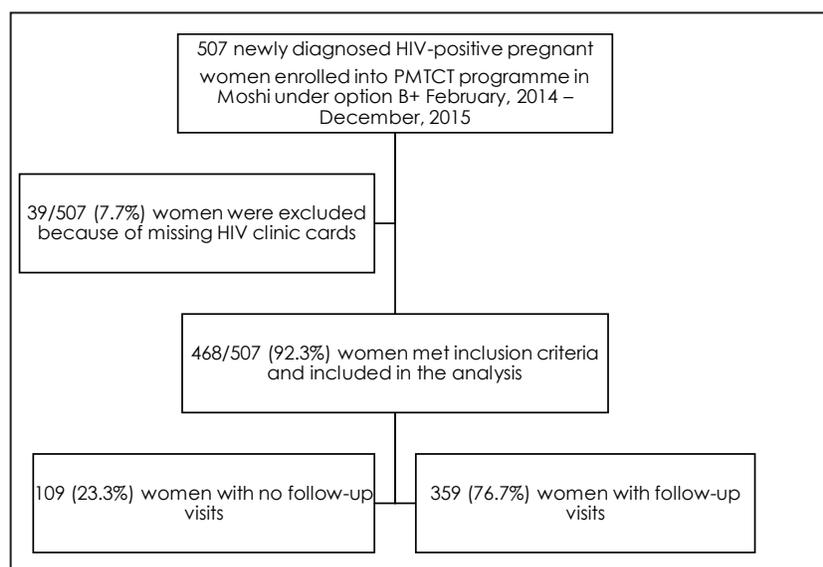
Patient information was extracted by a medical doctor and a trained and experienced data clerk in the health facility from paper-based, routinely maintained clinic records using a standardised medical record extraction tool. Study variables were extracted from multiple data sources in the clinic: PMTCT registers, ANC registers, and the patient HIV clinic card. Specifically, we extracted women's age, gestational age at ART initiation, and gravidity from ANC and delivery registers. We obtained the patient's marital status, presence or absence of a treatment supporter, and dates of follow-up and appointment visits from the HIV clinic card and the ART and appointment registers. Baseline demographic characteristics and clinical variables, including age at ART initiation, marital status, gestational age at ART initiation, gravidity, treatment supporter status, level of health facility, and eligibility criteria, were extracted for the time of ART initiation. Other variables, such as dates of follow-up and appointment visits, were abstracted on the last ART visit date for both LTFU patients and those retained in care. For all patients, the last ART visit date was the latest date of ART scheduled or unscheduled visit after ART initiation. Extracted data were then entered into Microsoft Excel and imported for analysis into Stata version 12 (StataCorp, College Station, TX, USA).

Two outcomes were considered in this study. The first outcome was NFU, defined as a patient having no recorded follow-up visit after ART initiation. The second outcome was LTFU, defined as a patient being > 90 days late for their last scheduled appointment without subsequently returning to the clinic. For all patients, the last ART visit date was taken as most recent scheduled or unscheduled ART visit occurring before June 30, 2016.

Sampling and Sample Size

The sample size was calculated using the formula for Poisson distributed data, which is also appropriate for log-binomial models.^{15,16}

FIGURE 1. Flow Chart With Total Number of Eligible and Included Women



$$n_{group} = \frac{4}{p(\sqrt{RR}-1)^2}$$

p =probability of event in the unexposed

RR =minimum relative risk of interest

To adjust for unequal group size of women with and without exposure of interest, we used the following formulas:

$$k = n_{unexposed} / n_{exposed}$$

$$n_{unexposed} = 0.5n_{group}(1+k)$$

$$n_{exposed} = 0.5n_{group}(1+1/k)$$

The required sample size was $n_{unexposed} + n_{exposed}$

The following assumptions were applied to calculate sample size: the probability of NFU is 0.15 in unexposed women and 0.20 in the total cohort, exposures of interest have a prevalence ranging from 25% to 75%, $RR=2.5$, power=80%, and $\alpha=0.05$. Based on these assumptions, the required sample size was 420. The final sample included 468 newly diagnosed HIV positive pregnant women initiating ART on Option B+.

Data Analysis

Extracted data were entered into Microsoft Excel and then imported for analysis into Stata version 12. Range checks,

frequencies and histograms were used to identify missing data and errors. Decisions on how to categorise variables were made based on previous studies. Descriptive statistics were generated. Continuous variables were summarised using means and standard errors (SD) as well as medians and interquartile ranges. Dichotomous variables were summarised using frequencies and percentages. Chi-square tests were used to evaluate bivariate associations between baseline variables and NFU.

Multivariable analyses were conducted. First, we developed a multivariable log-binomial regression model to identify variables that were associated with NFU. The final multivariable model included, *a priori*, age at ART initiation, treatment supporter, level of health facility, and reason for ART initiation, as well as variables with a P value $<.05$ in bivariate analysis. Adjusted relative risks (aRRs) and 95% confidence intervals (CIs) were estimated to assess the magnitude of associations after adjusting for other variables. Secondly, we conducted a survival analysis to estimate Kaplan-Meier survival functions for time to LTFU in the entire cohort and in the subset of women who returned to the clinic at least once after ART initiation. Patients were followed from ART initiation for up to 12 months. Participants were censored at the date of death, date of transfer out of the clinic, LTFU, or at the end of the observation period. In this analysis, we defined the follow-up time of those who never attended a second visit after initiation as 15 days after ART initiation.

Finally, we developed 2 multivariable Cox proportion hazards regression models to evaluate variables associated with time to LTFU, firstly in the entire cohort and then in the subset of women who returned to the clinic at least once af-

TABLE 1. Characteristics of Women Initiated on ART Under Option B+ From February 2014 to December 2015 (N=468)

Variable	Total n (%)	Follow-up Status n (%)		X ² P value
		No Follow-up	With Follow-up	
Total	468	109 (23.3)	359 (76.7)	
Age, years, mean (SD)	29.29 (6.1)	28.28 (6.8)	29.6 (5.9)	.05 ^a
Age at ART initiation, years				
<25	122 (26.1)	37 (33.9)	85 (23.7)	.03
≥25	346 (73.9)	72 (66.1)	274 (76.3)	
Marital status				
Married	227 (48.5)	54 (49.5)	173 (48.2)	.50
Unmarried	122 (26.1)	33 (30.3)	89 (24.8)	
Missing	119 (25.4)	22 (20.2)	97 (27.0)	
Gestational age at ART initiation				
1st or 2nd trimester	284 (60.7)	49 (44.9)	235 (65.5)	.01
3rd trimester or breastfeeding	59 (12.6)	19 (17.5)	40 (11.1)	
Missing	125 (26.7)	41 (37.6)	84 (23.4)	

Continued

ter ART initiation. Before developing the multivariable models, univariate Cox proportion hazards regression analyses were conducted to test associations with individual variables. To test the assumption of proportional hazards, we used the “tvc” and “texp” commands in STATA to assess whether or not a linear deviation from proportional hazards would improve the model fit. These tests confirmed that the assumption of proportional hazards was appropriate. The multivariable Cox regression model that best explains the variation in survival (by using a stepwise selection process) included all of the most significant prognostic factors that had a *P* value ≤.10 in univariable Cox Proportion hazards analysis. In the final model, we adjusted for age at ART initiation (below or above 25 years), treatment supporter status (yes or no), level of health facility (hospital, health centre, or dispensary), and reason for ART initiation (pregnancy or breastfeeding), regardless of their significance in the univariate analysis. Gravida and gestational age were not included in the final multivariable

model because of the high proportion of missing values. Associations were estimated using hazard ratios (HR) with 95% CIs and were considered significant at a *P* value <0.05 using a 2-sided test.

Ethical Considerations

Ethical approval to carry out the study was obtained from the Research and Ethics Committee of the Kilimanjaro Christian Medical University College (*Number: 983*). Confidentiality was maintained with no participants' names being used. The study utilised data that are routinely collected for service delivery, and no personal identifiers were included in the dataset used in statistical analyses; therefore, we did not seek patient consent.

TABLE 1. Continued

Variable	Total n (%)	Follow-up Status n (%)		X ² P value
		No Follow-up	With Follow-up	
Total	468	109 (23.3)	359 (76.7)	
Treatment supporter				
Yes	310 (66.2)	45 (41.3)	265 (73.8)	<.01
No	158 (33.8)	64 (58.7)	94 (26.2)	
Level of health facility				
Hospital	143 (30.5)	43 (39.5)	100 (27.9)	.07
Health centre	210 (44.9)	42 (38.5)	168 (46.8)	
Dispensary	115 (24.6)	24 (22.0)	91 (25.3)	
Reason for ART initiation				
Pregnancy	443 (94.7)	100 (91.7)	343 (95.5)	.12
Breastfeeding	25 (5.3)	9 (8.3)	16 (4.5)	

^aP value for Student's t-test

Abbreviations: ART, antiretroviral therapy; SD, standard deviation

RESULTS

Between February 2014 and December 2015, 507 newly diagnosed HIV-infected pregnant women were enrolled in PMTCT under Option B+ in Moshi Municipality. After exclusions due to missing data (n=39), data from 468 women were analysed. Of the 468 women, 109 (23.2%) did not return after the ART initiation visit and were classified as NFU, and 359 (76.7%) women had at least 1 follow-up visit after ART initiation (Figure 1).

Participant Characteristics

Participants ranged in age from 16 to 49 years, with a mean age of 29 years. In total, 346 (73.9%) were aged >25 years and 227 (48.5%) were married/cohabiting. At ART initiation, 284 (60.7%) women were in the first or second trimester of pregnancy, and >50% had a previous pregnancy. In total, 310 (66.2%) women had a treatment supporter, and 443 (94.7%) women initiated ART during pregnancy, while 25 (5.3%) initiated ART while breastfeeding (Table 1).

Factors Associated with No Follow-up in ART Care

In the univariate log-binomial analysis, age < 25 years at ART initiation, having no treatment supporter and health facility of ART initiation being a hospital (vs a health centre or dispensary) were significantly associated with NFU. After adjustment, these variables remained independently associated with NFU. Women aged < 25 years had a nearly 2 times higher risk of NFU compared to women aged > 25 years (aRR 1.70; 95% CI, 1.2 to 2.3). Women who had no documented treatment supporter had a nearly 3 times higher risk of NFU compared to those with a documented treatment supporter (aRR 2.86; 95% CI, 2.0 to 3.9). Women who started ART at a hospital had a 50% increased risk of NFU compared to those who started ART at a health centre (aRR 1.50; 95% CI, 1.0 to 2.1) (Table 2).

Loss to Follow-up From Care

In total, 468 women were followed for 3,209 person-months (PM). Mean (SD) follow-up time was 8.8 (4.2) months, with a range of 0.1 to 12 months. Overall, 245 (52.3%) women were LTFU during the observation period, including 109 (23.2%)

TABLE 2. Factors Associated with No Follow-up on ART Care Among Women Who Initiated ART Under Option B+ (N=468)

Variable	Univariate Analysis		Multivariate Analysis	
	RR (95% CI)	P Value ^a	aRR (95% CI)	P Value ^a
Age at ART initiation				
≥25	1		1	
<25	1.5 (1.0–2.0)	.03	1.7 (1.2–2.3)	<.01
Marital status				
Married	1			
Unmarried	1.1 (0.7–1.6)	.50	-	-
Gestational age at ART initiation				
1st or 2nd trimester	1			
3rd trimester or breastfeeding	1.9 (1.1–2.9)	<.01	-	-
Gravidity				
1st pregnancy	1			
Repeat pregnancy	0.5 (0.2–0.7)	<.01	-	-
Treatment supporter				
Yes	1		1	
No	2.8 (2.0–3.8)	<.01	2.9 (2.0–3.9)	<.01
Level of the health facility				
Health center	1		1	
Hospital	1.5 (1.0–2.1)	.03	1.5 (1.0–2.1)	.02
Dispensary	1.0 (0.6–1.6)	.85	0.8 (0.5–1.2)	.36
Reason for ART initiation				
Pregnancy	1		1	
Breastfeeding	1.6 (0.9–2.7)	.09	1.6 (0.9–2.4)	.05

n (%), Proportion of women with no follow-up in care for each category listed

Abbreviations: aRR, adjusted risk ratio; ART, antiretroviral therapy; CI, confidence interval; RR, risk ratio

TABLE 3. Factors Associated with Loss to Follow-Up Among Women Who Initiated ART Under Option B+ (N=468)

	Univariate Analysis		Multivariate Analysis	
	LTFU ^a HR (95% CI)	LTFU ^b HR (95% CI)	LTFU ^a aHR (95% CI)	LTFU ^b aHR (95% CI)
Age at ART initiation, years				
≥25	1	1	1	1
<25	1.3 (1.0–1.7) ^c	1.2 (0.8–1.8)	1.4 (1.0–1.8) ^c	1.3 (0.8–1.8)
Marital status				
Married	1	1		
Unmarried	1.1 (0.7–1.4)	0.9 (0.6–1.4)	-	-
Gestational age at ART initiation				
1st or 2nd trimester	1	1		
3rd trimester or breastfeeding	1.4 (0.9–2.0)	1.2 (0.6–1.9)	-	-
Gravidity				
1st pregnancy	1	1		
Repeat pregnancy	0.6 (0.4–0.9)	0.8 (0.4–1.2)	-	-
Treatment supporter				
Yes	1	1	1	1
No	1.7 (1.3–2.2) ^d	1.1 (0.7–1.6)	1.8 (1.3–2.3) ^d	1.2 (0.8–1.6)
Health facility level				
Health centre	1	1	1	1
Hospital	1.1 (0.8–1.5)	0.9 (0.5–1.3)	1.2 (0.8–1.5)	0.9 (0.5–1.3)
Dispensary	0.9 (0.6–1.2)	0.89 (0.5–1.3)	0.8 (0.6–1.1)	0.8 (0.5–1.2)
Reason for ART initiation				
Pregnancy	1	1	1	1
Breastfeeding	1.4 (0.8–2.3)	1.2 (0.5–2.5)	1.6 (0.9–2.7)	1.3 (0.6–2.7)

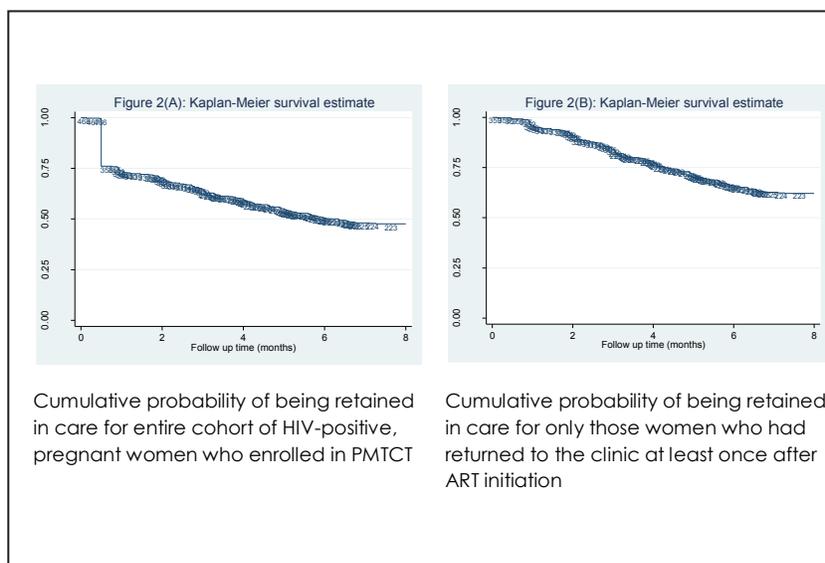
^aLTFU for entire cohort of HIV-infected, pregnant women who enrolled in PMTCT between February 2014 and December 2015 (N=468).

^bLTFU for only those women who returned to the clinic at least once after ART initiation (N=359).

^cHR adjusted for age, treatment support, health facility level and reason for ART initiation

^c(<.05), ^d(<.001)

Abbreviations: aHR, adjusted hazard ratio; ART, antiretroviral therapy; CI, confidence interval; HR, hazard ratio; LTFU, lost to follow-up

FIGURE 2. Kaplan–Meier Estimates of LTFU Among Women Starting ART Under Option B+

who were lost immediately after ART initiation. The cumulative proportion of women LTFU at 3, 6 and 12 months after ART initiation was 35.4% (95% CI, 31.3 to 39.9), 49.5% (95% CI, 45.1 to 54.1), and 52.3% (95% CI, 47.9 to 56.9), respectively (Figure 2A). The overall incidence rate of LTFU for this cohort, including those who had no follow-up visit after ART initiation, was 7.6 per 100 PM of the observation time (range, 6.7 to 8.6 per 100 PM).

In the analysis of 359 women who returned to the clinic at least once after ART initiation, mean (SD) follow-up time was 8.7 (4.2) months, with a range of 0.1 to 12 months. In total, 136 (37%) of these women were LTFU during the study period. The cumulative proportion of these women LTFU at 3, 6 and 12 months after ART initiation was 15.9% (95% CI, 12.4 to 20.0), 34.2% (95% CI, 29.6 to 39.4) and 37.8% (95% CI, 33.0 to 43.1), respectively (Figure 2B). The overall incidence rate of LTFU for this subgroup of women was 4.3 per 100 PM, with a range of 3.6 to 5.0 per 100 PM.

In assessing LTFU for the entire cohort of 468 participants, age < 25 years at ART initiation (aHR 1.4; 95% CI, 1.0 to 1.8) and having no treatment supporter (aHR 1.8; 95% CI, 1.3 to 2.3) were associated with higher hazards of LTFU. In the subset of women who returned to the clinic at least once after ART initiation, no factor was significantly associated with LTFU (Table 3).

DISCUSSION

In order to improve the implementation of the Option B+ guidelines for PMTCT, data is needed to understand care engagement across the PMTCT continuum. This study provides insight into PMTCT care engagement in Moshi Municipality,

Tanzania, where Option B+ guidelines have been in place since 2014. The study found that almost one-quarter of the women who initiated ART during pregnancy had no record of returning to the clinic after ART initiation. Overall, more than half of the women in the cohort were LTFU during the observation period. Being young, initiating ART at a hospital, and not having a treatment supporter were associated with a greater risk of not returning to the clinic, but not LTFU from subsequent visits.

The study revealed that many women fail to return for follow-up care after initiating ART under Option B+, and also that many women who do return are subsequently LTFU. In this study, we found that at 12 months, LTFU was 37.9%, among women who returned to the clinic after ART initiation. Similar patterns of LTFU have been observed in other African countries implementing Option B+. In Malawi, about half of women who collected ART at initiation never returned for another appointment,⁷ and in Ethiopia, about a quarter of the women who were LTFU received ART only once and never returned.¹¹ The high proportion of NFU might suggest that women never started ART, even if they collected ART on the day of initiation, or that they stopped ART after the first dose. However, it is possible that some of these women may attend HIV services in a different location and quite possibly with a different identification number (known as a “silent transfer”).¹⁷ Women may feel shocked by their HIV diagnosis, and may not be prepared for lifelong ART. Some women may want to receive HIV-related services at another clinic due to perceived stigma and a desire to keep their HIV status secret.^{11,17} The period immediately prior to and after ART initiation is thus an important target for interventions aimed at

improving retention in Option B+. Focus should be placed on ways to increase women's readiness for ART and reduce internalised and perceived stigma to improve retention in care.

Our study supports others in suggesting that being younger at ART initiation reduces retention in care.^{11,17-19} Several factors may contribute to poor retention among younger women, including reduced readiness for ART, decreased knowledge of the benefits of PMTCT, as well as stronger feelings of internalised and perceived stigma.^{20,21} Older women may have more social support within partnerships and families which allow them to better manage ART.⁷ Social support, as captured in our study as having a treatment supporter documented in the medical record, was associated with a lower risk of NFU. Having a treatment supporter may be an indication of HIV disclosure, which has been shown to be strongly associated with an individual's ability for sustained engagement in HIV care.^{12,22-25} Disclosing one's HIV status enables one to garner social support and removes the element of secrecy; women who have disclosed their HIV status are more likely to show up to their appointments without fear.²⁵⁻²⁸ The present study relied on routinely collected clinical data, which did not include details about the characteristic of the treatment supporter, including the individual's relationship with the patient and the type of support they provide. Further research should explore the characteristics of treatment supporters that facilitate care engagement.

Our data supports other studies showing that women who initiate ART in tertiary health-care facilities are at increased risk of NFU, compared with women who initiate ART at lower-level facilities.⁴ Poorer retention in higher-level health facilities may be related to unfavourable health system factors such as high patient loads and longer waiting times,^{4,11} or may be linked to the increased mobility of urban populations.²⁹ However, it may also be that women are not prepared to receive their ART care at the same location that they had selected for their pregnancy care. Further research is needed to determine if women who have NFU following ART initiation on Option B+ continue their care in other locations, and to examine their subsequent retention in these locations.

Our study has several limitations. The routine data extracted from the health facilities were often missing information on factors including marital status, gestational age at ART initiation, gravidity and parity. Other potentially important factors reported in other studies are not captured in the routine data (eg, HIV stigma and barriers to health-care access). Baseline characteristics were used as fixed variables to assess associations with the NFU and LTFU; however, some of these factors may change over time. Lastly, we were not able to trace women who may have moved to other facilities, and therefore, our analysis may have overestimated NFU and LTFU. In clinical settings such as those of the study area, health-care workers often do not actively trace patients who are LTFU, and transfers to other facilities are not recorded unless patients specifically request a transfer letter. Thus

patients who self-transfer to another facility may be misclassified as NFU or LTFU in routine data.

CONCLUSION

Our analysis of routine clinic data from Option B+ programmes in Northern Tanzania revealed a high proportion of HIV-infected pregnant women who initiated ART but never returned for follow-up care or an ART refill, a trend which may undermine the success of Option B+. Younger women, those initiating ART in hospitals and those with no reported treatment supporter were at increased risk of early dropout. These women may have transferred their HIV care to other facilities or may have disengaged completely. Further prospective quantitative and qualitative studies should be carried out to understand the reasons for and factors associated with early LTFU from HIV care in the context of Option B+ in Tanzania. Future reporting on PMTCT programme outcomes at the national level should disaggregate data by age and other variables to better assess early LTFU.

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Willingness and Barriers to Voluntary Counselling and Testing Among Self-Perceived Healthy Adults in Tanzania

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ABSTRACT

Background: Despite the ongoing efforts to promote HIV testing, the majority of adults in Tanzania remain untested, and many remain unwilling to know their HIV status. Understanding the underlying reasons for this unwillingness to test and know one's status will support the development of targeted interventions to promote the uptake of HIV testing. This paper explores the willingness of and barriers faced by self-perceived healthy individuals to test for HIV in selected districts of Tanzania.

Methods: A cross-sectional survey was conducted in urban and rural wards between October 2011 and March 2012. Structured questionnaires with closed- and open-ended questions were administered to heads of randomly selected households. Information collected included socioeconomic, demographics, rural/urban backgrounds and the perceived reasons which hinder household heads/members to access and utilise HIV-testing services. Regression analysis was conducted to assess the relationship between the same factors and participants' willingness to go for an HIV test in the near future.

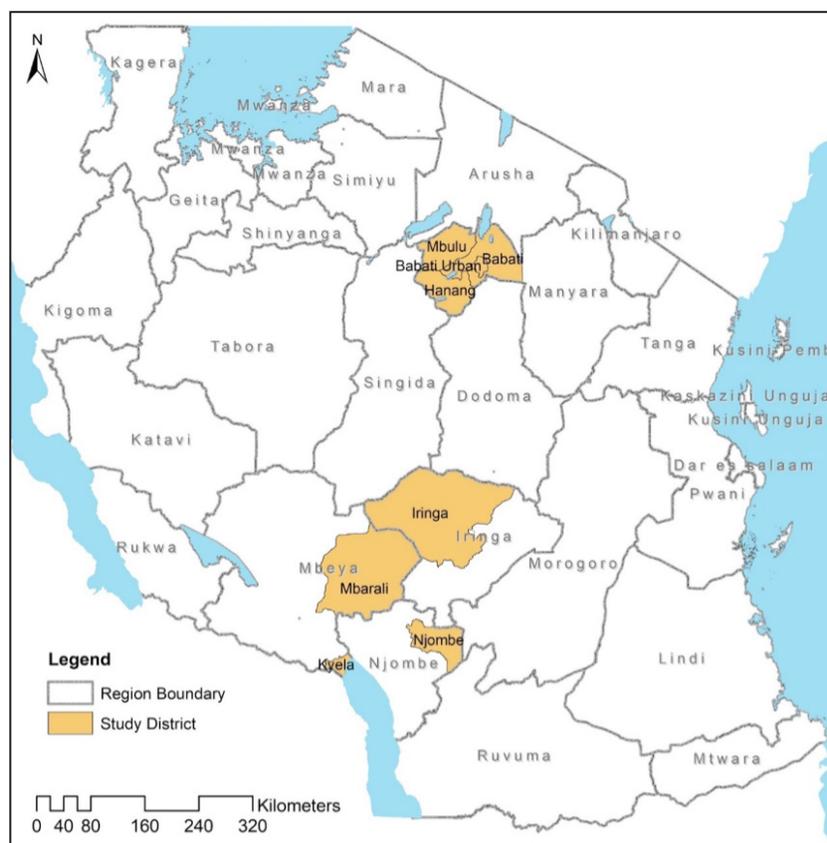
Results: There were 1,429 respondents from randomly selected households interviewed, and out of these, 57.1% were women, and 42.9% were men. The mean age of all respondents was 33.6 years; men were slightly older (mean age, 37 years) than women (mean age, 34 years). Almost one-third ($n=433$, 30.3%) of the respondents reported having ever tested for HIV, of whom 294 (61.8%) were women, and 139 (38.2%) were men. Being educated to at least the primary school level, being an urban resident, and being female increased the probability of HIV testing by 1.7% ($P<.001$), 1.3% ($P<.005$) and 0.2% ($P<.005$) respectively. Further, for each year, one's age increased the probability of positive future intentions to test for HIV increased by 0.4 % ($P<.005$). Education, residence and marital status were not significantly associated with future willingness to test. Fear of being stigmatised and discriminated was observed to be one of the important barriers for HIV testing among those who had never tested and those who were unwilling to test in the future.

Conclusion: In urban areas, knowledge of the benefits of HIV testing is higher than in rural areas. Overall stigma remains the most salient barrier to HIV testing and interventions that address this, and other structural drivers for stigma need to be addressed in order for people's willingness to test to increase. Finally, health systems need to be strengthened to further encourage testing and be ready to provide quality and non-discriminatory services once people's willingness to test becomes apparent.

INTRODUCTION

In December 2013 the UNAIDS set the 90-90-90 targets, which called for 90% of people to know their status, among whom 90% should be linked to care, among whom 90% should be virally suppressed.¹ Despite high and improved knowledge about HIV across the country,² in Tanzania the first "90" remains a bottleneck. The majority of adults in the United Republic of Tanzania remain either untested or unwilling to know their HIV status.³ Reasons for this pattern had not been systematically and comprehensively established in the Tanzanian literature.

The number of voluntary counselling and testing (VCT) sites in the country has rapidly expanded to 2,137.⁴ According to the 2010-2011 Malaria and AIDS Indicator Survey, more than 90% of people knew where to get an HIV test.⁴ In 2013, Tanzania introduced new HIV testing approaches such as home-based testing and community testing.⁴ Provider-initiated testing and counselling (PITC), wherein a health-care provider specifically recommends an HIV test to someone attending a health facility and performs the test unless the patient declines, has also been introduced.^{5,6} Data from the THIS 2016-2017 indicates that 67% of women and 50% of men had been tested for HIV at least once.^{2,5,6} While this represents an increase from the 2013 rates (Tanza-

FIGURE. Map of Tanzania Highlighting the Study Districts

nia's UNAIDS 2014 progress report found in 2013 only 28.4% of people aged 15-49 had taken an HIV test in the past 12 months and knew their results⁵) it still falls short from UNAIDS 90-90-90 target.

In 2016, Tanzania adopted a policy of universal test and treat (UTT) for the general population. Under UTT, all who test HIV positive will be initiated onto antiretroviral therapy (ART) regardless of their immune status. Translated into practice, this means that adults who test positive could still feel healthy when initiated on treatment. Evidence for the benefits of UTT policies to reduce onward HIV transmission is growing. The recent PopART trial suggests that if the 90-90-90 targets are reached, population transmission of HIV can be reduced by up to 30%.

Considerable efforts are needed if Tanzania is to reach the first "90" target. This study aimed to identify and analyse the willingness and barriers to VCT among self-perceived healthy adults. There has been significant documentation of the barriers to VCT in Tanzania; however, little has been documented since the widespread implementation of UTT. Understanding the drivers to VCT uptake in this context will be important to better direct efforts towards improve testing.

METHODS

Study Design and Setting

A cross-sectional study was conducted between October 2011 and March 2012. A structured questionnaire was administered in Swahili to heads of randomly selected households. The study was conducted in 7 districts: Mbulu, Babati rural, Hanang, Njombe, Iringa rural, Kyela, Mbarali (see table 1).

Sampling Strategy and Sample Size

A mix of purposive and random sampling was conducted. A multistage sampling strategy was adopted. The 2 highest prevalence regions in the country (Iringa and Mbeya) were purposively selected, and the final region (Manyara) was randomly sampled from the remaining 24 administrative regions recognised at the time of the study period. Rural-urban stratification was done in consultation with district authorities in each selected district. Two wards were selected from each district (1 ward was classified as rural and another urban). From each ward, 1 village was selected, making 2 villages from each district. A Probability Proportional to Size

TABLE 1. Characteristics of Study Districts

District	Region	Regional HIV prevalence	Population	Main Economic Activities
Mbulu	Manyara	1%	237,882	Farming, livestock keeping, fishing, and petty trading
Babati Rural District	Manyara	1%	303,013	Farming, livestock keeping, fishing, and petty trading
Hanang	Manyara	1%	275,990	Farming, livestock keeping, petty trading ,and bee keeping
Njombe	Formally Iringa, now Njombe region	>10%	130,223	Farming, livestock keeping, fishing, petty trading, logging and timber production
Iringa Rural	Iringa	>10%	245,623	Farming, livestock keeping, fishing, petty trading, logging and timber production
Kyela	Mbeya	>10%	~200,000	Fishing, livestock keeping, and petty trading
Mbarali	Mbeya	>10%	234,908	Farming, livestock keeping, fruit processing

(PPS) approach was used to estimate the required number of household from each village. We first calculated the proportion of the village population to the total population of the district. We then used the calculated proportions to establish the final sample from the village population. A random sampling technique was finally used to select households to meet the calculated sample size in each village.

Household Survey

A structured pretested questionnaire was administered face-to-face in Swahili to male or female heads of households by the trained research assistants who were supervised by 2 researchers in each study district. The interviews were managed by research assistants, and each interview took an average of between 45 minutes and 1 hour and took place in the respective participants' households or an area chosen by them. The tool was first pilot-tested to assess whether it was capable of capturing the required information, whether the questions asked to the respondents were comprehensively understood and whether the research assistants consistently and uniformly asked the questions in a way that was easy for respondents to comprehend logically. All the observed problems related to the content and structure of the questions, logic and consistency were considered and addressed during the tool refinement workshop which involved both

researchers and research assistants and took place in November 2011. The survey tool collected data on socioeconomic, demographics, rural/urban backgrounds and the perceived reasons that hinder or help household members to access and use VCT services. Willingness to go for VCT in the near future (any time between day 1 and the subsequent 90 days after the date of interview) was asked. Participants were asked to rate their health state on a scale of '0' to '100'; whereby '0' denoted poor health and any number between '50' and '100' denoted good health. Those who self-rated between '50' and a '100' were considered healthy and included in the study. Those who self-rated below '50' were excluded from the study.

Data Analysis

Data were double entered into a computer database using Epidata®. Responses from open-ended questions were post-coded before being entry. Data quality checking and analysis were performed using Stata software (StataCorp, College Station, TX, USA). Chi-square tests and tests of association (regression analyses) were performed to ascertain the association between independent and dependent variables. In order to perform the regression analysis, numerical variables were transformed to become categorical variables.

TABLE 2. Association Between Respondents' Characteristics and Willingness to Attend Voluntary Counselling and Testing in the Future (Study Participants Who Did Not Test, N=996)

Variable	Coefficient	P Value	95% Confidence Interval	
Gender (being a woman)	0.0187511	.992	-2.88	3.00
Education	0.2813292	.670	-1.01	1.58
Marital status (being married)	-0.8562862	.572	-3.82	2.11
Age	0.0466927	.050	0.062	0.10
Residence	0.0041625	.856	0.96	1.05
Cons_	0.0706359	.892	-1.09	0.95

Ethical Considerations

Ethical clearance was obtained from the Medical Research Coordination Committee (MRCC) of the National Institute for Medical Research (NIMR). The protocol was subjected to scientific and ethics review process, approved and given certificate number NIMR/HQ/R.8a/Vol.IX/1112. In addition, study permission was sought from the respective authorities from whom our potential participants were recruited. Both verbal and written consent were sought and obtained from participants.

RESULTS

Characteristics of the Study Participants

The study involved 1,429 respondents from randomly selected households in urban (49.6%) and rural (50.4%) wards, and 57.1% were women. The mean age of all respondents was 33.6 years. On average, men were slightly older (mean age, 37 years) than women (mean age, 34 years). The majority (62.9%) of respondents had completed primary school. Only 13.6% reported having completed ordinary level secondary education. Less than 2% had postsecondary education. The majority (67.3%) of the respondents were married; 17.8% were single, and the remaining 14.9% were either cohabitating or divorced.

TABLE 3. Association Between Respondents' Characteristics and Opting for Voluntary Counselling and Testing (N=1,429)

Variable	Coefficient	P Value	95% Confidence Interval	
Gender (being a woman)	0.0180538	.05	0.0058	0.30
Education	0.0172017	.05	0.0035	0.20
Marital status (being married)	0.1003441	.72	-0.45	0.65
Age	0.0482593	.66	-0.13	0.48
Residence	0.01318902	.05	0.0054	0.37
Cons_	2.9484361	<.001	1.62	5.49

Use of VCT Services

Overall, 433 (30.3%) of the respondents reported having undergone an HIV test. When disaggregated by area of residence, 57.3% of respondents from urban areas said they have ever tested for HIV compared to 42.7% of rural respondents. More women reported having ever been tested for HIV (36.05%) than (25.9%) of men. Female sex was significantly associated with an increased probability of testing ($P<.005$). This pattern was consistent even after adjusting responses for place of residence. The majority of participants had primary school-level education. Being educated, at least up to primary school level, significantly increased the probability that a person will test for HIV by 1.7% ($P<.001$). A point increase in age was significantly associated with the probability of HIV-testing by 0.4% ($P<.005$).

After accounting for the requirement for testing recommended under PMTCT, the majority of participants (72.6%) reported that the main motivation for VCT was a self-perceived risk of transmission, which participants defined as having sexual intercourse with partners who were perceived as being involved in high-risk sexual activity.

Reasons for Not Seeking VCT Services

The majority of respondents ($n=996$, 69.7%) across all study districts had never sought VCT services at the time of the study, despite the ongoing campaigns emphasising the importance of testing. The majority (mainly men) of respondents who confessed not to have sought VCT services pointed 4 reasons as main drivers for not going for VCT namely:

TABLE 4. Reasons and Motivations for Attending Voluntary Counselling and Testing Among Participants Who Tested (N=433)

	Men n (%)	Women n (%)	P Value
Reason/Motivation			
Self perception of high-risk sex behaviour	314 (72.6%)	119 (27.4%)	.05
Sexual relationship to a partner-with high risk sex behaviour	291 (67.3%)	142 (32.7%)	.05
Frequent illnesses	220 (50.9%)	213 (49.1%)	.06
Recommendation from a sex partner	313 (72.3%)	120 (27.7%)	.05
Self reassurance of negative HIV status	130 (30.1%)	303 (69.9%)	.05
Compulsory PMTCT for pregnant women	267 (68.5%)	136 (31.5%)	.05
Knowledge indicator			
Promotes behaviour change (to avoiding risky behaviours)	237 (54.8%)	196 (45.2%)	.07
Promotes the Prevention of Mother to- Child Transmission (PMTCT) of HIV/AIDS	153 (35.4%)	280 (64.6%)	.005
Poses as an entry point for treatment programs for STIs	142 (32.8%)	291 (67.2%)	.05
Poses as an entry point for diagnosis and treatment of tuberculosis/HIV co- Infections	209 (48.2%)	244 (51.8%)	.07
Enhances timely initiation of ARVs to HIV/AIDS patients	125 (28.9%)	308 (71.1%)	.05
Provides knowledge that reduce stigma and discrimination to infected people	138 (31.9%)	295 (68.1%)	.05

TABLE 5. Knowledge of Voluntary Counselling and Testing Benefits Among Participants Who Tested for HIV Adjusted for Area of Residence (N=433)

Knowledge Indicator	Urban n (%)	Rural n (%)	P Value
Promotes behaviour change (to avoiding risky behaviours)	245 (61.3%)	168 (38.7%)	.05
Promotes the Prevention of Mother to- Child Transmission (PMTCT) of HIV/ AIDS	(58.8%)	(41.2%)	.05
Poses as an entry point for treatment programs for STIs	265 (61.2%)	168 (38.8%)	.05
Poses as an entry point for diagnosis and treatment of tuberculosis/HIV co-Infections	222 (51.2%)	211 (48.8%)	.06
Enhances timely initiation of ARVs to HIV/AIDS patients	283 (65.3%)	3150 (4.7%)	.05
Provides knowledge that reduce stigma and discrimination to infected people	217 (50.1%)	216 (49.9%)	.06

distance from VCT centres associated with travel costs, HIV/AIDS-related stigma and discrimination, fear of people seeing them entering a VCT centre (stigma) and the knowledge that there is no cure for HIV (Table 4).

Future Willingness to Seek VCT Services

Increasing age was the only factor significantly associated with positive future intentions of testing for HIV ($P<.005$) (Table 3). Gender, education, residence and marital status were not significantly associated with positive future intentions to test.

Barriers to VCT Among Those Who Had Not Tested

Of the 69.7% of participants who said they never attended VCT (n=996); fear of stigma and the associated discrimination were the most cited barriers. Men were more fearful than women to attend services ($P<.05$). Another important barrier

er for those who did not test for HIV was that testing centres were too far from where they live (n=349, 30.5%), incurring travel costs (n=199, 20%) and a perceived fear of insufficient confidentiality at VCT sites.

Knowledge of VCT Benefits Among Those Who Tested

Respondents were asked about their understanding of the benefits of VCT (Table 5). Women were more knowledgeable than men. More than half (57%) of all women respondents who had ever gone for VCT services said that they knew that VCT promotes behavioural change, especially in relation to avoiding risky sex. The level of knowledge that VCT helps as an entry point for the diagnosis and treatment of HIV/AIDS and tuberculosis coinfections was generally higher for women than men. In addition, more women who had ever gone for VCT services were aware that higher levels of VCT uptake could help to reduce HIV/AIDS-related stigma and discrimination. They were additionally more aware of the role that VCT has in building confidence among the PLWHA. Adjusted for area of residence (Table 5), urban residents were more knowledgeable about the benefits of VCT than rural participants.

DISCUSSION

This study analysed VCT utilisation among self-perceived healthy adults in 7 districts of Tanzania, including from 2 of the highest prevalence regions in the country. The study provides a descriptive analysis of the intentions, motivations and barriers to VCT among people in urban and rural settings in Tanzania.

Overall, 30.3% of all those interviewed reported having had ever tested for HIV. This proportion falls far short of the UNAIDS target for 90% of people to know their HIV status. Studies have shown that in many developing countries, VCT services are vastly underutilised despite the growing knowledge on the benefits of testing.^{2,7} Our study suggests that being an urban resident is an important predictor for HIV testing. Typical developing country settings such as Tanzania, have a skewed distribution of many social services (including health services and VCT service centres) to the disadvantage of rural residents.^{3,8-10} That is, not only that VCT and its associated services such as availability of IEC materials are concentrated in urban areas but also the infrastructure and the health workforce needed to offer these services are more developed in urban areas than in rural areas. In our study, we did see a higher proportion of VCT users in urban areas than in rural areas. Moreover, our findings point out that more women reported having ever tested for HIV, most likely influenced by the widespread availability of and contact with antenatal HIV counselling and testing among women.

Respondents provided various reasons for their attitudes towards VCT. The majority were willing to use the service as they just wanted to be sure of their HIV/AIDS status. For others, their self-perceived risk of HIV infection as a result

of practising high-risk sexual behaviour was a motivating factor for seeking VCT services. These findings confirm what has been reported elsewhere,^{2,7,9-17} namely that uptake of VCT services is highly influenced by an individuals' perception of risk of being infected. Similar observations have been reported elsewhere.^{4-6,10,12,18} Those at highest risk of infection should be those most targeted to take up VCT services; our findings suggest that those who self-identify as being at high risk are more likely to access services. However, the question remains, do all at risk, self-identify as being at high risk? Further research is needed to explore risk perceptions and consider how they may also change over time.

Our study illustrated that knowledge of VCT benefits is higher among those who had previously tested than those who had not. Further, women were more knowledgeable than men. It is likely that the testing that forms part of ANC services improves knowledge. Findings from other studies have demonstrated that a high level of knowledge does not necessarily lead to a higher uptake of VCT services.^{2,3,7-10,12,14-17,19} Therefore, while knowledge is important for decision making, other factors are more critical in influencing a person's behaviour and subsequent uptake of VCT services.

Our study findings suggest that the majority of those who had not ever tested were willing to do so in the future. We found that increases in age led to an increased probability for future willingness to go for VCT. This might be explained by the fact that as people grow older, they become more concerned with their health; this needs to be further explored. Our study found that some respondents had no future intention to test for HIV. There are many factors which might have influenced their likelihood of not testing, for many these same factors would have also acted as barriers to previous testing. Confusion and desperation among those who had never tested is a critical issue which may make people unresponsive to VCT services, even after being informed of the benefits of doing so. In our study, some of those who had negative future willingness to attend VCT claimed that "just knowing that there is no cure for HIV/AIDS is enough reason for not seeking voluntary counselling and testing services".^{7,14-17,20,21} Policies, programmes and interventions aimed at increasing VCT uptake should focus on the structural factors which prevent potential clients from seeking VCT services; these include stigma and the associated discrimination, poverty (manifesting as an inability to afford the costs of travel). Additionally, findings from this study indicate that several health systems barriers exist. Many respondents mentioned that there were shortages of qualified health workers, a lack of confidentiality associated with health workers who do not abide to ethics because of poor training they received prior to assuming counselling and testing responsibilities, and poor health facility infrastructure which did not permit sufficient confidentiality especially in areas where the level of stigma and discrimination against PLWHA is high.^{16,17,20,21}

Our findings resonate with many others to clearly indicate that stigma remains a critical factor preventing many

people from seeking VCT services. To promote effective HIV prevention programmes, significant efforts are needed to identify and remove all the fundamental causes of stigma and its associated discrimination against people known to be HIV-positive.

Strengths and Limitations of the Study

This study had attempted to offer a number of insightful observations regarding the willingness and barriers to VCT among self-perceived healthy adults in resource-limited settings within the context of a generalised HIV epidemic.

The study had some limitations. The first important limitation the study relied on reported rather than actual VCT use. Future studies should consider prospectively collecting data which could include participants being presented with a card to present to the VCT centres within a specified period. However, this was beyond the scope of this study.

CONCLUSION

Many barriers still exist that prevent people from taking up VCT services. We found that knowledge of VCT benefits was higher in urban areas; however, knowledge alone did not necessarily translate to a willingness to take up VCT services. Our study showed that various structural barriers are present, primarily stigma, but also health service constraints in terms of staff availability and competency and facility infrastructure. Increased efforts are needed to promote the uptake of VCT. Targeting health promotion efforts and further exploring the willingness of people to take up services in areas of low uptake would be beneficial.

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Family Connectedness and Its Association With Sexual Risk-Taking Among Undergraduate Students at the University of Nairobi

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ABSTRACT

Background: Universities have a student population in the age range of 17 to 25 years, 75 % of whom are sexually active, with the median age of sexual debut at age 18 years. About half of all students are involved in risky sexual behaviour. Many interventions have decreased sexual risk behaviour in the short-term, but there is need for multilevel prevention, including targeting improvements in family relationships for sustained change. Perceived positive family connectedness has been found to be related to reduced sexual risk-taking among adolescents and young adults.

Methods: This cross-sectional study evaluated the family connectedness and sexual behaviour of students aged 18 to 24 years at the University of Nairobi. There were 904 participants, both male and female, who were registered students of the University of Nairobi. After institutional and individual consent were granted, participants completed a self-administered questionnaire within their classes. The family subscale of the Hemingway Measure of Adolescent Connectedness was used to evaluate connectedness, and a sexual behaviour questionnaire was used to evaluate sexual risk-taking behaviour.

Results: Six hundred forty (70.8%) of the respondents were sexually active – 372 males and 268 females. High-risk sex was reported by 203 male respondents (54.6%) and 117 females (43.7%). Reportedly abstinent participants had higher family connectedness scores than those who were sexually active ($P < .001$), and participants who reported less sexual risk-taking had higher mean family connectedness scores than those with higher sexual risk-taking ($P < .001$).

Conclusion: Family connectedness had a significant influence on sexual risk-taking, and investment in family relationships could reduce risky sexual behaviour and potentially other risky behaviours among young adult university students.

INTRODUCTION

There are about 5,000 new HIV infections per day, and 66% of these are in sub-Saharan Africa. About one-third of new HIV infections are among youth aged between 15 and 24 years, according to the 2018 Joint United Nations Programme on HIV/AIDS (UNAIDS) estimates. Of the new infections in Kenya, 93.7% are through sexual transmission.¹ Over 20% of youth in Kenya initiate sexual activity before 15 years of age, and the median age of sexual debut is 18 years. Additionally, 18% of Kenyan females begin childbearing in their teens.²

Sexual risk-taking behaviour refers to having unprotected sex, having sex with multiple partners, and early onset of sexual activity before the age of 19 years. Sexual risk-taking among the youth is associated with unplanned pregnancies, abortions, school dropout, sexually transmitted infections, and long-term consequences to individuals and society.³

Among university students in Kenya, risky sexual behaviour was reported by about half of all participants of the HIV and AIDS Sero-Behavioural Study in 2010. This included multiple sexual partners, the influence of drugs and alcohol on unintended sex, and intergenerational sex. Among those testing positive for HIV, over 40% were influenced by drugs or alcohol to have undesired sex.⁴ A study conducted in Tanzania found that 31.8% of 600 individuals aged 15 to 24 years were involved in high-risk sexual behaviour.⁵ A Ugandan study investigating sexual decision making among adolescents found that influences included social pressure, cultural barriers to condom use, knowledge about HIV transmission and prevention, and compunctions about premarital sex.⁶ In Soweto, South Africa, about half (52%) of 16- to 18-year-old participants in a study investigating condom use were sexually active, and the average age at sexual debut was 16 years among males and 17 years among females. One-third of the sexually active adoles-

cents reported inconsistent or absent condom use. Sexually active participants also tended to report earlier sexual debut; there was also a high prevalence of sexual partners older than 21 years of age.⁷

In Kenya, resources have been directed at various sexual risk behaviour-prevention strategies. These include sex education starting in primary school; voluntary counselling and testing (VCT) services for HIV in the community, health facilities and tertiary educational institutions; easy access to free condoms within tertiary institutions; a compulsory HIV/AIDS course in most universities; nation-wide campaigns promoting abstinence, condom use, and contraception; and multiple peer group endeavours.

However, it seems as though knowledge does not do much to change behaviour. For example, there was no significant difference between the 2008–09 Kenya Demographic and Health Survey (KDHS) and the 2014 KDHS in terms of the number of people with multiple sexual partners (2 or more) in the 12 months leading up to the survey, despite the aforementioned campaigns.

For sustained sexual risk behaviour change, multilevel interventions that go beyond knowledge and beliefs are necessary,⁸ including preventative interventions targeting improvements in family relationships⁹ and understanding cultural and family dynamics.¹

Connectedness refers to the relationships that individuals have with others and the benefits of these relationships to the individual and society. Connectedness has been found to correlate with self-esteem, social interest, academic attitude, resilience, and protective factors, while disconnection has been found to be associated with substance use, violence, social skill deficits, and academic underachievement.¹⁰ Connectedness has also been found to be positively associated with overall mental health,¹⁰ future orientation,¹¹ emotional resilience,¹² and to be protective against depressed mood.¹³

Research conducted in the United States has shown that positive family connectedness is associated with reduced sexual risk-taking behaviours among high-risk adolescents¹⁴ and young adults.¹⁵ However, there is a paucity of published research on this topic, particularly from sub-Saharan Africa. This study, therefore, aimed to investigate the impact that family connectedness has on the sexual risk-taking behaviour of university students.

METHODS

Study Design

This was a cross-sectional descriptive study carried out at the University of Nairobi to establish the relationship between family connectedness and sexual risk-taking behaviour among students.

Study Site

The university was selected by purposive sampling on the basis of being within Nairobi – for ease of data collection, hav-

ing students from all over the country and from a variety of cultural and socioeconomic backgrounds, and having a wide range of academic programmes so as to provide a balanced sample population of young adults pursuing university education.

Participants

Eligible participants were University of Nairobi students aged between 18 and 24 years who provided informed consent. Those who did not have at least 1 living sibling and at least 1 living parent or adult guardian were excluded.

Sample Size

We determine the smallest sample size ($n=841$) required to allow for adequate statistical power using the following formula for estimating mean family connectedness score (family connectedness is a continuous outcome variable):

$$n = \frac{Z_{1-\alpha}^2 \sigma^2}{d^2}$$

Where, $Z_{1-\alpha}$ is 1.96 for the 95% confidence level; σ , 0.74, is the standard deviation of mean family connectedness score among young people¹⁰; and d , 0.05, is the margin of error for estimating the mean.

Sampling Technique

We conducted multistage stratified random sampling to select the school or faculty and department. A school or faculty was randomly selected from each of the 6 colleges that make up the University of Nairobi, and a department was randomly selected from each of the randomly selected schools or faculties, where applicable. The number of students selected from each school or department was determined proportionately to achieve the required sample size; in other words, schools or departments with more students had a larger representation within the study sample. Classes within the selected schools and faculties were selected randomly, and all students within these classes were provided with questionnaires. Data were collected through questionnaires completed by randomly selected consenting students.

Pilot Survey

The data collection instrument was piloted using a sample of 10 eligible students. The instrument had a reliability coefficient (Cronbach's alpha) of 0.91. The instrument was reviewed by 2 consultant psychiatrists from the University of Nairobi, and the content was found to be valid.

Study Instrument

The anonymous questionnaire queried participant biodata and current living situation. There were 11 items about family (parent and sibling) connectedness drawn from the Hem-

ingway Measure of Adolescent Connectedness (HMAC; items 4, 5, 14, 15, 24, 25, 34, 35, 36, 44, 45 in the HMAC), and 15 items about sexual behaviour.

Family connectedness items were rated on a 5-point Likert scale (not at all, not really, sort of, true, very true). Question 34 was reverse coded (1 was very true, and 5 was not at all). The lowest possible score was 1, and the highest possible score was 5 per question. For each section (parents connectedness, sibling connectedness), a mean score between 1 and 5 was calculated for comparison and analysis purposes.

Sexual risk indicators included early sexual debut; multiple sexual partners; unprotected sex; having sexual partners who are more than 5 years older; transactional sex; unintended sexual intercourse influenced by alcohol or substance use; being in a noncommitted, noncohabiting sexual relationship; and experiencing consequences of sexual risk-taking, including transmitted infections and unwanted pregnancies. These indicators were chosen from risk factors identified in other studies^{3,4} and also from the Centers for Disease Control and Prevention (CDC) youth risk behaviour surveillance system.¹⁸ For sexual risk-taking, the score per question was 0 to 5, where 0 meant no sexual risk (have never had sex before) and 5 was the highest risk; the lowest possible score was 0, and the highest possible score was 57.

The HMAC was developed as a psychometric measure of adolescent connectedness. It assesses present versus future orientation as well as connectedness to conventional worlds (parents, religion, school) and unconventional worlds (peers, neighbourhood, self).¹⁰ Among the 4 subscales of the HMAC, this study investigated the *Family (Parents and Siblings)* subscale. Validation studies demonstrated that the HMAC has satisfactory test-retest and inter-item reliability and convergent validity across samples.¹⁶ The HMAC subscales are invariant across gender and ethnicity and are, therefore, appropriate for most assessments.¹⁷

We generated the sexual behaviour questionnaire items with the aid of the co-authors, who are supervisors from the University of Nairobi colleagues. These items were adapted from the CDC youth risk behaviour surveillance system's sexual behaviour questions.¹⁸

Data Management and Analysis

The data were collected using coded questionnaires and entered into a Microsoft Access (Microsoft Corp., Redmond, WA, USA) database. We analysed the data using IBM SPSS Statistics for Windows, Version 21.0 (IBM Corp. Armonk, NY, USA).

Descriptive characteristics were analysed and presented as percentages for categorical variables and means \pm standard deviations or medians with interquartile ranges for continuous data.

Family connectedness was analysed following the guidance of the HMAC scoring manual. Mean family connectedness scores (\pm standard deviations) were calculated to compare between categories of participants.

Median sexual risk-taking behaviour scores were calculated for 2 categories of participants: (1) those with "low" risk-taking scores, that is, with a score below the median, and (2) those with "high" risk-taking scores above the median. The median was chosen as a central tendency measure to separate the high and low risk scores because sexual risk-taking is an ordinal variable, and the intervals in the order are not equal and cannot be quantified, making the median a robust comparator in the presence of outliers.^{19,20}

Mean family connectedness scores were used to compare low-risk students with higher-risk students using Student's t-test. All the statistical tests were interpreted at the 5% level of significance. Linear multiple regression analysis was done with sexual risk-taking as the dependent variable and gender and family connectedness as independent variables.

RESULTS

Sociodemographic Characteristics

Of the 1,150 students who were screened, 904 fit the inclusion criteria; 52.8% were males, and 47.2% were females. The mean age of the participants was 21.3 ± 1.7 years. First-year students made up 28.3% of participants, 14.5% were in second year, 15.7% were in third year, and 35.6% were in fourth year. The majority of the students (71.9%) lived away from home, while 230 of the participants lived at the home of their parents or guardians.

Family Connectedness

The mean parental connectedness score was 4.1 ± 0.6 , and the mean sibling connectedness score was 4.0 ± 0.8 .

There were significant differences in parental ($P=.001$) and sibling ($P<.001$) connectedness between the genders, with the females having higher mean connectedness scores. There was no significant difference in the mean parental and sibling connectedness scores based on residence (home versus away from home).

Engagement in Sexual Activity

About two-thirds of the respondents, that is, 640 (70.8%) students reported having had sexual intercourse in the past, and 264 (29.2%) participants reported that they had never had sex. The mean age of the respondents who had never engaged in sexual intercourse, 20.8 years, was 0.8 years younger than those who had engaged in sexual intercourse (21.6 years; $P<.001$).

Males were 2.1 times more likely to have engaged in sexual intercourse than females (odds ratio [OR], 2.1; 95% confidence interval [CI], 1.6 to 2.8; $P<.001$). There was no significant difference in the residential status (home versus away from home) of participants who had ever engaged in sexual intercourse and those who had not. The likelihood of having engaged in sexual intercourse gradually increased with advancement in year of study, with 60.2% of first-year students

TABLE. Family Connectedness and Its Association With Sexual Activity and Sexual Risk-Taking; and Predictors of High Sexual Risk-Taking

	Mean Score (SD)	%	OR (95% CI)
Family connectedness			
Parents connectedness			
Male	4.039 (0.7)	-	-
Female	4.187 (0.6)	-	-
Sibling connectedness			
Male	3.881 (0.9)	-	-
Female	4.150 (0.8)	-	-
Ever had sex (N=904)			
Male	-	78.0	2.1 (1.6–2.8)
Female	-	62.8	1.0
Family connectedness score and sexual activity			
Parents connectedness			
Ever had sex	4.035 (0.7)	-	-
Never had sex	4.283 (0.5)	-	-

Continued

having ever had sex and 80.1% of fourth-year students having ever had sex (OR, 2.7; 95% CI, 1.8 to 3.9; $P < .001$).

Sexual Risk-Taking

The mean sexual risk-taking score was 26.1, and the median score was 25 (interquartile range, 21-30).

Males were more likely than females to engage in high-risk sexual behaviour (OR, 1.6; 95% CI, 1.1 to 2.1; $P = .007$). There was no significant difference in age, residential status, or year of study between participants who had high sexual risk-taking scores and those who had low sexual risk-taking scores.

Family Connectedness and Engagement in Sexual Activity

Among participants who reported never having had sex, the mean parental connectedness score 4.3 ± 0.5 , and the mean sibling connectedness score was 4.2 ± 0.7 . Among those who had ever had sex, the mean parental connectedness score was 4.0 ± 0.7 , and the mean sibling connectedness was 3.9 ± 0.8 . Connectedness to both parents and siblings was significantly

higher among participants who had never had sex compared to those who had reported having previously engaged in sexual intercourse ($P < .001$ for both).

Family Connectedness and Sexual Risk-Taking

Among participants who had low sexual risk-taking scores, the mean parental connectedness score was 4.2 ± 0.5 , and the mean sibling connectedness score was 4.1 ± 0.7 . Among participants who had high sexual risk-taking scores, the mean parental connectedness score was 3.9 ± 0.8 , and the mean sibling connectedness score was 3.7 ± 0.9 . The mean parental and sibling connectedness scores were significantly lower for participants with high sexual risk-taking scores compared with those who had low sexual risk-taking scores ($P < .001$ for both).

Family Connectedness and Gender as Predictors of Sexual Risk-Taking

In the multiple regression model, gender and connectedness were significant as independent factors of high sexual risk-taking. Male participants were 1.5 times more likely than

TABLE. Continued

	Mean Score (SD)	%	OR (95% CI)
Sibling connectedness			
Ever had sex	3.920 (0.8)	-	-
Never had sex	4.227 (0.7)	-	-
Engagement in high-risk sex			
Male	-	54.6	1.6 (1.1–2.1)
Female	-	43.7	1.0
Family connectedness score and sexual risk-taking			
Parents connectedness			
High-risk	3.893 (0.8)	-	-
Low-risk	4.178 (0.5)	-	-
Sibling connectedness			
High-risk	3.736 (0.9)	-	-
Low-risk	4.101 (0.7)	-	-
Predictors of high sexual risk-taking			
Gender (male)	-	-	1.5 (1.0–2.1)
Parent connectedness	-	-	0.61 (0.44–0.84)
Sibling connectedness	-	-	0.75 (0.58–0.97)

Abbreviations: CI, confidence interval; OR, odds ratio; SD, standard deviation

females to be involved in high-risk sex (95% CI, 1.0 to 2.1; $P=.035$).

A unit increase in parental connectedness contributes 0.6 odds of sexual risk-taking (95% CI, 0.44 to 0.84); that is, it is associated with a 40% reduction in sexual risk-taking. A unit increase in sibling connectedness contributes 0.75 odds of sexual risk-taking (95% CI, 0.58 to 0.97), or a 25% reduction in sexual risk-taking.

DISCUSSION

Most participants were sexually active, and high-risk sex was reported by just over half of the male participants and 44% of the females. Abstinent participants had higher family connectedness scores than sexually active participants, including those with lower sexual risk-taking scores.

The mean parental connectedness score was 4.1, and the mean sibling connectedness score was 4.0. These mean scores were slightly higher than the representative family connectedness statistics quoted for African American and Hispanic youth in the HMAc scoring manual, which are higher than the scores quoted for Caucasian American adolescents.¹⁰ The differences can be explained by the disparate cultural contexts of our study and the studies informing the HMAc. Females had higher mean parental and sibling connectedness scores than males, which was similar to the gender difference reported in the HMAc manual among Caucasian youth. The HMAc manual reports an inverse gender comparison, however, for African American and Latino American adolescents.¹⁰

The majority ($n=640$, 70.8%) of participants in our study were sexually active, with a larger proportion of the males having ever engaged in sex. Additionally, high-risk sex was

reported by 54.6% of males and 43.7% of females. The likelihood of participants reporting past sexual intercourse gradually increased with advancement in year of study. These findings regarding the sexual behaviour of university students are similar to the findings of the HIV and AIDS Baseline Sero-Behavioural Study in Six Universities in Kenya in 2010,⁴ which also investigated the habits of university students between 18 and 24 years of age.

The proportion (23.6%) of participants involved with multiple sexual partners was higher than the national averages reported in the 2014 KDHS (1% for women and 13% for men).² Notably, the KDHS surveyed participants between the ages of 15 and 64 years, which was much broader than our age range of 18 to 24 years, and individuals in this narrower age range are more likely to be involved in noncommitted relationships.

The gender differences in risky sexual behaviour support Darwin's sexual selection theory, which predicts that males tend to engage in more risky behaviour than females overall, with this inclination arising as efforts to court the opposite sex and being reinforced and propagated by natural selection. Male adolescents in Catalonia have also been reported to engage in risky sexual behaviour (more sexual partners and less condom use) more frequently than females. The Catalanian investigators postulated that this finding was probably explainable by socially reinforced male attitudes towards sex and risk-taking in general, making it more attractive for males to engage in sexual intercourse earlier and take greater risks.²¹ It has been shown that even in everyday situations, males tend to take more risks and that this is particularly true among single males, especially in the presence of females.²²

Connectedness is about relationships with others and the benefits accrued from these relationships. It is associated with resilience and protective factors.¹⁰ We found associations between connectedness to family and sexual behaviour patterns, with abstinent participants scoring higher in terms of parental and sibling connectedness than participants who reported having had sex. Among participants who reported previously having had sex, those with higher sexual risk-taking behaviour scores had a lower mean parent and sibling connectedness scores than those who reported less risk-taking.

Other studies have shown family connectedness to be protective against early sexual debut and involvement in high-risk sexual behaviour,¹⁴ that family relationships affect the incidence of unplanned adolescent pregnancies²³ as well as condom use among young adults.¹⁵

We have seen that the family microsystem, consisting of parents and siblings, can influence behaviour. In this case, the association between family connectedness and sexual risk-taking supports the ecological systems theory. These findings also support attachment theory, which posits that supportive family relationships improve self-regulatory mechanisms and reduce people's tendency to use risky behaviour as a coping mechanism.

Limitations

Purposive sampling was used to select the study site, and university students may not be representative of all young adults in the same age group, so the results cannot be generalised. We also must consider the potential for recall bias and under-reporting and over-reporting of sexual behaviour by some respondents, as the data collection tool was a self-administered questionnaire.

RECOMMENDATIONS

There is need to create a focus on improved family relationships as a key preventive measure against risky behaviour, particularly risky sexual behaviour. This should be incorporated into the discourse of policy-making and public education as well as premarital, marital, and parent counselling.

Family-centred interventions should also be created and implemented in the fight against the HIV/AIDS pandemic.

We found that females had higher family connectedness levels and abstinence rates, as well as lower levels of sexual risk-taking. There is need for further research to evaluate why females are more connected to their families and also on differences in male and female socialisation behaviours.

Owing to various constraints, this study was conducted at only 1 university in Nairobi. More research could be done involving youth from a wider array of institutions and settings, for a better understanding of risk-taking behaviour and its contributing factors among young adults.

Other sociocultural factors that may affect sexual risk-taking can also be studied; for example, the effects of poverty, substance abuse, and peer influences.

Further studies on connectedness, in its various facets, can be carried out to generate local and regional data, to investigate the relationship between connectedness and resilience, and to determine its effects on various aspects associated with risk-taking behaviour, including substance use, academic performance, and professional achievement.

CONCLUSION

Most university students who participated in this study were sexually active, and a significant proportion of them reported engaging in high-risk sexual behaviour, potentially exposing them to sexually transmitted illnesses and unplanned pregnancies. The study also demonstrated that family connectedness might act as a protective factor against sexual risk-taking. Investing in family relationships is a viable avenue that needs to be explored as a mitigating factor for risky sexual behaviour.

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Using the Theory of Planned Behaviour to Describe Male Involvement Intention During Childbirth Among Expecting Couples in a Rural Setting: A Cross-Sectional Study From Rukwa Region, Southern Tanzania

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ABSTRACT

Background: Male involvement during childbirth can increase utilisation of maternal services and reduce maternal and neonatal mortality. An individual's intention towards such male involvement can be understood through the theory of planned behaviour, which postulates that such intention is influenced by 3 domains: 1) attitudes, 2) perceptions of social approval (subjective norms) and 3) feelings about control over the intended behaviour. In sub-Saharan Africa, rates of male involvement in childbirth are low, and little is known about the predictors of intention for such involvement among expecting couples in rural Africa. This study aimed to determine the influence of the 3 domains of intention on male involvement intention during childbirth among expecting couples in Rukwa Region, Tanzania.

Methods: We conducted a community-based, cross-sectional study of pregnant women and their partners from June until October 2017. In total, 546 couples (n=1,092 participants) were identified through 3-stage probability sampling. A structured questionnaire based on the theory of planned behaviour was used to elicit information on the 3 domains of intention.

Results: Most pregnant women (71.6%) and their male partners (77.3%) intended to have male involvement during childbirth. Among women, only positive attitude (odds ratio [OR] 0.2, 95% CI, 0.1 to 0.7; $P=.012$) was significantly associated with intention, though in an unexpected direction. In adjusted analysis, men's positive attitude (adjusted odds ratio [AOR] 9.0, 95% CI, 1.9 to 40.9; $P=.004$) and positive subjective norms (AOR 4.4, 95% CI, 1.1 to 18.6; $P=.041$) were significantly associated with an increased likelihood of intention to accompany their partners during childbirth.

Conclusion: More male partners had the intention to accompany their spouses during childbirth compared to their female partners. Male attitudes and subjective norms may be influential in determining male involvement during childbirth in rural African settings.

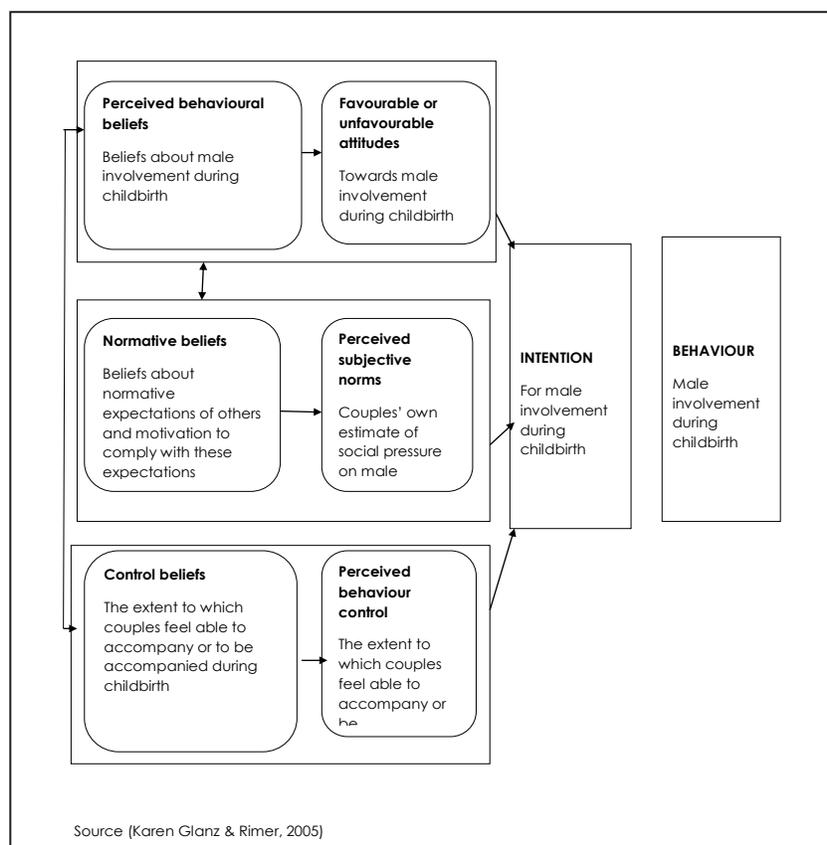
INTRODUCTION

An estimated 293,300 maternal deaths occurred in 2013 worldwide.¹ Most of these deaths occurred in sub-Saharan Africa, where low rates of use of skilled birth attendants are associated with high maternal and neonatal mortality.^{2,3} Birth preparedness, when a mother or couple engages in planning and preparation for childbirth, increases use of a skilled birth attendants⁴ by reducing delays in accessing maternal services, include those related to decision making to seek health care, reaching a health facility and obtaining appropriate care within health facilities.⁵ Male involvement in birth preparedness, can increase utilisation of maternal services and reduce maternal and neonatal mortality.⁶⁻⁹ However, in sub-Saharan Africa male involvement in birth

preparedness is low: 32.1% in Nigeria;⁸ 42.9% in Uganda;¹⁰ 18% in Burundi;⁹ and 12% in Tanzania.¹¹ Barriers to male involvement in birth preparedness include a lack of collective decision making at the household level, sociocultural beliefs about gender roles and responsibilities, peer influence, and health workers' attitudes towards their involvement.¹²⁻¹⁵

Male involvement in birth preparedness can be understood through the theory of planned behaviour, which links one's beliefs and behaviours. According to this the theory, an individual's intention to be involved during childbirth is influenced by their beliefs (Figure). This includes their attitude towards male involvement, their perception of social pressures regarding male involvement (subjective norms), and the extent to which

FIGURE. Description of Male Involvement Using Theory of Planned Behaviours



they feel able to accompany or be accompanied during childbirth (perceived behaviour control). Individuals are more likely to intend to have healthy behaviours if they: 1) have positive attitudes about the behaviours, 2) believe that community norms favour the behaviours, and 3) believe they are able to carry out the behaviours. An individual's intentions will be stronger when they have all 3 of the above elements, compare to when they have only 1.¹⁶ At present, little is known about the influence of attitudes, subjective norms and perceived behaviour control towards male involvement among expecting couples in Africa. This study aimed to use the theory of planned behaviour¹⁷ to describe male involvement intention among expecting couples in the rural setting of Rukwa Region, Tanzania.

METHODS

Study Design and Setting

This study was conducted in Rukwa Region, Tanzania, a country that has among the highest rates of maternal mortality worldwide¹⁸ with 6 maternal deaths for every 1,000

live births.¹⁹ With a population of 1,004,539, Rukwa Region has Tanzania's lowest mean age at marriage; men marry at an average age of 23.3 years and women at an average age of 19.9 years.²⁰ The region's fertility rate is 7.3 children per woman,²⁰ and health facility coverage is low, with just 1 facility for every 2 villages. From June to October 2017, we conducted a cross-sectional community-based survey among expecting couples from 45 villages in Rukwa Region to determine the influence of attitudes, subjective norms, and perceived behaviour control on the intention for male involvement in childbirth.

Sampling

Two districts (Sumbawanga Rural District and Kalambo District) were purposively selected from the 4 districts of Rukwa Region; these districts were chosen because they have a high proportion of childbirth not attended by a skilled birth attendant. Four-stage cluster sampling was used to obtain study participants. First, 15 villages from Sumbawanga District and 30 from Kalambo District were randomly selected from among all villages in the selected wards. Next, 4 hamlets

TABLE 1. Characteristics of Pregnant Women in Rukwa Region, Tanzania, 2017 (N=546)

	Total n	Intend to Have Male Partner Involved With Childbirth		P Value
		Yes n (%)	No n (%)	
Total	546	391 (71.6)	155 (28.4)	
Characteristic				
Age group, years				
<20	167	121 (72.5)	46 (27.5)	.058
21-25	156	109 (69.9)	47 (30.1)	
26-30	105	66 (62.9)	39 (37.1)	
31-35	55	43 (78.2)	12 (21.8)	
>35	63	52 (82.5)	11 (17.5)	
Age at marriage (years)				
<18	395	279 (70.6)	116 (29.4)	.714
19-24	147	109 (74.1)	38 (25.9)	
>25	4	3 (75)	1 (25.0)	
Parity				
0	120	90 (75.0)	30 (25.0)	.014
1-4	320	215 (67.2)	105 (32.8)	
>4	106	86 (81.0)	20 (19.0)	
Prior pre-term delivery				
Yes	29	20 (69.0)	9 (31.0)	.745
No	527	371 (70.4)	146 (27.7)	
Ethnic group				
Fipa	322	237 (73.6)	85 (26.4)	<.001
Mambwe	120	106 (88.3)	14 (11.7)	
Other	104	48 (46.2)	56 (54.8)	

Continued

TABLE 1. Continued

	Total n	Intend to Have Male Partner Involved With Childbirth		P Value
		Yes n (%)	No n (%)	
Total	546	391 (71.6)	155 (28.4)	
Characteristic				
Education level				
None	230	153 (66.5)	77 (33.5)	.072
Primary	299	226 (75.6)	73 (24.4)	
Secondary or higher	17	12 (70.6)	5 (29.4)	
Individual income per day				
<1 dollar	399	285 (71.4)	114 (28.6)	.876
>1 dollar	147	106 (72.1)	41 (27.9)	
Owns radio				
Yes	253	173 (68.4)	80 (31.6)	.12
No	293	218 (74.4)	75 (25.6)	
Household owns mobile phone				
Yes	69	55 (79.7)	14 (20.3)	.110
No	477	336 (70.4)	141 (29.6)	
Adult female in the family				
None	318	224 (70.4)	94 (29.6)	.473
>1	228	167 (73.2)	61 (26.8)	

Continued

were randomly selected from each village. Finally, systematic random sampling was used to obtain a maximum of 4 households per hamlet, in which a pregnant woman who was at <25 weeks gestation resided with a male partner. Each hamlet had approximately a total of 30 households and approximately 6 to 8 pregnant women.

Sample Size

The minimum sample size required to estimate the odds ratio (OR) for the study outcome associated with explanatory

factors, was determined using the following formula²¹:

$$n = \frac{[Z\alpha \sqrt{(1+m)\pi_0(1-\pi_0)} + Z\beta \sqrt{\pi_1(1-\pi_1) + m\pi_2(1-\pi_2)}]^2}{(\pi_2 - \pi_1)^2}$$

where $Z\alpha$ is the value 1.96 for a 95% confidence interval (CI), $Z\beta$ is the value 0.84 for 80% power, π_1 is the proportion of controls that have the exposure, π_2 is an auxiliary variable

TABLE 1. Continued

	Total n	Intend to Have Male Partner Involved With Childbirth		P Value
		Yes n (%)	No n (%)	
Total	546	391 (71.6)	155 (28.4)	
Characteristic				
Covered by health insurance				
Yes	177	115 (65)	62 (35)	.017
No	369	276 (74.8)	93 (25.2)	
Nearest health facility				
Clinic	452	334 (73.9)	118 (26.1)	.010
Dispensary	94	57 (60.6)	37 (39.4)	
Distance to nearest health facility, km				
<1	258	177 (68.6)	81 (31.4)	.262
1-5	233	171 (73.4)	62 (26.6)	
>5	55	43 (78.2)	12 (21.8)	
Attitude towards male involvement in childbirth				
Negative	7	3 (42.8)	4 (57.2)	.089
Positive	539	388 (72)	151 (28)	
Subjective norms regarding male involvement in childbirth				
Negative	36	33 (91.7)	3 (8)	.006
Positive	510	358 (70.2)	152 (29.8)	
Perceived behaviour control regarding male involvement in childbirth				
Negative	7	5(71.4)	2 (28.6)	.991
Positive	539	386 (71.6)	153 (28.4)	

equal to $OR \times \pi_1 / (1 - \pi_1 + OR \times \pi_1)$, π_0 is $(\pi_1 + \pi_2) / 2$, m is the number of controls per case, and n is the required sample size per case and control group. Here we treated participants with the intention for male involvement as cases and assumed cases would represent 50% of the sample. Our minimum OR of interest was 2, and we assumed that explanato-

ry factors would be prevalent at 15% or more in the control group. The formula yielded a minimum sample size of 420. The study included a total of 546 couples; analyses were conducted separately for men and women.

TABLE 2. Characteristics of Male Partners of Pregnant Women in Rukwa Region, Tanzania, 2017 (N=546)

	Total n	Intend to Have Male Partner Involved With Childbirth		P Value
		Yes n (%)	No n (%)	
Total	546	391 (71.6)	155 (28.4)	
Characteristic				
Age group, years				
<20	27	24 (88.9)	3 (11.1)	.493
21-25	143	114 (79.7)	29 (20.3)	
26-30	146	112 (76.7)	34 (23.3)	
31-35	87	65 (74.7)	22 (25.3)	
>35	143	107 (74.8)	36 (25.2)	
Age at marriage, years				
<18	71	60 (84.5)	11 (15.5)	.065
19-24	353	276 (78.2)	77 (21.8)	
>25	122	86 (70.5)	36 (29.5)	
Ethnic group				
Fipa	367	299 (81.5)	68 (18.5)	<.001
Mambwe	118	94 (79.7)	24 (20.3)	
Other	61	29 (47.5)	32 (52.5)	
Education level				
None	155	113 (72.9)	42 (27.1)	.142
Primary	353	282 (79.9)	71 (20.1)	
Secondary or higher	38	27 (71.1)	11 (28.9)	
Income per day				
<1 dollar	382	290 (75.9)	92 (24.1)	.242
>1 dollar	164	132 (80.5)	32 (19.5)	

Continued

TABLE 2. Continued

	Total n	Intend to Have Male Partner Involved With Childbirth		P Value
		Yes n (%)	No n (%)	
Total	546	391 (77.3)	124 (22.7)	
Characteristic				
Owens radio				
Yes	308	232(75.3)	76(24.7)	.213
No	238	190(79.8)	48(20.2)	
Owens mobile phone				
Yes	234	191 (81.6)	43 (18.4)	.036
No	312	231 (74)	81 (26)	
Adult female in the family				
None	315	238 (75.6)	77 (24.4)	.408
>1	231	184 (79.7)	47 (20.3)	
Covered by health insurance				
Yes	170	126 (74.1)	44 (25.9)	.234
No	376	296 (78.7)	80 (21.3)	
Nearest health facility				
Health facility	452	344 (76.1)	108 (23.9)	.148
Dispensary	94	78 (83)	16 (17)	

Continued

Data Collection

For eligibility screening, female partners were asked to undergo a pregnancy test. Women with confirmed pregnancies and their male partners were administered informed consent for study participation; those who consented were enrolled in the study. Trained research assistants conducted in-person interviews with participants using a semi-structured questionnaire about birth preparedness intention, which was developed based on the theory of planned behaviour. The questionnaire assessed sociodemographic characteristics and participants' attitudes, perceived subjective norms, and perceived behaviour control regarding male involvement in childbirth. Questionnaires were administered separately to each half of the participating couples.

Variable Definitions and Data Analysis

The dependent variable was the intention to be accompanied (pregnant women) or to accompany (male partners) during childbirth, which was coded as 'Yes' or 'No'. The independent variables of interest were participants' attitudes, subjective norms, and perceived behaviour control with regard to male involvement in childbirth, which were assessed using a 5-level Likert-type scale consisting of 12 statement items. These included statements like, "If I participate in setting aside some funds and equipment which will be used in case of an emergency or during delivery I am doing a good thing"; "If I participate in the preparation of transport which will be used in case of emergency or during childbirth I am

TABLE 2. Continued

	Total n	Intend to Have Male Partner Involved With Childbirth		P Value
		Yes n (%)	No n (%)	
Total	546	391 (77.3)	124 (22.7)	
Characteristic				
Distance to nearest health facility, km				
<1	259	188 (72.6)	71 (27.4)	.045
1-5	232	189 (81.5)	43 (18.5)	
>5	55	45 (81.8)	10 (18.2)	
Attitude towards male involvement in childbirth				
Negative	21	3 (14.3)	18 (85.7)	<.001
Positive	525	419 (79.8)	106 (20.2)	
Subjective norms regarding male involvement in childbirth				
Negative	21	4 (19)	17 (81)	<.001
Positive	525	418 (79.6)	107 (20.4)	
Perceived behaviour control regarding male involvement in childbirth				
Negative	17	4 (23.5)	13 (76.5)	<.001
Positive	529	418 (79)	111 (21)	<.001

doing a good thing"; and "If I participate in the identification of skilled attendant I am doing a good thing". On the Likert scale, 1 indicated "strongly disagree", 2 indicated "disagree", 3 indicated "neither agree nor disagree", 4 indicated "agree", and 5 indicated "strongly agree". Factor analysis was done to measure the attitude, perceived subjective norms and perceived behaviour control. The normality test was conducted, and the mean scores were established. The regression score above mean were termed as positive and below mean negative. A positive attitude indicates that the individual expects favourable results from male involvement during childbirth, while a negative attitude indicates that they expect unfavourable results. Positive perceived subjective norms indicate that the participant feels male involvement in childbirth is approved by relatives and friends while negative perceived subjective norms indicate they feel it is disapproved. Positive perceived behaviour control indicates that the participant feels they are able to engage in the behaviour, while negative perceived be-

haviour control indicates the participant feels unable to engage in the behaviour.

Statistical analyses of study data were conducted separately for men and women. Descriptive statistics were generated for sociodemographic and Likert-type scale variables; Pearson's chi-square (X^2) test was used to assess bivariate associations between explanatory variables and intention for male involvement in childbirth. Multivariable logistic models were developed to assess the association between explanatory variables and the outcome variable. Explanatory variables that were significant in the bivariate analysis at $P > .20$ were considered candidates for the multivariable logistic models. The final multivariable logistic models were developed using backwards elimination of explanatory variables with P values $> .05$. Prior to analysis, data were checked for completeness and consistency and entered into a database using statistical package IBM SPSS Statistics for Windows version 23.0 (IBM Corp, Armonk, NY, USA).

Ethical Considerations

The proposal was approved by the Ethical Review Committee of the University of Dodoma (reference number UDOM/DRP/134 VOL.III/29). A letter of permission was obtained from the Rukwa Regional Administration. Written informed consent was obtained from study participants after explaining the study objectives and procedures. Participants were informed of their right to refuse to participate or withdraw from the study. Each respondent was assigned an identity number, and all collected data were anonymised.

RESULTS

In total, 546 couples were included in the study. The mean age of pregnant women was 25.5 years, and the mean age of their spouses was 30.7 years. The majority of couples were married (71.4%), monogamous (85.9%), lived on less than 1 dollar per day (70.0%), and received basic obstetric care services from dispensaries (82.8%) (data not shown). Most pregnant women (54.8%) and their spouses (64.7%) had completed only a primary level of education (Tables 1 and 2).

A large proportion (98.7%) of pregnant women had a positive attitude towards male involvement during childbirth. Most pregnant women also had positive perceived subjective norms (feeling male involvement is approved by relatives and friends) (93.4%), and positive perceived behaviour control (feeling able to engage in the behaviour) (98.7%) towards male involvement in childbirth. Similarly, many male partners had positive attitudes (96.2%), positive perceived subjective norms (96.2%) and positive perceived behaviour control (96.9%) towards male involvement in childbirth (Tables 1 and 2).

Among pregnant women, 71.6% stated that they intended to be accompanied by their male spouses during childbirth, while 77.3% of male partners stated that they intended to accompany their female partners during childbirth (Tables 1 and 2). In bivariate analysis, several factors were associated with women's intention to be accompanied by their male partner during childbirth, including, positive subjective norms ($P=.006$), ethnic group ($P<.001$), type of nearest health facility ($P=.010$) and parity ($P=.014$) (Table 1). Among male partners, positive attitude ($P<.001$), positive subjective norms ($P<.001$), positive perceived behaviour control ($P<.001$), ethnic group ($P<.001$), owning a mobile phone ($P=.036$) and walking distance to the nearest health facility ($P=.045$) all significantly influenced the intention to accompany their female partner during childbirth (Table 2).

In pregnant women, we were unable to develop a multivariable logistic model because of the very high proportion (>98%) of women represented in the category of 'positive' for attitudes and perceived behaviour control regarding male involvement in childbirth. We therefore calculated unadjusted ORs, which were: (OR 3.4, 95% CI, 0.8 to 15.5; $P=.109$) for positive attitude, (OR 0.2, 95% CI, 0.1 to 0.7; $P=.012$) for positive subjective norms and (OR 1.0, 95% CI, 0.2 to 5.3; $P=.991$)

for positive perceived behaviour controls (data not shown). Thus pregnant women with positive subjective norms were 5 times less likely to intend to be accompanied by their male partner during childbirth compared to women with negative subjective norms. Among male partners, a multivariable logistic model showed that positive attitudes (adjusted odds ratio [AOR] 9.0, 95% CI, 1.9 to 40.9; $P=.004$) and positive subjective norms (AOR 4.4, 95% CI, 1.1 to 18.6; $P=.041$) were significantly associated with increased odds of men's intention to accompany their partners during childbirth. Positive perceived behaviour control was not significantly associated with men's intention to accompany their partners during childbirth (data not shown).

DISCUSSION

Our large, community-based study examined the influence of attitudes and beliefs on intentions for male involvement in childbirth in rural Tanzania, finding that over 90% of both female and male participants expressed positive attitudes, subjective norms and perceived behaviour control regarding male involvement in childbirth. However, these positive attitudes and beliefs did not always translate to intention; only about 70% of participants intending to be accompanied by their partner (or to accompany their female partner) during childbirth. Interestingly, the intention for male involvement in childbirth was greater among male partners (77%) compared to pregnant women (72%).

Our observation that female participants were less likely than their male partners to intend to have male involvement in childbirth suggests that, in the settings such as that of the study, women may be barriers to such involvement. This finding is contrary to another study conducted in a Maasai community in rural Tanzania, which reported that pregnant women are more in favour of being accompanied by their male partners compared to their male partners.²² This disparity in findings may be due to cultural differences.

In some rural communities, negative feelings towards male involvement may be rooted in local beliefs that pregnancy and childbirth are the sole responsibility of female partners.^{12,13}

We conjecture that in this context, defiance against approval of others may have a stronger influence on the intention for male involvement in childbirth, compared to acceptance of approval of others. This idea is supported by our finding that among female study participants, positive subjective norms predicted a *lower* likelihood of intention for male involvement in childbirth, compared to negative subjective norms. This is contrary to the theory of planned behaviour, which postulates that societal approval of a behaviour promotes an individual's intention to perform the behaviour.¹⁷ Similarly, positive attitudes and perceived behaviour control regarding male involvement during childbirth did not significantly increase intention for male involvement among pregnant women, as would be predicted by the theory of planned behaviour. It is possible that other

factors play a substantial role in predicting intention for male involvement during childbirth among pregnant women. Our findings suggest that interventions geared towards improving attitudes and beliefs about male involvement during childbirth may not be effective among pregnant women in some rural African settings.

In contrast to our findings among pregnant women, we found that among male partners, positive attitudes and positive subjective norms regarding male involvement significantly predicted intention to accompany female partners during childbirth. Male partners with a positive attitude were 9 times more likely to intend to accompany their female partners during childbirth compared to men with negative attitudes. Male partners who felt that others approved of their involvement during childbirth were 4 times more likely to intend to accompany their female partners during childbirth compared to men who felt others disapproved of their involvement. Our findings agree with those of other studies that report that male partners are in support of being involved in maternal services utilisation,¹³ and that beliefs and attitudes influence male intention to be involved in childbirth.

The study is not without limitations. Our study findings relied upon self-reported intention for behaviour, rather than actual behaviour. It is possible that respondents reported a behaviour that they believed would please the interviewer, rather than their true intentions regarding that behaviour. Previous studies suggest that intention for male involvement in childbirth may not match the actual male involvement in maternal services utilisation. Studies from rural Tanzania report that only 12% of male partners participate in maternal service utilisation¹¹ and that cultural beliefs limit male involvement in childbirth to the provision of financial support for obstetric emergencies.¹² It is unclear whether the low level of male involvement in childbirth is due to a lack of intent, or to other barriers, including financial constraints.²³

RECOMMENDATIONS AND CONCLUSION

Male partners were more likely than pregnant women to intend to have male involvement during childbirth. Among the 3 domains of intention in the theory of planned behaviour, only subjective norms influenced pregnant women's intention to be accompanied. Against expectation, positive subjective norms predicted a lower likelihood of intention among pregnant women. Among male partners, positive attitudes and positive subjective norms were statistically significant predictors of intention to accompany their female partners during childbirth. We recommend that interventional studies be conducted in rural African settings that target attitudes and subjective norms among men to increase male involvement during childbirth, and identify factors that positively influence women's intention regarding such involvement. Future studies in this area should assess objective behavioural endpoints.

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Iron Depletion, Iron Deficiency, and Iron Deficiency Anaemia Among Children Under 5 Years Old in Kilimanjaro, Northern Tanzania: A Hospital-Based Cross-Sectional Study

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ABSTRACT

Background: Iron depletion results from reduced iron stores, and it is an early stage of disease progression before iron deficiency, which leads to iron deficiency anaemia (IDA). IDA is associated with delayed infant growth and development, diminished cognitive function, poor academic performance, decreased exercise tolerance, and impaired immune function.

This study aimed to determine the prevalence of iron depletion and IDA and factors associated with low ferritin levels among children under 5-years-old receiving care at Kilimanjaro Christian Medical Centre (KCMC) in Moshi, Tanzania.

Methods: Under-5 children presenting at KCMC were successively enrolled and screened for iron depletion and IDA using complete blood count and serum ferritin levels. The generally accepted World Health Organization cut-off levels for normal haemoglobin (Hb) and ferritin level were used. Iron depletion, iron deficiency, and IDA prevalences were estimated in relation to the combination measures of haemoglobin, mean corpuscular volume, and ferritin levels. Dietary and sociodemographic characteristic of the children were recorded after parents or caretakers provided informed consent. Data analysis was conducted using SPSS version 21.0.

Results: A total of 303 children aged 2 to 59 months were enrolled in the study. Anaemia was detected in 169 (55.8%) children. Children aged 2 to 12 months had a higher prevalence of anaemia (n=101, 60.1%). The overall prevalences of iron depletion, iron deficiency with no anaemia, and IDA were 2.6% (n=8), 9.6% (n=29), and 28.1% (n=84), respectively. Low ferritin levels were detected in 124 (40.9%) children. Drinking more than 500 ml of cow's milk per day was associated with an increased risk of anaemia (adjusted odds ratio [AOR] 5.6; 95% confidence interval [CI], 2.6 to 12.1) relative to those not drinking cow's milk. Children whose families had meals that included beef more than 3 times per week were less likely to have low ferritin (AOR 0.6; 95% CI, 0.3 to 1.3), though the difference was not significant.

Conclusion: The IDA prevalence among children in the Kilimanjaro area was high, with more than 50% of infants being anaemic. Drinking cow's milk was associated with an increased risk of IDA. Future community-based research is recommended to elucidate more details about iron deficiency in the general population.

INTRODUCTION

Iron depletion results from reduced iron stores and is an early asymptomatic stage of micronutrient deficiency. If not corrected, iron depletion has the potential to progress to iron deficiency and iron deficiency anaemia (IDA). The progression is usually considered in 3 phases; iron depletion (normal haemoglobin, normal Mean corpuscular volume (MCV) but low ferritin level), iron deficiency with no anaemia (normal haemoglobin, low MCV level and low ferritin level) and IDA (low haemoglobin, low MCV and low ferritin levels).¹ IDA is as-

sociated with delayed infant growth and development, diminished cognitive function, poor academic performance, decreased exercise tolerance, and impaired immune function.²⁻⁵

IDA among children under 5 years of age has a prevalence of 47.4% worldwide and ranges from 18% to 26% among children under 5 years old in developed countries.⁶⁻⁸ A recent report, which included several African countries, reported a prevalence of anaemia in children below 5 years old, ranging from 10.5% in South Africa to 75% in Cote d'Ivoire, while IDA ranged from 11% in

South Africa to 64% in Egypt.⁹ In Tanzania, the overall prevalence of anaemia was 77.2%, and the prevalence of IDA based on the ferritin level was 22.6%.¹⁰ Several risk factors have been associated with IDA and low ferritin levels, which include; poverty, being born prematurely, maternal anaemia, intestinal infestations like worms, infections, haematological disorders and nutritional factors like poor eating behaviours and use of cow's milk in children below the age of twelve months.^{4,11,12}

There are several different methods for measuring anaemia, including complete blood count (CBC), total iron-binding capacity, serum iron, serum transferrin, and serum ferritin levels which are used either singly or in combination to assess iron levels in patients. Serum ferritin is the major form in which iron is stored in the body, and measurement of this can easily detect early changes in body iron storage, thereby making it the preferred single best blood test for the diagnosis of iron deficiency.^{4,13-15}

Despite the high prevalence of IDA (11%-64%) in developing countries,^{9,10} the challenge is lack of resources for early diagnosis for iron depletion and iron deficiency. Iron depletion is asymptomatic and has unclear risk factors, thereby hampering a clinical diagnosis. Early detection would enable early intervention; therefore, knowing the risk factors and magnitude of the problem in a specific setting will allow primary prevention and hence prevent the harmful effects of IDA which are not reversible.

The most common causes of iron deficiency in children include insufficient intake together with rapid growth, low birth weight and gastrointestinal losses related to excessive intake of cow's milk,¹⁶ and parasites infestation such as helminth.¹⁷ Therefore, the main management of IDA should include identification and treatment of the underlying cause for IDA, iron replacement, nutritional counselling and advice as well as educational to the parent and family as well as helminthic control through deworming.^{16,17}

This study aimed to determine the prevalence of iron depletion and IDA and factors associated with low ferritin levels among under-5 children receiving care at Kilimanjaro Christian Medical Centre (KCMC) paediatric department to inform planning for interventions to prevent IDA in children.

METHODS

Study Design and Study Site

This was a cross-sectional, hospital-based study carried out at the paediatric outpatient clinic (POPD), Reproductive and Child Health service (RCHS), Human Immunodeficiency Virus (HIV) exposed clinic and within the paediatric ward from August 2014 to July 2015 at KCMC in Moshi, Tanzania. KCMC is a faith-based organisation located in Kilimanjaro region in the northern part of Tanzania serving a population of approximately 15 million. KCMC has the official bed capacity of 638 beds with 130 beds, specifically being for paediatric care. The hospital receives referrals from the northern zone of Tanza-

nia, and several outpatient clinics are attended daily. Daily, more than 1,000 patients are seen as outpatients, with about 20% being children. Paediatric outpatient clinics include HIV/AIDS clinic known as Child Centred family care clinic (CCFCC), general paediatric known as POPD clinic, neuropaediatric outpatient clinic (NPOC) for children with neurological disorders, paediatric outpatient neonatal follow-up clinic (POPNF) as well as the reproductive and child health services (RCHS) for wellbeing under 5 for vaccination and development. For this study, we included children attending POPD, CCFCC and RCHS.

In the Kilimanjaro region, the main activities remain agricultural production with the main being coffee, banana, maize and beans plantation. The region is divided into 4 different zones which favour the agro-economic activities in the region: (1) the Coffee Zone (coffee, bananas, maize, beans, and dairy production), (2) the Wheat Zone (wheat, beans, maize and dairy production), (3) the Lower Zone (maize, cotton, beans, paddy, and suitable for ranching), and (4) the Forestry Zone, which accounts for 388,500 ha of forest and national park.¹⁸

Study Population, Inclusion and Exclusion Criteria

The study population included children aged 2-59 months who attended POPD, CCFCC and RCHS clinics as outpatients or inpatients, whose mothers agreed to sign informed consent. Children who had a history of blood transfusion within 3 months before recruitment, regular iron supplementation for more than 2 months with a known haematological disorder, tuberculosis, HIV/AIDS, history of prematurity, or active haemorrhage were excluded. Information on age, sex, birth weight, residential address, breastfeeding history, use of cow's milk (including amount used), child's intake of meat (including amount).

This study used CBC and serum ferritin level to assess the level of iron storage in the study population using the World Health Organization (WHO) general accepted cut-off levels as; Hb >11mg/dl, MCV >80fl and serum ferritin (SF) level 12 ng/ml, Mild moderate and severe anaemia was considered when Hb level is = 10.0-10.9 mg/dl (Mild), 7.0 -9.9 mg/dl (moderate) Less than 7 mg/dl (severe).^{19,20} Iron depletion was defined as a state when Hb >11mg/dl, normal MCV (80fl) and serum ferritin (SF) level is below 12 ng/ml, while iron deficiency is when the Hb is >11mg/dl with low MCV (<80fl) and low SF (<12ng/ml) while IDA is when Hb is <11mg/dl, and MCV <80fl with low SF (<12ng/ml).^{6,13,21}

Sample Size Estimation

The minimum sample size was estimated using a formula by the Survey System Creative Research and Joint WHO (1988) expressed as sample size = $Z^2(p)(1-p)/\epsilon^2$, where, Z = value (1.96 for 95 % confidence level). A prevalence (P) of 24 % for IDA reported from the Tanzania demographic and health 2010²² and ϵ = minimal tolerable error at the 95% confidence level,

TABLE 1. Baseline Characteristics (N=303)

Characteristics	n	%
Sex		
Male	153	50.5
Female	150	49.5
Age, months		
2-12	169	55.8
13-23	78	25.7
24-59	56	18.5
Median	10 (IQR: 6-18)	
Religion		
Christian	263	86.8
Muslim	40	13.2
Region of residence		
Kilimanjaro	283	93.4
Manyara	5	1.7
Arusha	13	4.3
Other	2	0.7
Birth weight, kg (°N=299)		
<2.5	30	9.9
2.5-4.0	258	85.1
>4	11	3.6
Median	3.2 (IQR: 2.9-3.5)	

°Missing data for 4 participants

Abbreviation: IQR, interquartile range

expressed as a decimal (0.05). The minimum estimated sample size was 303 participants. The study used a convenience sampling technique where all children seen at the outpatient and inpatient who fulfilled the inclusion criteria during the study period were enrolled.

Laboratory Sample Analysis

Venous blood (4 to 5 ml) was drawn where, 2 ml of blood

was placed in the EDTA tube for analysis of Complete blood count with Mindray 3200 haematology analyser (Shenzhen Mindray Bio-Medical Electronics Co., Ltd) at the KCMC Clinical laboratory. The remaining 3 ml of blood was placed in a serum separation tube (SST) then transported to Kilimanjaro Christian Research Institute (KCRI) – Biotechnology laboratory, situated within KCMC campus. The KCRI-Biotechnology Laboratory is located on the campus of KCMC, about 500 meters from the Hospital buildings. It supports both clinical trials and basic science research.

Centrifugation was done at 1,000 to 1,300 rpm for 10 minutes. Serum was collected in cryotubes and stored in a refrigerator at -20°C . Samples batched and tested for serum ferritin by ELISA using a commercial kit (Pishlaz Teb Diagnostics Zaman; catalogue no PT -Ferr -96, Germany). Laboratory data sheets were used to record all laboratory results. All children identified with iron depletion, iron deficiency, or IDA were started on iron supplementation and follow up given at the regular paediatric outpatient clinic every 3 months until 6 months after MCV and MCH have normalised.

Data Analysis

Data analysis was done using SPSS version 21.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were estimated where frequency count, and percentages were reported. Logistic regression was used to determine factors associated with iron depletion, iron deficiency, and IDA. Chi-square tests were used to test for significance in each of characteristics of the population at $P \leq 0.05$.

Ethical Considerations

The ethical clearance was obtained from Kilimanjaro Christian Medical University College (KCMUCo) ethical review committee with a certificate No. 711. Informed consent was obtained from the parents/guardian of the study participants before enrollment. To ensure confidentiality, no names were used, and to minimise pain, the smallest needle was used to collect the minimum amount of blood required. Each participant's parent/guardian was informed of the results of haemoglobin level and the implications. Iron supplementation was prescribed when necessary. Children whose parents or guardians refused to consent received the same service provision and care as children who participated in the study.

RESULTS

We enrolled 314 children aged below 60 months, of which 6 did not show up for sample collection, and the samples from another 4 were insufficient for complete blood count and serum ferritin and 1 sample clotted. Therefore, 303 children samples were obtained and analysed, of which 153 (50.5%) were male and 150 (49.5 %) female. Median (IQR) age in months was 10 (6-18). The majority, (n=169, 55.8%) were in the age group 2-12 months. Two hundred fifty-eight (85.1%) had a normal birth weight between 2.5 and 4.0 kg with a me-

TABLE 2. Prevalence of Anaemia, Iron Depletion, Iron Deficiency With No Anaemia, and Iron Deficiency Anaemia (N=303)

Categories	Total	2-12	13-23	24-59
		months	months	months
		n (%)	n (%)	n (%)
Low Serum ferritin	124	60 (48.4)	49 (39.5)	15 (12.1)
Anaemia	168	101 (60.1)	52 (31.0)	15 (8.9)
Mild	79	49 (62.0)	23 (29.1)	7 (8.9)
Moderate	87	52 (59.8)	28 (32.2)	8 (8.0)
Severe	2	0(0)	1 (50.0)	1 (50.0)
Iron depletion	8	4 (50.0)	1 (12.5)	3 (37.5)
Iron deficiency	29	11 (37.9)	14 (48.3)	4 (13.8)
Iron deficiency anaemia	84	43 (50.6)	34 (40.0)	8 (9.4)

dian weight (IQR) at birth of 3.2 kg (2.9-3.5) and 74 (24.4%) of children being exclusively breastfed at the time of the study (Table 1).

Prevalence of Iron Depletion, Iron Deficiency, and IDA

Of the 303 participants, 168 (55.5%) had anaemia, of these 79/168 (47.1%) had mild anaemia (Hb 10.0 - 10.9mg/dl) 87/168 (51.7%) had moderate anaemia (Hb 7.0 -9.9mg/dl) and 2/168 (1.2%) had severe anaemia (Hb Less than 7mg/dl). In total, 84 (28.1%) children had IDA, 29 (9.6%) had iron deficiency with no anaemia, and 8 (2.6%) had iron depletion. A total of 124 (40.9%) children in the study had low ferritin level. Among children with anaemia, the majority (n=101, 60.1%) were aged 2 to 12 months (Table 2).

Factors Associated With Low Ferritin Levels

The factors found to be independently associated with low ferritin levels after adjustment were sex, whereby males had nearly twice the odds of having a low ferritin level (adjusted odds ratio [AOR] 2.0; 95% confidence interval [CI], 1.2 to 3.4), compared to female counterparts. Infants and toddlers had higher odds of having low ferritin levels as compared to pre-school children (AOR 2.7; 95%CI, 1.2 to 6.1 and AOR 5.0; 95% CI, 2.0 to 11.2, respectively) (Table 3). Drinking more than 500 ml of cow’s milk per day was associated with increased risk of

TABLE 3. Factors Associated With Low Ferritin Level (N=303)

Variable	Ferritin		Unadjusted OR (95% CI)	Adjusted OR ^a (95% CI)
	Normal n (%)	Low n (%)		
Sex				
Male	79 (51.6)	74 (48.4)	1.9 (1.2-3.0)	2.0 (1.2-3.4)
Female	100 (66.7)	50 (33.3)	Ref	Ref
Age, months				
2-12 (Infants)	95 (57.2)	71 (42.8)	1.2 (0.7-2.3)	2.7 (1.2-6.1)
13-23 (Toddlers)	47 (60.3)	31 (39.7)	1.1 (0.6-2.2)	5.0 (2.2-11.2)
24-59 (Pre-school)	37 (62.7)	22 (37.3)	Ref	Ref
Use of cow’s milk				
No	60 (81.1)	14 (18.9)	Ref	Ref
Yes	119 (52.0)	110(48.0)	4.0 (2.1-7.5)	-
Amount of cow’s milk				
≥500	69 (45.1)	84 (54.9)	5.2 (2.7-10.1)	5.6 (2.6-12.1)
<500	50 (65.8)	26 (34.2)	2.2 (1.1-4.7)	2.2 (1.0-5.0)
No cow's milk	60 (81.1)	14 (18.9)	Ref	Ref
Inclusion of red meat				
≥3	38 (65.5)	20 (34.5)	0.9 (0.5-1.7)	0.6 (0.3-1.3)
<3	36 (46.2)	42 (53.8)	2.0 (1.2-3.4)	1.6 (0.7-3.1)
No red meat	105 (62.9)	62 (37.1)	Ref	Ref

^aAdjusted for time of weaning, age started cow’s milk, birth weight, time of breast feeding and past 2 months medical history

Abbreviations: OR, odds ratio; Ref, reference category

anaemia (AOR 5.6; 95%CI, 2.6 to 12.1) as compared to children who had not used cow's milk. Children whose family who ate beef 3 or more times per week were less likely to have low ferritin (AOR 0.6; 95% CI, 0.3 to 1.1) as compared to those who had not used meat; however, this was not significant.

DISCUSSION

In this study, we aimed to determine the prevalence of iron depletion, IDA, and factors associated with low ferritin level in children aged 2-59 months. The overall prevalence of anaemia in this population was 55.8% with more than 60% of anaemia being amongst aged 2-12 months. The prevalence of iron depletion was 2.6%, iron deficiency with no anaemia 9.6%, and IDA 28.1%. Low ferritin level was observed in 40.9% of the children. Various factors were observed to independently affect low ferritin levels the outcome, including young age, male sex, and drinking cow's milk. This suggests a need for nutritional improvement and educational to the parents.

The anaemia prevalence among children below 5 years of age was high (55.8%). Similar prevalence rates were reported in Brazil (56.6%)²³ and Nigeria (57.1%).²⁴ The prevalence in our study was lower than those reported in Mwanza, Tanzania (72.2%).¹⁰ The study in Nigeria is the only study which had a similar age range as our study (2 to 59 months) whereas; other studies used the age group from 6-59 months. The differences noted in children from different settings are most likely due to ingestion of food with low iron contents, a higher burden of worm infestations in other settings and less ingestion of micronutrients with higher use of cow's milk. Despite the high prevalence, in our study, only 2 children were reported to have severe anaemia. This low number is similar to what others have reported, suggesting the condition is often picked up before getting to a severe state.

The observed prevalence of iron depletion in our study was low (2.6%), which differed from other studies from Iran (19.7%),⁷ United Arab Emirates (26.4%),⁸ and New Zealand (18.6%).⁶ The prevalence of iron deficiency with no anaemia was 9.6% which is lower than a previous study conducted in Mwanza, Tanzania, where the prevalence was 33.3%.¹⁰ This difference could be due to regional differences in the type of porridge traditionally used for weaning. In Kilimanjaro mothers typically use finger millet porridge with milk being used for weaning while in Mwanza, maize porridge is more commonly used. Finger millet is a better source of iron and folate when compared to maize. The findings from our study are lower than those in developed countries, (for example 5.6% in New Zealand⁶ and 7% in the USA.⁸ The use of fortified food/milk and the avoidance of cow's milk before the age of 1 year may be the reason for this low prevalence in the developed countries.

The prevalence of IDA in our study (28.1%) was almost similar to the 24%, which was reported previously in the 2010 Tanzania demographic and health survey.²² However, the prevalence of IDA was higher when compared to what has been reported in previous studies in other developing

countries such as Nigeria 14.9% and United Arab Emirates 9.9%,^{8,25} and developed countries such as USA(8%), New Zealand (4.3%) and Turkey (3.29%).^{5,6} Cow's milk before the age of 1 year is known to be a risk for anaemia.^{6,9,26} In our study, we also observed that children who drink more than 500 ml of cow's milk a day had lower ferritin compared to children who drink less than 500 ml per day. Similar findings were also previously reported in New Zealand.⁶ The lower observed prevalence of IDA compared to a study in Mwanza (37.5%),¹⁰ this might be as explained by differences in cultural and socioeconomic status, which may impact the type of food eaten as well as milk consumption. Interestingly, the time of weaning was not an independent predictor for iron deficiency or IDA, and the majority of the children less than 12 months in this study were not supplemented with iron. A study by Kadivar et al. in Iran found that iron supplementation in the first year of life appears to be protective to anaemia and iron deficiency.⁷

Low ferritin level was observed in 40.9% of children in this study, which is similar to the 32.6% reported in Mexico.²⁷ In this study, female children were less likely to have low ferritin level when compared to males; this was not the case in a study in New Zealand where females were at increased risk of developing anaemia.⁶ Children who had a lower levels of red meat consumption (less than 3 days per week) had a slightly increased risk of having low ferritin levels. This was consistent with the findings from Nigeria, where dietary intake of vegetables and animal products less than 3 times a week was significantly associated with a lower IDA prevalence.²⁵ Red meat has a high iron content and is a good source of absorbable haeme iron.

In general, cow's milk has several properties that lower iron uptake, including low iron availability and excessive protein and calcium which inhibit the absorption of iron as reported in a review by Olivera et al,²⁸ therefore, iron supplementation should definitively be recommended when using cow's milk to feed infants as not all cow's milk formulae used are fortified with iron.

Limitations

This was a hospital-based study; therefore, the prevalence of IDA may not truly reflect the general population. It is likely that the prevalence in this study overrepresents that of the general population. A community-based study might give us a better estimation of the actual situation within the community.

CONCLUSION AND RECOMMENDATIONS

The prevalence of IDA in children in the Kilimanjaro area was high, with more than 50% of infants in this study having IDA. Nutritional counselling on iron-rich food and the increased risk of IDA if cow's milk is used under 12 months of age may help to prevent IDA to under-5 children. Future community-based study is recommended to get the actual situation on iron deficiency in the general population.

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A Qualitative Description of Community Participation in Water and Sanitation Activities in the Control of Schistosomiasis in Nyalenda B, an Informal Settlement in Kisumu City, Western Kenya

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ABSTRACT

Background: Community participation is central to the success of primary health care. However, over 30 years since the Alma Ata declaration, the absence of universal community participation remains a major obstacle to combating all types of diseases. This study investigated community participation in water and sanitation activities towards schistosomiasis control in Nyalenda B, an informal settlement in Kisumu City.

Methods: Eight key informant interviews (KIIs) and 8 focus group discussions (FGDs) were conducted. Additionally, data on NGOs dealing with water and sanitation activities in Kisumu was collected from the local NGO registration Board. Qualitative data was organised into themes and concepts and analyzed using Atlas.ti.

Results: Most participants felt that project implementers did not involve them in key levels of project implementation, leading to unsustainable projects and unacceptance from the community. Community structures identified that could be used as avenues of engaging the community in improving water and sanitation situation included the use of organised groups, such as youth, gender-based, farmers and HIV support groups, and merry-go-rounds. Factors mentioned that hindered community participation included negative attitude from community members, poor monitoring and evaluation strategies, limited disclosure of project details, and overdependence from the community.

Conclusion: Effective community participation in water and sanitation activities requires a multipronged paradigm that incorporates a change of attitude from the community, information sharing and consultation, improved monitoring and evaluation, transparency and accountability.

INTRODUCTION

Large populations in the developing countries do not have ready access to adequate water and sanitation even though it is universally accepted as a basic need. This situation is worse in informal urban settlements in developing countries where environmental contamination, often associated with improper waste and excreta management, is widespread.¹ The spread of many infectious diseases, including cholera, typhoid, hepatitis, polio, cryptosporidiosis, soil-transmitted helminths (STH) and schistosomiasis (Bilharzia), is associated with faecal matter and poor hygiene. About one-third of deaths in developing countries are caused by the consumption of contaminated water and, on average, as much as one-tenth of each person's productive time is sacrificed to

water-related diseases.² In addition, 10% of the population in developing countries is severely infected with intestinal worms related to poor faecal waste management.³ Worm infestations continue to be a major public health and socio-economic concern despite efforts and improvements that have been made to reduce helminth transmission worldwide.⁴ An estimated 207 million people in 74 countries are infected with bilharzia (schistosomiasis),⁵ 90% of whom reside in sub-Saharan Africa.⁶

In Kenya, over 9.1 million people are infected with schistosomiasis⁷ despite the availability of an effective and safe drug. While schistosomiasis has generally always been considered a rural phenomenon, there is increasing evidence on the existence and active transmission of the disease in urban settings.⁸⁻¹⁰ This is because

of high populations in urban settings which facilitate high rates of disease transmission, larval development sites and poor waste disposal mechanisms.¹¹ This creates a critical need to scale up control interventions against schistosomiasis in urban settings. Schistosomiasis can be controlled using 3 key approaches: improved sanitation, health education and treatment using available and safe drugs. Other control measures include targeting vector snails and avoiding contact with infected waters.¹² Regular administration of anthelmintic drugs has strongly been advocated for by the World Health Organization (WHO) as an effective control strategy. The role of community participation in water and sanitation activities in the control of schistosomiasis has been advocated for, though few studies have looked at this in detail.

Although studies prove that improving access to clean water, changing hygiene, behaviour and proper waste disposal go a long way in preventing parasitic diseases, very little emphasis has been placed on this.¹³⁻¹⁵ Community participation not only enhances control efforts but also guarantees their sustainment. In community participation, rather than be mere recipients, beneficiaries are actively involved in the planning and execution of the development projects. They also have a say in the nature and direction of the projects.¹⁶ A good example is community-directed mass treatment, which has successfully been used for the control of diseases such as lymphatic filariasis and onchocerciasis and is currently being tried for schistosomiasis.^{17,18} The strategy is well-accepted by communities since local members are fully involved and take responsibility for delivery of treatment.¹⁹ Schistosomiasis control efforts advocated for by the WHO largely focus on chemotherapy. However, these efforts can be augmented by involving communities in control interventions targeting water, sanitation and chemotherapy. Since community structures vary in different settings, they can influence the outcome of control efforts against schistosomiasis. This study therefore sought (1) to describe awareness on schistosomiasis and other water and sanitation-related diseases among community members; (2) to assess the water and sanitation situation in the area; and (3) to identify structures and issues that affect community participation in water and sanitation activities in the control of schistosomiasis in Nyalenda B. Understanding community participation in water and sanitation activities in the control of schistosomiasis in informal settlement areas is critical in designing, implementing and ensuring the sustainment of the control interventions.

METHODS

Conceptual Framework

The study adopted Laodichah's model for community participation²⁰ that argues that for communities to be fully involved, there are 4 stages that project implementers need to bear in mind. First, information sharing stage is a one-way information sharing process from project managers to community members. This is done in the case of sharing preliminary

findings. Second, the consultation stage involves programme managers not only sharing information with community members but also seeking their opinion on proposed projects. Third, the decision making stage involves engaging the community on project design, implementation and objectives. Fourth, the initiating-action stage is a proactive process where community members take charge of the health gaps in their community and are more involved in the implementation stage of projects.

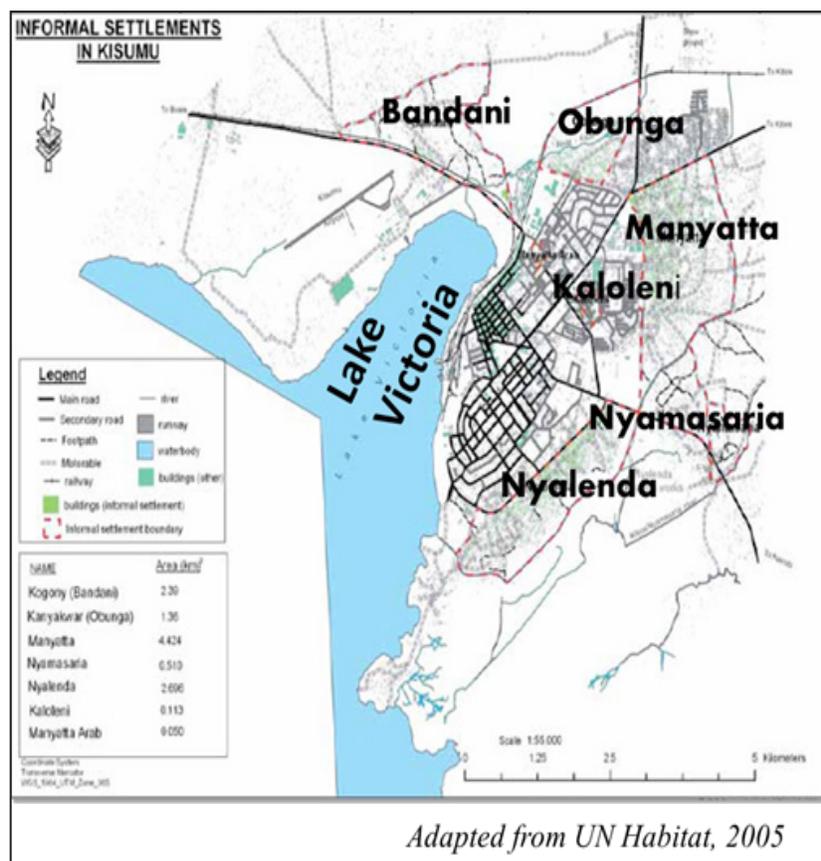
Study Area

The study was conducted in Nyalenda B, an informal settlement in Kisumu City, situated along the shores of Lake Victoria in western Kenya. Nyalenda B is 1 of the 8 informal settlements in Kisumu City, with an area of 6.1 km² and an estimated population of 32,430, population density of 5,317 people/km².²¹ It comprises 8,561 households with a total population: 32,430 people.²⁰ Nyalenda B is divided into 5 health units, which are further subdivided into 9 subunits that are either headed by 1 or 2 village elders depending on the size of the subunit.

Kisumu, like the majority of fast-growing cities, faces various challenges such as overcrowding as well as water and sanitation issues that are common with urbanisation. For example, it faces an acute water shortage, and only 40% of the population has access to piped water. The majority of residents rely on unprotected wells and the lake which are subject to high degrees of contamination due to the rampant use of pit latrines and high water tables.¹⁷ Schistosomiasis being a waterborne infection, it is, therefore, no surprise that the presence of intermediate host snails for schistosomiasis have been reported from some of the frequently accessed water points.¹⁰ Other studies in the area have also found high prevalences of schistosomiasis.⁹ A map of the study area is shown below in the Figure.

Study Design

This was a cross-sectional qualitative study involving 8 FGDs with local community members and 8 KIIs with individuals in various professions or assuming leadership roles in the community. Purposive sampling was used to select the respondents for the KIIs. The interviews were conducted in the participants' offices or rooms within their working environment. Each FGD with a maximum of twelve participants each were conducted. These were categorised by gender and age. The FGDs were conducted in classrooms in primary schools located within Nyalenda B. Participants were screened at the venue before commencement of the discussion to ensure eligibility and avoid selection bias. Participants for FGDs had to be adults aged 18 years and over, residents of Nyalenda B, and must have lived there for at least 6 months. A semi-structured FGD guide developed by the research team and pilot tested in Obunga, an informal settlement which experiences similar water safety and sanitation issues as Nyalenda B, was used.

FIGURE. Map of the Study Area

This guide covered: knowledge on signs and symptoms, community structures, issues and challenges in community participation and the roles of gender and disability. Both English and Swahili were used for data collection.

Data Analysis

Voice data from both the KIIs and FGDs were tape-recorded and later transcribed. Transcripts that were in Swahili were translated and back-translated to English to ensure that both versions carried the same meanings. Data coding was conducted by the research team. The coding structure evolved inductively with the codes from the narrative data of earlier interviews informing subsequent coding of the following interviews supplemented with field notes from the interviewer and note-taker. A coding frame was developed through open coding, a word-by-word analysis used to identify, name, and categorise explanations and descriptions of the day-to-day reality of participants as related to their perspectives on the water and sanitation situation in their community. Consensus on the coding frame was obtained through discussions

between the 2 research assistants who had also participated in data collection. Each transcript was then examined to identify texts relevant to the coding frame. Quotes were later retrieved from the output monitor and arranged according to themes. Our data was validated by triangulation – verification of transcripts with the audio files, and discussions on the coding systems until agreements were reached.

Ethical Considerations

The study was part of a larger project evaluating the effectiveness of Community Directed Intervention (CDI) strategy in increasing access to treatment for schistosomiasis and soil-transmitted helminths in Nyalenda. This larger study was reviewed and approved by the Scientific Ethical Review Committees (ERC) of the Kenya Medical Research Institute (KEMRI, SSC # 1841) and from the ethics board of Maseno University. Additional clearance for our study was obtained from the Provincial administration and Ministry of Public Health and Sanitation (MOPHS) and the Municipal Council of Kisumu.

TABLE 1. Characteristics of Key Informant Interview Participants

Age, years	Gender	Education level	Representation
59	Male	Postsecondary	Nurse
38	Male	Secondary	Beach management
54	Female	Secondary	Farmer
52	Female	Secondary	Group leader
45	Female	Postsecondary	Community health worker
30	Female	Primary	Group leader
52	Male	Primary	Village elder
44	Female	Secondary	Church leader

The purpose of the study and its objectives were explained to local authorities, opinion leaders, village elders and community members. Consent was obtained from respondents. Participants were assured of the confidentiality of information during data collection. All personal identifiers were excluded during the discussion. FGD participants were given assigned numbers to anonymise the voice data further.

RESULTS

Eight KIIs were carried out. Additionally, 8 FGDs were conducted, with a total number of 85 participants. Of these, 44 were females, and 41 were males. A few (7%) of the individuals had only elementary education – all of these participants were between 29 and 43 years of age. Nearly half (47%) of the participants had attended high school, while 42% reported having some postsecondary education. The majority of adult men were businessmen and fishermen, while most of the women were fishmongers. Table 1 and Table 2 show the respondents' characteristics.

Awareness About Water and Sanitation-Related Diseases and Infections

When the participants were asked about the most common diseases in the area in relation to water and sanitation, malaria, cholera, amoeba and diarrhoea received the most mention with schistosomiasis being brought up only 4 times. This further confirms the neglected aspect of this disease.

A 31-year-old male CBO leader said:

We have cholera due to poor drainage systems... when it rains, there is stagnant water. You find that these young kids – they play on this stagnant water, and this affects them so much. You find that sometimes they drink this dirty water.

A 44-year-old woman, also a CBO leader said:

I think in our community, we are experiencing some waterborne diseases like typhoid. Typhoid is rampant in this community, again at times we experience diarrhoea, this is cholera break out, and these are some common illness. Diarrhoea at times is not all that about water, but it is about sanitation.

Participants understood the transmission of cholera and its relationship with sanitation but did not mention schistosomiasis. A 32-year-old salaried worker stated:

You find children they don't go to the pit latrines for fear that they may drop inside the latrine. So, they just drop their faeces outside in the open – the same place you find the mothers also selling vegetables, the flies go from the faeces to the food they are selling, and they also take the food... this is where cholera comes in.

Water and Sanitation Situation in Nyalenda B

It was the general view of participants that the water and sanitation situation in Nyalenda B is wanting. Factors mentioned included poor drainage systems, low latrine coverage, broken pipes and leakage of the sewerage system. Capturing the poor drainage systems in the community, a 37-year-old small business owner said:

We don't have any drainage system in the whole of Nyalenda. What, maybe, the average income earners use is septic tanks and most of these people also don't empty the septic tanks when they are supposed to. Many of them... wait around rainy season; when it is raining, they drain them and the waters from up sweep the waters down the rivers.

With regards to low latrine coverage, a 44-year-old male farmer said:

I think even another problem is that the latrine coverage is very low...so they end up defecating on the open places, and you find that when the rain falls, it carries it to the river.

On broken pipes and leakage of the sewerage system, an adult male said:

I have ever used water, and later realised it had passed near some toilet, and the pipe had burst in the toilet, and it had passed very deep inside. There is no proper supervision. They are not put up to the standard that is required.

Leakage of the sewerage system is further captured by the sentiments of a 44-year-old leader of a women's group:

In this area, some people have dug pit latrines, and sometimes wells are dug near the latrines and water is water; the water in the latrine can flow into the well. When you draw, you may think you are getting clean water from the well, but you will be affected by this.

TABLE 2. Characteristics of Focus Group Discussion Participants

Participant Category	n	Age, years	
		Mean	Range
Male Adult	20	38.1	22-60
Female adult	20	35	22-47
Male youth	21	22.5	18-29
Female youth	24	21	18-29
Total	85		
Education level			
Primary	9		
Secondary	40		
Post secondary	36		
Group representation			
Volunteer	28		
Group leader	28		
Community health worker	21		
Teacher	3		
Church Leader	2		
Unknown	3		

This is despite the NGO registration board reporting that there are 43 NGOs in Kisumu dealing with water and sanitation. Additionally, an interview with the assistant chief in Nyalenda B reveals 4 NGOs working on the same. She was quick to add that there are many who continue to work in the area but do not pass by her office to inform her and she only stumbles on this information occasionally, while interacting with villagers or village heads in the subunits.

Community Participation Process

Participants reported that they were fairly engaged by programme implementers. However, they mentioned that key steps in community participation: Information sharing, consultation and decision making had been left out in most programmes. This, in turn, led to unsustainable projects and unacceptance from the community. On information sharing, a 23-year-old male youth volunteering in a local NGO said:

I wish that we would be told in advance what is happening. I think because people were not told what to use them for (Garbage collecting tanks). People are dumping faeces.

A 32-year-old male salaried worker added:

Most of these things...you will just get surprised when they happen. No one is telling us what is going on. Sometimes some call people together like how we are here. We discuss how the community can move forward, but we never hear of that again. We never see them.

A 60-year-old businessman was more blunt:

We cannot accept! These people have used us as rubber stamps. They have used the community as rubber stamps. They come, collect information and go. Where do they take it? Maybe it's just someone doing a PhD and is not coming to help the community.

With regards to project implementation, respondents indicated that CHWs were involved in project activities. A 27-year-old female CHW said:

I think those who participate mostly the community health worker they participate through the (chief's)... office. Because it is the CHWs that do most of the things like health talk, Afya Two (a local NGO)... You find that they involve the CHWs. They inform them.

A 23-year-old male added that:

SECODE – an NGO – came up with a group of people, the CHWs. They carried out awareness as far as from Dunga unit to Western unit and all in the line of sanitation and waste management.

However, some were of the view that engagement with CHWs was only a recent development. A 22-year-old businesswoman said:

To my understanding, they just started recently; there is an organisation called Concern and Great Lakes. Recently, they just started working with the community health workers. At least they go into the community, and some have talked to the women about so many issues that affect the women.

Structures in Community Participation

Participants identified structures in the community that can be used as avenues of engaging the community for better involvement by various stakeholders interested in improving water and sanitation. It was reported that there were organised groups incorporating different criteria: gender, age-group and interests. In terms of gender, the female groups received most mention with participants reporting that there were very few groups consisting of men only. Adult women groups were most popular among the participants, followed by youth groups. Various categories, such as farmers groups, merry-go-rounds, HIV support groups were also mentioned.

With regards to the Youth group, a 23-year-old CHW said:

So they used their time, they used to take their time, go to a certain place where there is a lot of litter. They collect the litter and burn it.

A 41-year-old farmer from a women group said:

Muungano wa Wanakijiji [Integration of Villagers], which is a community-based organisation, they have participated in... mass awareness, extending the water lines, and giving water guards.

Issues in Gender and Disability

Respondents identified gender and disability as playing a major role in participation. The majority of participants believed that more women than men were involved in water and sanitation activities. This was attributed to issues, such as availability and the gender roles in the community, which required the woman to be more involved in water and sanitation activities. A 27-year-old CHW said:

In most cases, women do take their time and get involved in these interventions.

This was supported by sentiments from a 20-year-old female, member of a youth group who added that:

Mostly, the interventions are being conducted by the females in the community more than [their] male counterparts. Women are always available.

It emerged that gender roles in the community were clearly defined, but also that women were more concerned than men about health matters. A 29-year-old businesswoman said:

...women are so much interested they look after children and look after the father and the whole family.

A 58-year-old salaried worker said:

I think females are the best, because females are carers; you see, like men, we have no time to – maybe – to treat our water, so I think it is ladies... in general, because they are more concerned on health than men.

With regards to people with disabilities, leaders of CBOs admitted to having no member of their group with a disability. A 38-year-old woman, leader of a CBO, said:

I can say for sure; I don't have anyone who is disabled... But you know they can't move much. It really depends with their level of disability.

A 20-year-old woman said:

I think they don't [participate] because they tend to be ignored, they would like to, but since they cannot there is no way.

Challenges in Community Participation

Respondents' comments also highlighted the fact that negative attitude from community members can pose as a major setback in effective community participation. This they said can be attributed to a breakdown of information flow from the project managers. This is illustrated by a 43-year-old male farmer who stated:

I think they are using our people here as rubber stamps to make money and then they go... They get whatever they want, and they disappear.

A 47-year-old businesswoman added:

Just recently, we were doing household administration, we went to a house. That house – we were chased away. That's a problem in the community. They think we are going there to watch to observe the house and come back and steal.

The second aspect mentioned that hinders community participation was poor monitoring and evaluation strategies, which led to project unsustainability. A 30-year-old male salaried worker said:

The most important is project sustainability. You have planned how to do it. When the project has been put down, it can't pick up... like the government has got a lot of 9 employees for projects... but why they don't follow up?

A 41-year-old fisherman said:

NGOs are [partly] to blame to some [extent] because – a good example is Nyalenda Development Group. They were given even equipments by the programme, but they went underground. Some even dispose [of] those things by selling them. You see?

The third issue mentioned as a challenge to community participation was limited disclosure of study details. This was aptly captured by a 47-year-old business owner who said:

In some of the implementations which failed, sometimes there was no transparency among the involved people who were to do it ... In those which succeeded, those people were transparent, working in teamwork.

The last aspect mentioned that hinders community participation was overdependence from the community. A 44-year-old woman working as a professional counsellor said:

I think it is lack of initiative. We don't involve ourselves in these activities; we are waiting for somebody else to bring in the resources may be to help the community... bridge the gap, and after the resource, we don't take the initiative ourselves. We depend so much to be pushed – is when we do these activities. So even though we know that this thing is affecting us we can't do it on our own, we are waiting for the resources to be brought in is when we can do the activities.

DISCUSSION

This paper provides qualitative insights into awareness on schistosomiasis and other water and sanitation-related diseases, the water and sanitation situation and issues that affect community participation in water and sanitation as part of community-directed interventions targeting schistosomiasis control in an informal settlement in Kisumu City. It is widely appreciated that the real value of participation emanates from a bottom-up approach where every community member is involved rather than complete non-involvement or individual consultations.²²

As is often the case with other neglected tropical diseases, awareness of schistosomiasis was low in this setting. Participants indicated that the water and sanitation situation in this setting was generally poor and recommended the utility of several strategies in engaging the community towards improving the water and sanitation situation. The low level of awareness of schistosomiasis in this urban setting was quite unexpected, however, and is in contrast to other previous studies in other bilharzia-endemic regions. For instance, Ndamba and others reported that 80% of villagers in Zimbabwe were aware of schistosomiasis,²³ whereas other studies in Brazil²⁴ and Egypt²⁵ revealed that people were fairly familiar with schistosomiasis.

It is likely that the rural versus urban dichotomy might explain the differences observed, especially since schistosomiasis is largely considered a rural phenomenon. Considering the proximity of Nyalenda B to Lake Victoria, it is also plausible that most of the infections observed in this setting are due to active transmission in situ as opposed to the infection being attributable to migrants moving in from the rural areas in search of employment opportunities. Two arguments might support this position: First, if the bilharzia-rural phenomenon was true, migrants from rural areas would be expected to bring with them their awareness (if any). Second, recent research supports active transmission in this setting.¹⁰ Another explanation for the low awareness may be related to the fact that schistosomiasis is still not considered a significant public health problem compared to other infections, as illustrated by a 23-year-old woman volunteering in a local NGO:

You see, bilharzia is 1 of the few diseases that are not talked about much. They are compared to things like HIV/AIDS, malaria and all that,I think the best thing is that when the community can be sensitised on the fact that the bilharzia is also a problem.

The subtle morbidity or not easily detectable sequel associated with schistosomiasis may give the wrong impression of a less significant health threat that does not warrant seeking medical attention,²⁶ further confounding its level of awareness. On the other hand, it was noteworthy that participants had a fair amount of knowledge about other waterborne and sanitation-related conditions, such as cholera, amoebiasis, typhoid, and diarrhoea. Like many other infor-

mal settlements and as aptly captured by the respondents, Nyalenda B grapples with water and sanitation problems, among them poor drainage systems, low latrine coverage, broken pipes and leakage of the sewerage system. This area has an acute water shortage problem, with only 40% of the population in Kisumu City having access to piped water.¹⁷ Consequently, a majority of slum dwellers rely on water sources that studies prove to have high degrees of contamination such as springs, the lake and unprotected wells.²⁷ Additionally, poor drainage systems and low latrine coverage are attributable to high water tables coupled with black cotton soils and rock outcrops.

Studies show that about 11% of the population living in the slums have no latrines and rely on their neighbours' toilets, the wrap and throw ("flying toilets") or open defecation in the fields,²¹ leading to high levels of environmental faecal contamination. Further support of this contamination comes from a study that reported *Escherichia coli* contamination in 100% of a subsample of fish (*Rastrineobola argentea*) sold in 6 markets within the City.²⁸ As a result, morbidities related to water and sanitation are on the rise such as diarrhoea and intestinal helminthiasis in this setting.^{9,29}

A concerted effort is needed by the Municipal council, stakeholders and community members to improve the sewerage infrastructure and improve water treatment and increase access to adequate and safe drinking piped water. A key element of community engagement is participation by the individuals, community-based organisations, and institutions that will be affected by the effort. From the present study, participants identified structures in the community that could be used as avenues of engaging the community in improving water and sanitation situation. Among those that received mentions were: use of organised groups, such as youth groups, gender-based groups, adult women groups, farmers groups, merry-go-rounds, and HIV support groups. Indeed, such partnerships and groups can help mobilise resources and influence systems and serve as catalysts for changing policies, programmes, and practices.³⁰ For instance, community- and faith-based organisations (CBOs/FBOs) are a major source of support for millions of families affected by AIDS.³¹

Respondents' comments also highlighted the fact that community participation may take a gender-biased dimension, with women expected to take care of water and sanitation and health-related activities. This gender-biased dimension may stem from the fact that women, in sub-Saharan countries are traditionally expected to take the lead in food production as well as the general health and well-being of the family. Therefore, women are naturally at the heart of home-based care management.^{32,33} However, since water and sanitation or health problems have no gender discrimination, the emphasis should be on the pursuit of gender equity in participation and opportunity.

Ultimately, the consideration of gender issues benefits everyone. Absence or low level of participation from people

with disabilities, as seen in our study, may emanate from societal discrimination. Partiality and social intolerance in the community towards people with disability can prove an uphill task for them when they seek to contribute to policy processes or other participatory processes.³⁴ Furthermore, stigma can negatively influence their confidence in advocating for their agenda during programme activities or policy-making processes, therefore necessitating special attention where possible.

Management of water and sanitation services may provide valuable opportunities for the employment of youth in infrastructure maintenance programmes. Perhaps 1 of the ways to assess the community's performance on sanitation would involve use of strategies such as community-led total sanitation approach (CLTS) and assessing its impact on re-infection patterns of soil-transmitted helminthiasis, schistosomiasis and other waterborne and sanitation-related diseases. Community participation is a multilevel spectrum that needs to be nurtured. Several factors were mentioned that hinder community participation including negative attitude from community members, poor monitoring and evaluation strategies, which has led to project unsustainability, limited disclosure of project details to community members, and overdependence from the community. Project failures may occur when community members are unable to influence public action through accountability. Lack of transparency often fosters mistrust and misunderstanding between project authorities and local communities, whereas sustainability is often supported by the continuity of leadership.^{35,36}

Limitations

This study employed qualitative methods for data collection and analysis. This means that the participant's responses were the main basis for results and conclusions. Participant's responses may be biased, based on individual perceptions and attitudes towards the various topics of discussion. To control for this, the moderator took a neutral stance to avoid influencing the responses from the participants. Probing technique was also used to capture the participants' full understanding of the topic of discussion.

CONCLUSION

Our results show that there was low awareness of schistosomiasis in this setting, despite the high prevalence as discovered in other studies,⁹ suggesting that the disease is perceived to be of low public health importance. Poor drainage systems, low latrine coverage, broken pipes and leakage of the sewerage systems were mentioned as the leading factors associated with poor water and sanitation conditions in Nyalenda B. Use of organisational groups and partnerships was cited as an important avenue of engaging community members towards improving water and sanitation activities. Our findings suggest that promotion of and organisational development and sensitisation among community groups could

well be effective for improving community involvement in water and sanitation projects. Community participation could be enhanced by attitude changes, information sharing, and consultation to improve monitoring and evaluation as well as transparency and accountability.

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Perceptions and Experiences of School Teachers During the Implementation of a School-Based Deworming Activity in Kenya

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ABSTRACT

Background: Primary school teachers are key stakeholders in the success of school-based deworming activity as they are responsible for drug administration and provision of health education to the School-Age Children (SAC). In Kenya, the National School-Based Deworming Programme (NSBDP) for control of soil-transmitted helminths and schistosomiasis was initiated in the year 2012 in prioritised areas. By the year 2013, over 6 million SAC had been treated. The present study sought to assess the teachers' perceptions and experiences of the school-based deworming activity in an effort to improve programme effectiveness.

Methods: Qualitative data were collected, using in-depth interviews, in 4 subcounties of the coastal region of Kenya. Using purposive selection, 1 primary school teacher from each of the 38 schools also purposively selected participated in the study. The data were audio-recorded, transcribed, coded and analysed manually by study themes which included: reason for being selected for training to administer drugs; perceptions of training content and duration; experiences during drug acquisition, administration and record-keeping and motivation to continue participating in the deworming of school-age children.

Results: Half of the teachers indicated that they were selected to administer drugs to children as they were responsible for school health matters. The duration and content of the training were considered sufficient, and no challenges were faced during drug acquisition. Challenges faced during drug administration included non-compliance and experience of side effects of the drugs. No major problems were experienced in record-keeping, although the teachers felt that the forms needed to be simplified. Improvement of the children's health and class performance was reported as a source of motivation to the teachers to continue administering the drugs. Fellow teachers were reported to have given moral support while over half of the respondents indicated that parents did not provide much support.

Conclusion: Generally, teachers have positive experiences and perceptions of the deworming activity. There is, however, a need to involve all stakeholders especially the parents through the school board of management to help counter non-compliance and possibly support in providing meals to the children to help minimise side effects after drug consumption. Inadequate moral support and incentives are negative factors on the teachers' motivation.

INTRODUCTION

Soil-transmitted helminthiases (STH) are a group of parasitic diseases and are among the Neglected Tropical Diseases (NTDs) that cause huge disease burden in the developing world.¹ Neglected tropical diseases (NTDs) refers to a group of mainly chronic, debilitating and often stigmatising diseases,² that generally persist under conditions of poverty or impoverished populations, the most affected being concentrated almost exclusively in Low and Middle Income (LMIC) countries.³

More than 2 billion people are estimated to be infected with STH worldwide, with disease burden being caused primarily by 3 main species of STH; *Ascaris lumbricoides* (roundworms), *Trichuris trichiura* (whipworm) and *Necator americanus* and *Ancylostoma duodenale* (hookworms).⁴

School-age children (SAC) and pre-school age children (PSAC) are the most vulnerable groups that harbour the greatest number of worms, parasites *A. lumbricoides* and *T. trichiura* being particularly the most prevalent and

intense.⁵ It is estimated that over 400 million SAC are infected with 1 or more major species of worms,⁶ with 44% of the infection being concentrated in Nigeria, Democratic Republic of Congo, South Africa and Tanzania making children their main targets for treatment.⁷ In Kenya, surveys carried out in 2008 found that an estimated 5 million (56.8%) school-going children were infected with parasitic worms (including STH and schistosomiasis) and required mass deworming.⁸

Morbidity of the disease is often linked to the intensity of worm burden rather than the mortality it causes, hence children with a heavy STH intensity suffer health problems, such as general malaise, diarrhoea, abdominal pain, malnutrition, and intestinal blood loss, which is accompanied by iron deficiency in cases of hookworm infection.⁵ Impairments in physical and cognitive development are also associated with chronic STH infections leading to poor school performance and absenteeism in children.⁹ For the control of STH, the World Health Organization recommends the periodic mass administration of anthelmintic drugs albendazole or mebendazole, ie, preventive chemotherapy, which includes its integration in the existing school-based systems.^{4,10} Treatment of school-aged children in schools is especially favoured because it is among the most cost-effective approaches in minimising infection intensity by utilising school infrastructure and reducing distribution costs.⁵ Furthermore, school-based control programmes can also extend to other high-risk groups such as; children not enrolled in schools, women of childbearing age and adults at high risk in certain occupations.⁷

Surveys demonstrate that coastal and western regions of Kenya have the highest, 32.2% prevalence of STH in school-age children. Hookworm infections are also particularly high in south-western Kenya and in Kilifi and Kwale counties in the coastal region.^{11,12} To counter the negative impact of the worms on children's health and education, the National School-based Deworming Programme (NSBDP) was launched in Kenya in the year 2012. The programme targets all school-age children in subcounties of high densities of STH infection located in Western, Nyanza, Coast and parts of Rift-valley regions.^{13,14}

School-based control programmes do not often comprise deworming, improvement of water and sanitation and health education, although this would be ideal. Studies have shown that the successful combination of these strategies in helminth control programmes can reduce the transmission of schistosomiasis and STH.¹⁵ Deworming programmes rely on the use of existing school infrastructure, especially primary school teachers to administer deworming tablets to their pupils.¹³ Thousands of teachers in endemic countries take a leading role in administering deworming drugs to SAC and PSAC and providing health education to parents and pupils in their respective schools. In Kenya, a total of 16,000 teachers were trained in the first phase, during the year 2012 of the NSBDP.⁸ Training takes place through a cascade where National level Ministry of Health and Ministry of Education personnel train officers at the County level who then train

those at the subcounty level who are then charged with the responsibility of training the teachers to administer the drugs to the school-age children. The primary school teachers are expected to ensure that all PSAC in ECD Centres within the primary school compound and outside receive the drugs.

Several helminth control programmes have demonstrated that recruiting and training teachers for the implementation of school-based deworming programmes is advantageous. Teachers are generally trusted by children and their families, hence are usually more willing to accept health interventions,¹⁵ thus playing an important role in benefiting the overall health and educational outcomes of children.¹⁴ Studies show that there is a need to better understand teachers' knowledge, skills and attitudes as health promoters in any school health programme to promote their motivation and build their capabilities to implement health promotion in schools.¹⁶ In the programme, the Health personnel specifically, the community health extension workers (CHEWs) are charged with the role of community sensitisation for awareness creation and mobilisation and provision of technical support to the teachers during the deworming day especially in the management of the occurrence of any side effects.

Through the School-based Deworming Programme (SBDP), surveys conducted in Kenya show that, by 2013, over 6 million children had been dewormed.¹⁴ The results of a survey conducted prior to deworming in 2012 showed that the prevalence of STH in PSAC in Matuga and Msambweni subcounties in Kwale County was 27.8% and 66.7% respectively while that of Malindi subcounty in Kilifi County was 44.5%.¹² Most recent surveys show that after 3 years of programme implementation, the overall prevalence of STH infection has reduced to 16.4% from a prevalence of 32.3% at baseline.¹² This paper is part of a larger study entitled "Evaluating Different Drug Delivery Approaches for Treatment of Soil-transmitted Helminthiasis and Schistosomiasis Infections in the NSBDP among children attending Early Childhood Development (ECD) Centres in Coastal Kenya" which was carried out after mass drug administration (MDA) of 2014. The present study assessed the primary school teachers' experiences and perceptions of; teacher selection and training, community sensitisation, drug acquisition, record maintenance, teachers' motivation and incentivisation during drug administration to children. The study sought to identify areas for improvement or continuity in the implementation of the school-based deworming programme.

METHODS

Study Site

The study was conducted in 4 endemic subcounties: Matuga, Msambweni, Lunga Lunga and Malindi in Coastal Kenya. These subcounties were selected on the basis of a high prevalence of infection and the distance between some primary schools and pre-schools being ≥ 2 km. Three of the subcounties (Matuga, Msambweni, and Lunga Lunga) are located in

Kwale County, whereas Malindi is located in Kilifi County.¹⁷ Kwale County covers an area of 8270 km² and lies between Latitudes 30° 3' and 40° 45' South and Longitudes 380° 31' and 390° 31' East.¹⁷ The total population was projected to be 759,318 in 2015,¹⁸ with the majority of its population living in poverty. Kwale County experiences monsoon type of climate marked by hot and dry weather from January to April/May and cool temperatures from June-August.¹⁷

Health-care service delivery in Kwale is generally poor due to inadequate health workers and health facilities and shortage of medicines, medical supplies and equipment. The county has a total of 3 government hospitals, 8 health-care centres, 64 dispensaries including 2 private hospitals. The patient to doctor and nurse ratio stands at 1: 76,741 and 1: 3,133 respectively which is far below the WHO prescribed ratio of 1:1000.¹⁹ Access to health facilities is also a major challenge as the average distance to the nearest health facility within the county is 7 km.¹⁸ The most common diseases reported are; malaria, diarrhoea, flu, respiratory diseases and stomach ache. There is also a high prevalence of HIV/AIDS.¹⁸

Malindi subcounty is located 120 km east of Mombasa and covers an area of 7,750 km² and has a population of 424,081.²⁰ This population is served by 3 hospitals, 4 private chemists and 24 dispensaries. A major challenge for Malindi residents is the accessibility to health facilities; statistics show that in rural areas, the nearest health facility is 3 kilometres away. Aside from long distances, high poverty levels also make health care inaccessible to the people.²¹ Malaria, respiratory tract infections, skin infections, diarrheal diseases and intestinal worms are the most highly reported diseases that cause morbidity.²¹

Study Design and Setting

This was a qualitative study that utilised in-depth interview method for data collection. The data were collected in May 2014, after the February 2014 round of deworming. The data collection instrument was developed by trained KEMRI researchers through a consultative process with the programme implementers. The questions were then translated into Kiswahili by a hired independent translator and then back-translated into English by a different translator to confirm that the intended meaning of the questions had not changed. The interviews were conducted at the primary schools. All primary schools that serve stand-alone pre-schools that are ≥ 2 km away were identified with the help of the Early Childhood Development Education Office and considered for the study.

Study Population and Data Collection

A total of 38 primary school teachers from 38 primary schools with pre-schools attached to them who administered anti-helminths to the school children during the February 2014 round were selected purposively and in-depth interviews conducted by trained KEMRI researchers to gather information on their perceptions of and experiences during

the deworming activity. In the selection, researchers minimised bias by ensuring that head teachers and health teachers who are charged with the responsibility of administering treatment to the SAC and PSAC were recruited for the study. The number of interviews was determined by the level of saturation, ie, once no new information was being received, then no more interviews were conducted. The design was iterative, and there was a back and forth process which included data collection and analysis and further sample selection, therefore, giving early insights and influencing the selection of more participants up to the point where no more new information was being gathered. Standard procedures including maintaining a neutral stance, probing and allowing the respondents to express themselves without asking leading questions, asking general questions before specific questions and varying questions wording to avoid seeming repetitive were adhered to while conducting the IDIs.²² Each interview took a minimum of 40 minutes to a maximum of 50 minutes at a venue conducive to the process. Data were recorded using audio-cassettes in *Kiswahili* the local language commonly used in the coastal region. The data were then transcribed and translated and back-translated into English by trained KEMRI investigators. Double transcription and translation and back-translation was done among the investigators to agree on the meaning of the transcripts and minimise bias.

Data Management and Analysis

The data that were captured through note-taking was compared with that captured through voice-recording to ensure that all important information was captured. The analysis was done manually according to study themes which were determined before the analyses. A code sheet was created following the in-depth interview guides after which, the textual data were coded into selected themes, and a master sheet analysis was carried out, giving all the responses from the IDIs a theme. Thematic analysis was used where responses were categorised into themes and then ideas formulated by looking at the patterns of responses. Analysed data were presented in text form. The identified themes included the reason for being selected for training to administer drugs; perceptions of training content and duration; experiences during community sensitisation, drug acquisition, drug administration and record-keeping and motivation to continue participating in the deworming of SAC and PSAC. The data analysis was approached deductively, wherein general statements were used to form specific conclusions. The quantitative data from the socio-demographic profiles, ie, age, highest level of education, religion, and marital status was managed using Excel (Microsoft Corp., Redmond, WA, USA) spreadsheets.

Ethical Considerations

Ethical clearance was received from the Kenya Medical Research Institute (KEMRI)/National Ethical Review Board

(Protocol Number 2547) and written informed consent sought from all the study participants. All the participants were adults above the age of 18 years, and therefore, no parents/guardians were expected to give consent on behalf of a minor. All information given by the study participants was kept confidential, and anonymity was highly observed as no personal identifiers were used during data entry, analysis and presentation. Confidentiality was ensured through coding the transcripts by giving a number to each respondent and a name based on the subcounty, ie, LLG for Lunga Lunga, MSB for Msambweni, MLD for Malindi and MAT for Matuga. PT was used to distinguish the Primary Teachers from other study participants of the larger study.

RESULTS

A total of 38 teachers from 38 primary schools consented and participated in the full in-depth interviews, 28 males and 10 females. The oldest teacher interviewed was 58 years old and the youngest 23. Regarding religion, 23 teachers were Christians, and 15 were Muslims; 34 were married, and 4 were single. All teachers had received college-level training. From the total of 38, 12 were from Malindi, 8 from Msambweni, 10 from Matuga and 8 from Lunga Lunga subcounty (Table).

Teachers' Selection

With regards to the criteria used to select teachers to administer the drugs during the NSBDP, half (n=19) of respondents indicated that they were selected because of their role in the school as the health teacher. About a quarter of the participants (n=10) indicated that they were selected because it is their responsibility as head teachers to oversee the exercise. Only a small minority (n=3), indicated they were selected because they had in previous rounds dewormed the school children. A health teacher stated that:

I am the school health teacher, and they needed the school health teacher and either the deputy or the head teacher so being the school health teacher, I was the right person to go.” (MLD PT004)

Training

A majority (n=31) of respondents indicated the training on drug administration took 1 day. On the content of training, a large majority (n=31) indicated they were trained on how to administer drugs and manage side effects, and educated on intestinal worms and their effect on health. A teacher stated:

We were trained on how to administer, the drugs the side effect of the drugs and how to prepare the children to be ready for the drugs and also discussed the worms different types and how they affect the learners and why they were targeting the schools they said because they target the young children who can only be found in school, and that is why they did not go to the villages. (MSB PT 007)

Only a small minority (n=5) mentioned they were trained

TABLE. Background Characteristics of the In-Depth Interview Participants

Variable	Male	Female
Number of participants	28	10
Age	Median (range)	47 (23-58) 47 (29-53)
Marital status	Single	3 1
	Married	25 9
Religion	Christian	15 8
	Islam	13 2

on how to maintain records during drug administration. Less than half (n=15) of respondents indicated the training was satisfactory. A majority of the teachers indicated that they would have liked to have more training on the worms, transmission cycle, and preventive measures and probably the length of training should be increased for them to learn and understand more about the record-keeping. A teacher stated:

I had challenges, especially in the writing of the summary; it was a bit technical... (MAT PT 009)

Community Sensitisation

When teachers were asked on the methods used to inform the community about the school-based deworming activity, a majority (n=28) indicated they used the school children to inform community members about the exercise. Less than a third (n=11) stated they used posters with another 11 indicating that they used other school teachers and school committee members. More than half (n=21) of respondents stated that the methods they used to sensitise the communities were adequate to reach the parents. However, about a half (n=18) indicated that using children alone to sensitise the community members were not adequate. A head teacher stated:

That method that we ourselves used was not adequate because you cannot rely 100% with the children since some of them might not tell their parents about the exercise. (MAT 004)

To improve the means of community sensitisation, about a third (n=13) proposed that using media sources such as; radio, public address systems and posters would be the most effective means of sensitising community members. A teacher thus stated:

Maybe posters, we put them at the market centres and these days we have got these “FM” radios, local example here we have got “Kaya FM” which Kwale residents listen to that can also assist.” (MAT PT 002)

A teacher further stated:

I think more still needs to be done like if it is done using these public communication devices, ... like we have a vehicle perhaps going across the region announcing what was going to happen and perhaps educating briefly the community members on why it is happening, I think it would bring more attention to the people and the attendance would improve. (MLD PT011)

Other suggestions given by slightly more than a quarter (n=10) of respondents to improve on community sensitisation were to use local leaders such as village elders and chiefs.

Drug Acquisition

With regards to drug acquisition, more than half (n=25) of the respondents indicated they did not face any problems during the collection of drugs which was done after the teacher training session. A large majority (n=34) of respondents indicated they received the drugs on time, and all 38 reported they received sufficient amount of drugs to carry out the treatment with some indicating that they received excess drugs. A health teacher thus stated:

There was no problem because we were given the drugs there and then after the training and we came with them to the school and stored them waiting for the deworming day. The quantities were more than enough and some of them we took back to the Zonal Education office. (LLG PT 002)

Mode of Drug Administration

More than half (n=22) of the teachers indicated that they faced challenges during drug administration. The greatest challenge reported was children's refusal to take drugs out of fear of their safety. The teachers reported that children, however, eventually complied with treatment after they swallowed the drugs themselves to demonstrate their safety. There were isolated reports of children refusing to comply with treatment because of religious beliefs. A health teacher stated that:

It was somehow challenging because there are some religious sects which refused their children who are in that denomination to take drugs. They refused totally; for example, those from Imani Mwenga and One Faith Schools, they refused completely and ended up running away from schools. (MLD PT005)

Other challenges experienced by teachers during drug administration included; late arrival, poor attendance and failure to have eaten a meal before drug consumption. A head teacher stated that:

Challenges were there; for instance, we were told that the children should have eaten at their homes before taking the drugs. Knowing whether or not a child has eaten is a problem. Another one is about attendance, as I explained to you. You find that some pupils do not

like medicine; once they hear that there shall be deworming on a certain day, they do not come to school. (LLG PT004)

Less than half (n=15) of the respondents, however, indicated they did not face any challenges during drug administration.

Regarding side effects after drug consumption, more than half (n=22) of the respondents reported that children did not experience any side effects after consuming the drugs. However, less than half (n=14) reported that children experienced side effects which were transient such as; dizziness, nausea, vomiting, weakness and stomach pain, especially after consumption of praziquantel for schistosomiasis. The main strategy used by teachers to manage side effects was directing children to rest in a cool shady area. A teacher thus stated:

... there was dizziness, the children were complaining of headache, and feeling dizzy, it was more the ones who took bilharzia drugs, those children who were feeling dizzy, feeling like vomiting, they would just rest, but after some time in the afternoon, it was fine. (MSB PT 002)

Another teacher also stated that:

What I can talk about is the way this drug is very strong. If there could be the provision of a feeding program, which would be nice so that the children can have the energy to receive the drug well. It is sad that they receive the drugs on an empty stomach. (LLG PT 04)

Record Maintenance

A large majority (n=29) of the respondents indicated that they had enough forms to maintain records after drug administration. Only 3 teachers indicated that the forms were not enough.

A majority (n=28) of respondents reported that they did not face major challenges in recording keeping, while 9 teachers reported having faced challenges in filling the forms as in their opinion, they were quite technical. One teacher thus stated:

...about how to fill in the totals at the bottom. You see when you got 1 form, it was easy, but when you got more than 1 form, it was a bit tricky where to write the final summary, it was bit challenging...it was a bit technical. (MLD PT 006)

Motivation

Out of the 38 primary school teachers interviewed, more than half (n=23) indicated that improving the children's health and performance in class motivated them to continue administering the drugs to the children. A head teacher stated:

... the motivation is that these children are ours and if they have some good health they will perform well, and if they perform well, it is also good. (MSB PT 03)

Support Received

A majority (n=29) of primary school teachers reported that they received support mostly from fellow teachers in the facilitation of the deworming exercise and record keeping. However, slightly more than half of respondents (n=20) reported they did not receive enough support, especially from parents who failed to participate and bring their children to receive the drugs. The failure of the parents to take their children to schools to receive the treatment may have been as a result of the inadequacy in community sensitisation. Another teacher stated that:

The least supportive now, I can say, were the parents.
(MLD PT010)

Out of the 38 respondents, only 11 indicated they received financial support for transport, lunch and communication allowance. A small minority (n=7) however indicated that in future, more financial support due to the heavy workload would make the teachers feel appreciated. A head teacher stated that:

I don't think I have anything to add maybe just that next time, you should consider the teachers, even if its fifty shillings each, just as a token of appreciation. So that they can feel appreciated... (LLG PT 006)

DISCUSSION

Results reported in this study show that generally, the standard of activities being implemented during the NSBDP is satisfactory based on the results showing high treatment coverage of targeted schools; 94% and 98.1% of Kilifi and Kwale counties, respectively.¹² but a few areas need to be addressed for an improved programme. The teachers who administered drugs to children were selected mainly because of their role in the school as health teachers. Furthermore, some teachers who attended the training were selected because it is their responsibility as the school head teacher. This follows the Kenya National School-based deworming programme implementation model which requires for particularly, primary school heads and health teachers to receive training on school-based deworming by Division-level trained personnel.²³

According to the results of this study, the duration of training was 1 full day. In terms of the content covered during the training, most teachers mentioned they were trained on how to administer drugs, manage side effects and educated about intestinal worm transmission, effects and prevention measures. A study conducted to assess the implementation of the NSBDP in Bihar State, India shows similar results.²⁴ Other studies have reported that the effective training of teachers contributes to increasing the acceptance of community members to participate in deworming exercises, by demystifying rumoured myths or misconceptions.^{13,25} However, the present study results also show that a small number of teachers indicated that they received training on re-

cord-keeping, which is contrary to stipulations of the NSBDP module, which highlights training on filling and managing of monitoring forms as very important in teacher training sessions.¹³ The programme implementers are thus advised to ensure that the training given on record-keeping is adequate for accurate data to be transmitted to the Health and Education authorities.

Using students to inform parents and other community members about school-based deworming activities was the most common means of awareness creation due to its convenience. There was, however, a feeling among teachers of the need to improve the means used to sensitise the community, to ensure that the parents are properly informed about the deworming activities. Reports indicate that awareness creation and community sensitisation efforts are crucial for achieving high coverage of treatment as it aims to motivate parents to bring their children for treatment. Programme implementers are advised to combine several approaches to maximise on compliance taking the community leaders as important in reaching more community members. The Ministry of Health and Welfare in India recommended using a mix of media sources that are culture-specific or most effective in the local context, such as print media, posters and newspapers, radio, public announcements, or television.²⁶ Odhiambo et al²⁷ reported that more involvement of local community leaders who are respected in the community is also encouraged as they play a pivotal role in sensitising the community and can lead to increased ownership and acceptability of the programmes. Similarly, results of the present study demonstrate that teachers highly recommend the use of media sources (posters, radio, public announcements and television) and local leaders through village meetings (*barazas*) to sensitise community members on deworming activities.

The teachers faced no challenges at the time of drug acquisition, and the amount of drugs received was sufficient. Lack of challenges in drug acquisition and receiving sufficient quantities are important factors in ensuring that all targeted children receive the treatment during the deworming day. These results are contrary to those of a study on lymphatic filariasis elimination carried out in Kenya,²⁸ and different states and districts in India^{29,30} which reported a delay in supplies as well as inadequate amounts of drugs being supplied to the drug administrators. The study conducted in India by Babu et al³⁰ associated timely and adequate drug supply with promoting high coverage and compliance to drugs, hence contributing to the smooth and effective implementation of deworming programmes.

The results of this study demonstrate that a number of challenges were faced by teachers during the drug administration activity. One of the reported challenges was the children's refusal to take the drugs. This, however, was resolved when teachers took drugs in front of the children to demonstrate their safety, which led to the children's compliance. A study carried out in Turkey demonstrated that children are

more willing to comply with treatment if it is delivered by a trusted source such as a parent or teacher.³¹ Religious beliefs were also found to be a reason for children's refusal of treatment, although the cases were few. A study conducted in western Kenya also reported cases of community members resisting treatment for schistosomiasis due to religious beliefs.²⁸ Religious and sociocultural barriers are major hindrances to health-seeking, especially among rural communities. Increased sensitisation and education of spiritual leaders to advocate for compliance with health interventions have been recommended as a strategy to overcome such religious and other sociocultural barriers.³²

The present study also reported side effects cases following treatment with praziquantel. Signs presented were considered mild and ranged from; dizziness, nausea, vomiting, weakness and stomach pain, which were effectively managed by teachers. The teachers associated the occurrence of side effects with the failure to feed children before treatment. The health authorities are called upon to ensure that there is supervision of the deworming activity in schools, so that side effects are managed in good time to counter any chances of negative publicity. Similarly, a study in Uganda reported that side effects occurred especially after taking praziquantel on an empty stomach.³³ A number of studies have recommended the taking of deworming drugs with food to mitigate side effects.^{34,35}

According to the results of this study, majority of teachers had minimal challenges in filling of monitoring forms during drug administration which can be attributed to success of the programme that has shown a reduction in prevalence and intensity of STH.¹² Efficacy in the distribution of programme support materials such as monitoring forms have been reported to potentially determine the success in achieving smooth implementation of deworming programmes. Furthermore, information gathered from forms filled out by teachers is crucial as it is used to evaluate programme success alongside the target population, making the filling of forms an important part of the implementation process.³⁶ It is, however, important for the programme managers to note the negative reports by teachers that emphasised on the complexity and technicality of the monitoring forms, which could negatively affect programme effectiveness.

Results of the present study have highlighted the improvement of the health and general wellbeing of the school children as the major motivating factor for teachers to administer drugs. Furthermore, teachers were increasingly motivated because improvements in children's health were directly associated with reduced absenteeism and increased concentration in class and thus improved class performance. Primary school teachers play key roles in the success of the NSBDP, and the programme implementers are encouraged to ensure that teachers feel appreciated. These results corroborate with studies carried out in Kenya and Tanzania,^{37,38} which stated that community volunteer drug distributors were more likely to be motivated to administer drugs due

to intrinsic reasons such as; helping the community and improving their health.

Community support, according to the present study results, has been identified as an important incentive in increasing teachers' motivation. The importance of peer support in facilitation of the deworming exercise and recording keeping was especially highlighted by the teachers. This may have contributed to building teachers morale to participate in the deworming exercise, similar to the results of the study carried out in Kenya.³⁷ The present study, however, demonstrated that teachers somehow felt demotivated by lack of active participation of the parents during the deworming exercise. The Programme implementers are thus required to implement health promotion campaigns through intersectoral approaches and involve the parents in the control strategies for buy-in and support. Results of other studies have shown that the support by community members, such as parents, is critical for making drug administrators feel appreciated in the communities to which they provide services³⁹ and is also crucial to the success of the programme.¹⁵

Limitations

The study's limitation is recall bias on questions pertaining to the training as the teachers in the far-flung subcounty of Lunga Lunga were interviewed at a time exceeding 3 months from the time that they had received the training although within 3 months of administering treatment to the school-age children.

CONCLUSION

The teachers generally have positive experiences and perceptions of the school-based deworming activity. The study has, however, identified critical factors that are important for the improvement of the NSBDP from the teachers' perspective. There is a need to involve all stakeholders especially the parents through the school board of management to help counter non-compliance and possibly support in providing meals to the children to minimise side effects after drug consumption. Intersectoral approaches are recommended for improved awareness creation. The treatment record-keeping forms may need to be simplified for the teachers to make use of them easily. Inadequate moral support and incentives are negative factors on the teachers' motivation and there is need for all stakeholders, particularly parents, to get fully involved in the programme.

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Prevalence and Predictors of Dermatophyte Infections Among Primary School Children in Ilemela, Mwanza, Tanzania

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ABSTRACT

Background: Dermatophytes are highly contagious organisms of public health importance, particularly among primary school children in the resource-limited settings with a prevalence of 10% to 20% in East Africa. Here, we report the prevalence and associated factors of dermatophyte infections among primary school children in Ilemela, Mwanza - Tanzania.

Methods: A cross-sectional study was conducted involving 323 children aged between 4 and 10 years from 10 randomly selected primary schools. The study was conducted between July 2017 and September 2017. Pretested interviewer-administered semi-structured questionnaire was used to collect relevant social-demographic information followed by clinical examination to establish the diagnosis of dermatophyte infections. Data were analysed using Stata version 13.

Results: The mean age of the study participants was 7.63 ± 1.27 years, with the slight majority ($n=183$, 56.7%) of participants being girls. The majority ($n=277$, 70.3%) of the study participants were from public schools. A total of 299 (92.6%) children reported using tap water at home. Using clinical diagnosis, 94 (29.1%) children had dermatophyte infections with 92 (97.9%) of them having tinea capitis. By multivariate logistic regression analysis: being a boy (odds ratio [OR] 1.98; 95% confidence interval [CI], 1.22 to 3.22; $P=.01$); using lake, river, or well water (OR 3.18; 95% CI, 1.36 to 7.38; $P<.01$); playing in a dusty environment (OR 2.65; 95% CI, 1.28 to 5.47; $P<.01$); playing with animals (OR 2.13; 95% CI, 1.28 to 3.56; $P<.003$); and having family members with dermatophyte infections (OR 10.56; 95% CI, 4.57 to 24.41; $P<.001$) predicted dermatophyte infections.

Conclusion: The prevalence of dermatophyte infection is high in the study population and is associated with poor hygiene. Improved hygiene will reduce the prevalence of dermatophyte infections among primary school children in low-income countries. Further studies to identify the species and susceptibility patterns of these dermatophytes are recommended to establish empirical treatment guidelines.

INTRODUCTION

Dermatophyte infections are common superficial fungal infections of public health importance in areas with poor personal and domestic hygiene.¹ Due to the presence of a low amount of inhibitory fatty acids in the skin of prepubertal children, dermatophyte infections tend to occur more in this age group and mainly affects scalp and skin.^{2,3} In East Africa, the prevalence of dermatophyte infections has been reported to range from 10% to 20% among primary school-aged children⁴⁻⁶ with limited information from rural areas. Tinea capitis was reported to be endemic in Africa with more than 20 million people affected in the past 4 decades.⁷

Dermatophyte infection is of public health concern due to its contagious nature, as it has been found to be easily transmitted through close skin-to-skin contact with an infected person, sharing of combs and clothes,

and playing with domestic animals.⁴ Asymptomatic carriers and the seasonal nature of the disease significantly contribute to dermatophyte transmission between close contacts.^{8,9} The epidemiological distributions of dermatophyte infections have geographical and seasonal variations, depending on the migration of people and climatic conditions. Poor living conditions (overcrowding, poor sanitation, low water supply and low socioeconomic status), close contact with infected children, and playing with domestic animals have been found to predispose prepubertal children to dermatophyte infections.^{4,9}

Dermatophyte infections can lead to social stigma, resulting in psychosocial trauma to the affected children. The irritation of the affected area due to inflammatory reactions affect children's concentration in class, potentially leading to poor performance and school dropout.⁴

TABLE 1. Sociodemographic Characteristics (N=323)

Variable	n (%)
Sex	
Girls	183 (56.7)
Boys	140 (43.3)
Age, years±standard deviation	7.63±1.27
School ownership	
Private	98 (30.3)
Government	225 (69.7)
Playground surface	
Dust	258 (79.9)
Cement/grass	65 (20.1)
Plays with domestic animals	
Yes	96 (29.7)
No	227 (70.3)
Family size, mean±standard deviation	5.532±1.967
Mode of family	
Both parents	268 (83)
Single parent	55 (17)
Source of water	
Clean tap water	299 (92.6)
Lake/well/river	24 (7.4)
Towel sharing^a	
Yes	59 (22.3)
No	205 (77.6)
Comb sharing	
Yes	169 (52.3)
No	154 (47.7)
Friends with dermatophytosis	
Yes	48 (14.9)
No	275 (85.1)
Family member with dermatophytosis	
Yes	289 (89.5)
No	34 (10.5)

^a59 students did not use towels

Additionally, ulceration of the affected area increases susceptibility to secondary bacterial infections.

Despite the physical and psychosocial sequelae that can be brought about by dermatophyte infections, this group of diseases remains neglected in low-income countries. This is partially because most of these fungal infections are benign¹⁰; as a result, robust epidemiological data are scarce. The present study provides data on the prevalence and factors associated with dermatophyte infections among primary school children in Ilemela, Mwanza, Tanzania. These data are important for identifying the high-risk groups among these children and will inform appropriate preventive strategies.

METHODS

Study Design and Study Area

This was a cross-sectional study conducted from July 2017 to September 2017 in primary schools in Ilemela District, Mwanza, Tanzania. According to the national bureau of statistics of Tanzania, Mwanza is the second most densely populated region after Dar es Salaam, with approximately 1,294,761 children aged 0 to 14 years.¹¹ Mwanza city has two administrative districts, namely Nyamagana and Ilemela. We chose Ilemela District out of convenience. The district has 74 primary schools and 46 health centres (17 public and 29 private). Participating schools were selected at random.

Sample Size, Sampling, and Inclusion Criteria

The representative target population (323 primary school children) was estimated using Cochran's equation,¹² assuming a prevalence of 30.4% based on previous study findings from Dar es salaam, Tanzania.⁶ Ten schools were randomly selected. Pupils were randomly chosen until the desired sample size and distribution across schools was reached.

Data Collection

A trained nurse used a semistructured, pretested, interviewer-administered questionnaire to collect sociodemographic and clinical data. If a child failed to provide the required information, a checklist was provided to the child's parents to fill. Physical assessment to detect skin lesions suggestive of dermatophyte infection was done. Tinea capitis was defined by the presence of dull, grey, circular patches of alopecia, which is scaling and itching, while tinea corporis was defined by the presence of annular lesions with a clearing, scaly centre surrounded by a red, advancing border that was either dry or vesicular.¹³ Physical assessment and questionnaire administration took about 30 minutes.

Data Management

The data were entered and cleaned using Microsoft Excel (Microsoft Corp., Redmond, WA, USA) and analysed using Stata version 13 (StataCorp, College Station, TX, USA). Continuous variables, such as age and family size, were summarised using

TABLE 2. Factors Associated With Dermatophyte Infections Among Primary School Children (N=323)

Variable	Dermatophytes		X ²	P Value	
	Yes	No			
Sex	Girls	42 (22.2%)	141 (77.1%)	7.7430	.005
	Boys	52 (37.1%)	88 (62.9%)		
School ownership	Private	14 (14.3%)	84 (85.7%)	14.6899	.001
	Government	69 (35.8%)	124 (64.3%)		
Family type	Single parents	13 (36.1%)	23 (63.9%)	1.3468	.25
	Both Parents	72 (26.9%)	196 (73.1%)		
Source of water	Tape	81 (27.1%)	218 (72.1%)	7.8941	.005
	Lake/well/river	13 (54.2%)	11 (45.8%)		
Playground surface at school	Not dusty	10 (15.4%)	55 (84.6%)	7.4215	.01
	Dusty	84 (32.6%)	174 (67.4%)		
Plays with pets	No	55 (24.2%)	172 (75.8%)	8.7904	.003
	Yes	39 (40.6%)	57 (59.4%)		
Friend with dermatophytosis	No	67 (24.4%)	208 (75.6%)	20.1383	.001
	Yes	27 (56.3%)	21 (43.8%)		
Family member with dermatophytosis	No	68 (23.5%)	221 (76.5%)	41.3241	.001
	Yes	26 (76.5%)	8 (23.5%)		

means and standard deviations. Categorical variables were described as proportions and percentages. A stepwise logistic regression analysis was employed to determine factors associated with dermatophyte infection. All factors which were statistically significant on univariate analysis were subjected to multivariate logistic regression analysis. The statistical significance was set at the 95% confidence level, wherein $P < .05$ was considered statistically significant.

Ethical Considerations

The study protocol was reviewed and approved by the Joint Catholic University of Health and Allied Sciences/Bugando Medical Centre (CUHAS/BMC) Research Ethics and Review Committee (CREC) (certificate no: CREC/274/2017). Students were given information regarding the study and provided with the informed consent form to give to their parents. Children were included if they provided assent and their parents consented.

RESULTS

Demographic Characteristic of Study Participants

A total of 323 primary school children were involved in the study, including 183 (56.7%) girls. The mean age of the study participants was 7.6 ± 1.2 years, and the mean family size was 5.5 ± 2 people. The majority of the children were from public schools ($n=225$, 69.7%), and 299 (92.6%) children reported using clean tap water at home (Table 1).

Dermatophyte Infections

A total of 94 (29.1%) children were clinically diagnosed with dermatophyte infections. The majority ($n=92$, 97.9%) had tinea capitis, with only 2 (2.1%) children diagnosed with tinea corporis. Of 140 boys, 52 (37.1%) had dermatophyte infection compared with 42 (22.2%) of 183 girls children ($X^2= 7.7$; $P < .01$). There was a significantly higher prevalence of dermatophyte infection among children attending public schools compared with private schools ($n=69$, 35.8% vs $n=14$, 14.3%, respectively; $P < .001$) (Table 2).

Predictors of Dermatophyte Infections

Multivariable logistic regression analysis revealed that male gender (adjusted odds ratio [AOR] 2.04; 95% confidence interval [CI], 1.07 to 3.90; $P < .029$), attending public school (AOR 2.27; 95% CI, 1.04 to 4.98; $P < .039$), not changing uniform at least weekly (AOR 4.56; 95% CI, 1.11 to 18.71, $P < .035$), playing with domestic animals (AOR 2.04; 95% CI, 1.3 to 4.02; $P < .030$), and sharing of bed sheets (AOR 6.35; 95% CI, 3.32 to 12.15; $P < .001$) were significant predictors of dermatophyte infections among the participating primary school children (Table 3).

DISCUSSION

Dermatophyte infections are common and remain an important public health problem among primary school children in resource-limited settings, including Tanzania. This

TABLE 3. Multivariate Logistic Regression Analysis of Predictors of Dermatophytes

Variable	OR	95% CI	P Value	AOR	95% CI	P Value
Sex						
Female	1			1		
Male	1.98	1.22–3.22	.01	2.04	1.07–3.90	.029
Type of school						
Private	1					
Government	3.34	1.76–6.32	.001	2.27	1.04–4.98	.08
Type of family						
Single mother/guardian	1					
Both parents	0.64	0.31–1.35	.25	-----	-----	-----
Source of water						
Tap	1					
Lake/river/well	3.18	1.36–7.38	.01	2.49	0.87–7.10	.08
Reported towel sharing						
No	1					
Yes	1.25	0.65–2.39	.49	-----	-----	-----
Frequency of changing school uniform within a week						
Twice	1					
Once	1.33	0.81–2.20	.25	1.22	0.62–2.39	.55
None	2.97	0.97–9.02	.05	4.56	1.11–18.71	.035
Playground surface						
Not dusty	1					
Dusty	2.65	1.28–5.47	.01	1.71	0.71–4.13	.23
Reported playing with animals						
No	1					
Yes	2.13	1.28–3.56	.003	2.04	1.03–4.02	.038
Reported having family members with dermatophytes						
No	1					
Yes	10.56	4.57–24.41	.001	7.66	2.75–21.26	.0011
Reported sharing of bed sheets						
No	1					
Yes	5.62	3.34–9.45	.001	6.35	3.32–12.15	.001

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; OR, odds ratio

was evident in the present study whereby about one-third of children had dermatophyte infections. The observed prevalence was similar to the 30.4% and 33.3% reported among primary school children in Dar es Salaam and Kenya, respectively.^{2,6} Nevertheless, the reported prevalence was lower than what was reported in other previous studies conducted in Af-

rica – 59% in Ethiopia¹⁴ and 81.2% in Kenya, for example¹⁵. The observed differences could be explained by the differences in the study populations; in the previous studies, the majority of children were from slums and public schools, while the present study involved both public and private schools.

As has been previously observed elsewhere,¹⁵⁻¹⁸ the prevalence of dermatophyte infections in the present study was significantly higher among boys compared with girls. The higher prevalence among boys has been attributed to several factors, such as poorer personal hygiene, sharing of combs, playing in dust, sharing of towels, and interacting and playing with friends without considering personal hygiene.¹⁵⁻¹⁸ It should be noted that studies conducted in Nigeria and Egypt reported significantly higher prevalences of dermatophyte infections among girls compared with boys.^{19,20}

As observed in previously,⁹ tinea capitis was the predominant dermatophyte infection detected in this study. Male gender, having family member with a dermatophyte infection, not using tap water, and sharing combs significantly predicted tinea capitis. Similar observations have been reported from previous studies^{9,15,18,21,22} investigating primary school children.

This work was limited by a lack of capacity for fungal culture; dermatophyte infection was solely a clinical diagnosis, and this might have inflated the prevalence findings.

CONCLUSION

A high proportion of children with poor hygiene had tinea capitis. Health education tailored to boys regarding personal hygiene will significantly reduce the burden of dermatophyte infections. Further studies should be conducted to identify the patterns and distributions of the dermatophyte species that cause these common infections in children.

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Research Dissemination Strategies Used by Kenya Medical Research Institute Scientists

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ABSTRACT

Background: Dissemination of research findings is acknowledged as an important component of any research process. Implementation of research findings into practice or policy is necessary for improving outcomes in the targeted community. Given the context and dynamic environment in which researchers operate, there is need to find out existing gaps in terms of disseminating research findings to key stakeholders. The objective of this study was to investigate the health research dissemination strategies used by Kenya Medical Research Institute (KEMRI) researchers.

Methods: This was a mixed-method study employing concurrent sequence (use of both qualitative and quantitative) methods of data collection. The study was conducted in KEMRI's 10 centres spread in 3 geographical areas: Kisumu, Kilifi, and Nairobi counties. Potential respondents were identified through purposive sampling. Three inter-related data collection methods were employed in this study. These methods included key informant interviews with: (a) MoH officials from county government; (b) KEMRI researchers; and (c) key KEMRI departments, namely Corporate Affairs and the library. Additionally, secondary sources of information, such as scientific reports, KEMRI annual reports, and financial statements, were also reviewed.

Results: Publication of papers in peer-reviewed journals was mentioned as the most common method of dissemination of research findings. Scientists published in 353 peer-reviewed journals (or publishing houses) between the years 2002 and 2015. Over 92.7% of these publications were in international peer-reviewed journals. Conferences and workshops were also mentioned. In the absence of a centralised electronic KEMRI publication database, the research team extracted and collated a publication lists from KEMRI annual reports and financial statements. This was limiting since it did not have an exhaustive list of all publications by KEMRI scientists. Only 3 respondents mentioned having written policy briefs or engaged the media as part of dissemination channels. The media representatives cited the use of social media (Facebook and Twitter) as another channel that KEMRI scientists could exploit. Challenges in dissemination included lack of knowledge on research translation leading to poor synthesis of research outputs as well as selective reporting by the media.

Conclusion: Publications in peer-reviewed journals was the most preferred channel of communicating scientific outputs. Conferences and writing of policy briefs were the other sources of dissemination. We recommend that KEMRI dissemination channels should go well beyond simply making research available through the traditional vehicles of journal publications and scientific conference presentations but establish institutional mechanism which would facilitate extracting the main messages or key implications derived from research results and communicating them to stakeholders in attractive ways that would encourage them to factor the research implications into their work.

INTRODUCTION

Dissemination is acknowledged as an important component of the research process. The dissemination and implementation of research findings into practice is necessary so as to apply research findings to improve outcomes in the broader community.¹ Innovative models to facilitate more rapid uptake of research find-

ings into practice are urgently needed.² Previous studies indicate that a number of research findings which if implemented would have significantly improve health or behavioural outcomes, failed to be translated into meaningful public health interventions across multiple contexts.^{3,4} Barriers to dissemination and implementation may occur at multiple levels of research and health-

care delivery namely at the researcher level, patient level, organisational level, or the market/policy level.⁵

Moving the field of scientific dissemination forward will require studies that identify mechanisms and approaches to package and convey the evidence-based information necessary to improve public health and clinical care services in ways relevant to local settings and that balance fidelity and adaptation.³ Nonetheless, the communication of research findings in a rural sub-Saharan African setting is less straightforward and presents significant challenges with respect to literacy, language, logistics, and confidentiality. In recent years, the Internet and television have revolutionised dissemination as well as introduced new sets of challenges.⁶ There is need to find out what the challenges are in disseminating research findings, from researchers, Ministry of Health (MoH) officials and the media, who are key stakeholders in this process.

Interventions developed in the context of efficacy and effectiveness trials are rarely transferable without adaptations to specific settings and additional tools and guidance to support uptake and implementation. Therefore, research is needed to examine the process of transferring interventions into local settings, which may be similar to but also somewhat different from the ones in which the concepts were developed and tested. The most prevalent strategy for dissemination has been to target scientists to increase their dissemination efforts. A combination of education, incentives, and admonishments are required to encourage health scientists who develop and test incentives to also find innovative ways to disseminate results. This approach has however been criticised as being misguided on the basis that asking scientists to be central players in dissemination when they lack the necessary training and usually operate in organisational environments that lack the infrastructure and reward structure to motivate and support systematic dissemination, is unrealistic.⁶

As a necessary prerequisite for unpacking how information which can lead to intervention or service changes, we need to understand how and why information on physical and behavioural health, preventive services, disease management, decision making, and other interventions may or may not reach various stakeholders, or why they might not be able to utilise it when it reaches them. We need to understand what underlies the creation, transmission, and reception of information on evidence-based pharmacological, behavioural, genomic, policy and systems interventions.⁶ Successful dissemination of health information (including evidence about underutilised interventions) may occur quite differently depending on whether the audience consists of consumers, caregivers, practitioners, policymakers, employers, administrators, or other multiple stakeholder groups.⁷ Unless health research findings are communicated effectively, there will be a little chance of those changes happening.⁸ The question arises as to how those findings should be disseminated to them in a suitable format when they be-

come relevant. By practice, it is known that researchers at the institute publish their finds in various journals, but to the best of our knowledge, this has not been documented. The objective of this study was, therefore, to investigate and document dissemination strategies used by Kenya Medical Research Institute (KEMRI) scientists and their effectiveness to stakeholders.

METHODS

Study Area

This study was conducted in KEMRI's 10 centres located in Nairobi, Coast and Western Kenya. The institute is a state corporation established by an Act of Parliament as the national body responsible for carrying out research for human health in Kenya. The majority of these centres are located in Nairobi County, and they include the Centre for Biotechnology Research and Development (CBRD), Centre for Clinical Research (CCR), Centre for Microbiology Research (CMR), Centre for Public Health Research (CPHR), Centre for Traditional Medicines and Drug Research (CTDMR), Centre for Virus Research (CVR), Centre for Respiratory Diseases Research (CRDR), and Eastern Southern Africa Centre for International Parasitic Control (ESACIPAC). Other centres outside Nairobi include: Centre for Global Health Research (CGHR) in Kisumu County, Centre for Geographic Medicine Research – Coast (CGMR-C) in Kilifi County and Centre for Infectious and Parasitic Diseases Control Research (CIPDCR) in Busia County. MoH programme managers were targeted in the 4 counties where the KEMRI Centre are located. Journalists from media houses in Nairobi were purposefully selected for inclusion into the study.

Study Design

This was a mixed methods study employing a concurrent sequential method of data collection. That is, it involved the collection of qualitative and quantitative data simultaneously. A semistructured questionnaire and interview guide were the 2 tools that were used to collect quantitative and qualitative data, respectively.

Study Population

The total number of research staff as at the time of conducting the survey were 250 scientists who have diverse qualifications and skills in matters of health. In addition, there are over 300 technologists and technicians who provide research support to the scientific community. All the research scientists were eligible for consideration to participate in the study.

Sampling

The study established that at the time of undertaking the survey, a number of research officers were either out in the field collecting data or were officially on leave. Thus, all the researchers who were found at their respective workstations

were interviewed. No sampling of respondents was necessary. Potential respondents of the in-depth interviews were identified through purposive sampling. Researchers were identified on the basis of i) Principal investigators with more than 1 study concluded, ii) Scientists from the same centre working on different disease profiles to give diversity on thematic areas of interest iii) Scientists who have been in KEMRI for more than 7 years to give depth on issues of dissemination iv) Scientists who provided informed verbal consent. Also included in the interview list, were respondents from KEMRI's Corporate Affairs Department and the Library. Additional interviews were also carried out with health journalists from established media houses, as well as MoH representatives/heads of policy development departments at the county government levels to assess their uptake of health research findings from KEMRI researchers.

Data Collection Methods

The following 3 data collection methods were employed in this study. In-depth interviews with MoH officials from the county government as well as key KEMRI departments (Corporate Affairs and the library). Review of secondary sources of information such as scientific reports and KEMRI annual reports and financial statements. In-depth interviews with KEMRI researchers

In-depth Interviews with MoH Officials

An interview guide containing questions addressing the broad areas of the baseline study was formulated. These themes included 1) policy changes implemented in the last 10 years; 2) what influenced policy change; 3) interaction with KEMRI; (4) views on how interactive with KEMRI could be improved; 5) What research from KEMRI had benefited their work or any interventions they had implemented. Sociodemographic information of respondents was also collected. A total of 3 KIIs were carried out and were conducted in English.

Review of Secondary Sources of Information

In the absence of a centralised electronic KEMRI publication database, the research team extracted and collated a publication list from previous KEMRI annual and financial statements reports from the year 2002 to 2016. These annual and financial reports contained a list of publications by staff as part of the annexure section for each year under review and thus provided an objective and verifiable source document. However, it was found to be limiting since it did not have an exhaustive list of all publications by KEMRI scientists and in some instances had duplication of publications by the same authors. To examine the preferred journal and content of KEMRI publications, a content analysis was performed on papers published. A content analysis provided a means for objective, systematic, and quantitative consideration of published articles. It also allowed for an interpretation of the direction in which KEMRI scientists are taking in terms of priorities of publications. Two reviewers examined the list of

publications and coded them into pre-determined themes. A third reviewer was contacted whenever there was a disagreement.

Interviews with KEMRI Researchers, KEMRI Corporate Department, and Library

Key informant interviews (KIIs) were carried out targeting specific departments. The checklist consisted of questions relating to dissemination practices, preferences, and future demand for KEMRI research outputs. This survey targeted to conduct at least 5 KIIs per group, with an option of conducting more until a point of response saturation was attained. The main focus in these guides included methods used for data sharing; challenges in dissemination of research findings; interaction with the media and MoH; how that interaction can be improved; factors that have influenced research use in policy making; factors that have hindered research use in policy making; health issues popularly published; interaction with KEMRI researchers; research packaging by KEMRI scientists.

Data Management and Analysis

Qualitative data were transcribed verbatim. The team of qualitative researchers first familiarised themselves with the transcripts, after which independent coding was done and the codes collectively finalised for each tool. In case of a disagreement on a theme, a third party was called to break the deadlock. The conceptual model for considering diffusion, dissemination and implementation of innovations in health service delivery⁹ was used to tease out categorisation of the data collected.

Ethical Approval

Before the commencement of the survey, scientific and ethical approval was sought and received from the national Scientific and Ethical Review Unit (SERU), based at KEMRI. In addition, approval was sought from the directors of each of the 10 centres that constitute KEMRI. During the interview process, informed consent was obtained from the study participants. Additional consent was sought when interviews were to be tape-recorded. Permission to publish this manuscript was also received from the KEMRI Director's Office.

Data Limitation

At the time of conducting this survey, a number of scientists were out of their workstation on official duties. Repeated visits to the stations did not yield much in terms of interviewing more staff members. This was a limitation, especially when compiling the findings. In addition, KEMRI did not have a centralised electronic publication database which would facilitate data mining. The researchers were referred to online journals so as to compile an institutional list of publications. This resulted in duplication of effort. Furthermore, scattered database and profiles were located in different Centre and

TABLE 1. Sociodemographic Characteristics (N=37)

Description	n (%)	95% CI
Sex		
Female	11 (29.8)	17.5%–45.8%
Male	13 (35.1)	21.8%–51.2%
Did not disclose ^a	13 (35.1)	21.8%–52.1%
Age in years		
30-34	2 (5.4)	1.5%–17.7%
35-39	4 (10.8)	4.3%–24.7%
40-44	4 (10.8)	4.3%–24.7%
45-49	4 (10.8)	4.3%–24.7%
Above 50	10 (27.0)	15.4%–42.9%
Did not disclose ^a	13 (35.1)	21.8%–51.3%
Educational level		
Secondary	1 (2.7)	0.4%–13.8%
College	2 (5.4)	1.5%–17.7%
Bachelor's	2 (5.4)	1.5%–17.7%
Master's degree	7 (18.9)	9.5%–34.2%
PhD	18 (48.7)	33.5%–64.1%
Did not disclose ^a	7 (18.9)	9.5%–34.2%

^aRepresents the number of respondents that did not give responses with regard to sex, age, and education level

Abbreviation: CI, confidence interval

departments. The Monitoring and Evaluation (M&E) Department of KEMRI had a more organised but not exhaustive list of staff publications. The list of publications from this department formed the basis of secondary desktop review as it was conveniently located.

RESULTS

Quantitative Findings

A total of 37 KEMRI scientists were interviewed during the survey. Their sociodemographic profiles are shown in Table 1.

Publications in Peer-Reviewed Journals

A total of 1,639 publications were published by KEMRI researchers between the period 2002 to 2016. During the period under review, KEMRI's scientists published in 353 peer-reviewed journals of which 92.7% were published in international journals. The East African Medical Journal was

the only journal from a developing country listed among the top 10 preferred journals, accounting for 7.3% of KEMRI publications. Among the top 10 journals preferred by KEMRI researchers, the *PLoS* series of journals accounted for 18.7%, *Malaria Journal* (13.7%), while the *American Journal of Tropical Medicine and Hygiene* accounted for 12.8%, as shown in Table 2.

All the respondents (n=37) reported they also attend and present the findings of their research outputs at international conferences. The choice of which conference to attend and funding depends on researchers preferences and the availability of additional funds. The most commonly mentioned conference include American Society of Tropical Medicine and Hygiene (ASTMH) Annual Conferences (48.7%) as well as the annual Pan Africa Mosquito Control Association (PAM-CA) conference (27.0%). Table 3 profiles the most commonly attended conferences as reported by the respondents.

Qualitative Findings

Publication of papers in peer-reviewed journals was the frequently mentioned method of dissemination of KEMRI research findings. Other dissemination channels included presentations at conferences, seminars, workshops and generation of reports to KEMRI and research clients. Only a few participants mentioned having written policy briefs or engaged the media.

Male researcher, Kilifi Centre: *“Scientists don't have training in writing media and policy briefs. That could be 1 reason why we don't use those methods... I think there are many levels of approval before one can use the media. That is discouraging, so mainly we will just publish in journals”.*

Respondents reported that they were not motivated to publish. The numbers of publications had no influence on job promotions or assignment of responsibilities.

Female researcher, CPHR: *“...honestly can't say that as a KEMRI scientist I am motivated to publish. We do it because it's part of the job. The promotions are not even based on that. You will see someone with 1 publication getting promoted and another with 10 getting stuck... We get more recognition outside than right here”.*

Respondents involved in the IDIs expressed their frustrations with journals citing long turnaround periods, which sometimes render data obsolete. Other issues of concern included a lack of knowledge about research translation leading to poor synthesis, limited funding to attend conferences, and selective reporting by media.

Male researcher, CMR: *“...sometimes I think we people in science talk to ourselves and I think it is important for us to learn to simplify our language and our findings so that you know it is usable to the other people”.*

TABLE 2. The Top 10 Peer-Reviewed Journals in Terms of KEMRI Publications Between 2002 and 2015

Peer-Reviewed Journals	Number Published by KEMRI Scientists	Percentage	Impact Factor Information	
			Impact Factor	Notes/Source of Information
PLoS series of Journals	138	18.7 %	-	PLoS does not consider Impact Factor to be a reliable or useful metric to assess the performance of individual articles.
Malaria Journal	101	13.7 %	3.079	malariajournal.biomedcentral.com /about
American Journal of Tropical Medicine & Hygiene	94	12.8 %	2.740	http://www.ajtmh.org/journal-facts
BMC series of Journals	65	8.8 %	-	The BMC series is a collection of high-quality, peer-reviewed journals covering all areas of biology and medicine, focusing on the needs of the research communities which they serve.
Tropical Medicine & International Health	71	9.6 %	2.519	http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1365-3156
Journal of Infectious Diseases & Immunology	65	8.8 %	1.69	www.esciencecentral.org/journals/infectious-diseases-and-therapy.php
Lancet series of Journals	65	8.8 %	21.372	www.journals.elsevier.com/the-lancet-infectious-diseases/
East Africa Medical Journal	54	7.3 %	0.11	www.researchgate.net/journal/0012-835X_East_African_medical_journal
AIDS Journal	42	5.7 %	5.554	en.wikipedia.org/wiki/AIDS_(journal)
Transactions of Royal Society of Tropical Medicine & Hygiene	42	5.7 %	1.909	academic.oup.com/trstmh/
Total	737	100%		

Male researcher, C-GHRC: *“I think there is a lot of bias. Coverage will be given to Zika virus, Ebola or when there is an outbreak of a disease... So you will find others equally detrimental to health are left out”.*

The majority of researchers pointed out that there is a disconnect between the KEMRI departments responsible for research dissemination and the centres, which further aggravates the lack of research being taken up as policy or practice.

Female researcher, CRDR: *“There is a department... which is supposed to link us to the media or people out there. They are the ones to take up the issue. Now that department has not been doing that. I have not heard”.*

Male researcher, CBRD: *“Now if someone is working in that department and they don’t come around they don’t find the interesting finding that is 1 reason why it has not worked... there is a disconnect”.*

Male researcher, CTDNR: *“... there is a particular department... like now in marketing. You should take [up] the challenge because during eeh... events that is where you should engage the KEMRI scientist to come and maybe speak or talk about what they are doing. KEMRI is a research institution, so why are you not engaging the scientist in every one of those activities?”*

Policy and Practice Changes Impacted by Research Done at KEMRI

In-depth interviews with KEMRI scientists revealed that most of their research had influenced changes in policy and practice in the country. It was interesting to note that this view was not necessarily acknowledged by the MoH officials. The MoH did not attribute any changes in policy and practice with research done at KEMRI. This could partly be attributed to the frequent reshuffling of officers in the various ministries

TABLE 3. Most Commonly Mentioned Conferences and Seminars Attended by KEMRI Staff to Disseminate Research Findings (N=37)

Name of Conference	Meeting Location (Local/Regional/International)	Host/Convener	n (%) ^a
American Society of Tropical Medicine and Hygiene (ASTMH) Annual Conference	International	American Society of Tropical Medicine and Hygiene (ASTMH)	18 (48.7%)
Drugs for Neglected Diseases Initiative (DnDi) Annual Conference	International	World Health Organization/DnDi Programme	12 (32.4%)
Pan Africa Mosquito Control Association (PAMCA) Annual Conference	International	PAMCA	10 (27.0%)
The Union World Conference on Lung Health	International	The International Union Against Tuberculosis and Lung Disease	8 (21.6%)
MoH-related conferences/ workshops/seminars	Local	Various departments of the Ministry of Health, Kenya	16 (43.2%)
KEMRI Annual and Scientific Conference (KASH)	Local (hosted by KEMRI)	KEMRI	15 (40.5%)
East African Health and Scientific Conference and Medical Exhibition	Regional	East African Health Research Commission (EAHRC)	5 (13.5%)
African Society for Laboratory Medicine (ASLM) Annual Conference	Regional	(ASLM)	3 (8.1%)

^aSome participants provided multiple responses.

as well as limited access to published material, as mentioned by the respondents.

Male researcher, CCR: "I can't boast about it as my work, but together with others it has contributed like change of policy from chloroquine to SP, from SP to ACTs and right now we are working on the issue of correcting ACTs into schistosomiasis. It's still on an early stage, but I believe that there are discussions on very high levels... even the transfusion guidelines in Kenya. The studies that we did in Siaya yeah have contributed into those guidelines because initially, it was like if you have haemoglobin of 5, but our studies showed transfuse the patient and not the lab result. Yeah (Laughs)"

Male researcher, CVR: "For example, look at the HIV testing among infants that started as a research thing around here initially around 2006 all the way

to 2008. Do you know that programme was taken up by the ministry, and now it is a national programme that's how the infants are being tested for HIV all over the country? That's a clear area that showed that research showed that this can work because that is molecular testing".

Barriers to KEMRI Research use by Decision Makers

Majority of the MoH officials and media journalists mentioned poor synthesis of research as a major factor contributing to research not being taken up as policy or practice. The scientific language limits the audience to fellow researchers who may not necessarily have a say in policy direction, thus the gap.

Female Journalist, 31 years: "well eeh.. scientist you usually communicate in a very technical language, and journalist eeh communicate in a very simple easy to understand language everybody can understand

so aaaah I know the scientist eeh... communicate in that kind of language because of the nature of their work. It will be good for them if they communicate in a language that eeh it is eeh friendly to the journalist and... for to the public”.

Male researcher, EASCIPAC: *“... I think it is a problem everywhere. Scientists conduct their research all the time, everywhere in the whole world, but... translating this item into policy findings... there is a disconnect between the researchers and the policy makers. Sometimes even the policy makers do not understand your language so I know in certain institutions they form partnerships with private companies to uptake the data coming from their scientists and convert them into a product that is sellable so that way we are not saying we gave our data to the Ministry of Health... and they did not act on it so KEMRI in itself through this private companies can actually make a product out of it...”*

Female respondent, 33 years, MoH: *“You know, we don’t have access to Internet here... people don’t know where to find those journals... Even the reports that people bring here are collecting dust. But if you come to the office, call the officers concerned and share your results, then I think that’s the best way to proceed. People can ask questions, and everyone is satisfied and understands what it is about”.*

Other impediments mentioned included the choice of dissemination method, financial implications involved in implementing policy changes, donor-driven research that does not address local needs, priorities of media house and policy makers, delays in ethical clearance from KEMRI and ‘media phobia’ from scientists.

Female Journalist, 31 years: *“I don’t know whether the scientists have been sensitised about how to deal with the journalist or they do not know how the journalist profession works... so they are quite hesitant when it comes to providing this research information that the scientist has undertaken. So much valuable information is not out there because scientists are afraid to talk to journalists. We need to work together”.*

Female researcher, CCR: *“...for donor-driven research, it mostly starts as a collaboration, but later, they want to bully and boss you out, even overtake you as the local researcher and run the show. Now, in the end, your objective becomes a small component of the study. So when you want to sell the idea, no one buys it... Because what does it address anyway?”*

Male researcher, CBRD: *“We do not have experience or training in writing policy briefs or media briefs so in the end, who are we targeting? We will publish in*

peer-reviewed journals, but not everybody has access to that. Not everyone is going online to look. So there is a gap; there are important people not accessing this data. How will it even inform policy then?”

Suggested Way Forward by Researchers

Researchers mentioned the need to have systems put in place in KEMRI that ensures dissemination of research results. Another key factor mentioned was that researchers need more training on re-packaging of findings to improve chances of research products and outcomes being taken up as policy or practice. Other factors mentioned included functional links between the KEMRI researchers and the corporate department; advocacy for KEMRI research findings to partners and stakeholders; having in place a digital repository in the library; and use of social media.

Male respondent, 45 years, MoH: *“There was a time representatives from KEMRI used to attend our meetings, and it worked well because we were informed of what the scientists are doing. That was a while back. KEMRI now has no visibility here”.*

Male researcher, CPHR: *“You see research and policy are somehow detached, especially where institutions don’t work like together they are working as separate entities. So for us, I think one of the things is to become proactive in all the areas like doing a lot of lobbying...”*

Female Librarian: *“...we should be able to reflect on what KEMRI does and what KEMRI has been doing for the past, and it would just be nice if someone can access from wherever. We need a digital institutional repository which will work hand in hand with the digital library. I believe, if implemented, it will create a good working information library system that will now uplift our digital level on the electronic part... once we start working with departments, we will be able to get information from centres and the researchers. The repository will bring this together...”*

DISCUSSION

This study provides insights into strategies used by KEMRI researchers and barriers that hinder the dissemination of research findings. The insights are summarised as follows.

Dissemination Channels

This survey established that KEMRI scientists’ most preferred avenue of dissemination is through publication in peer-reviewed journals. For researchers, the assessment of productivity and contribution to science is highly pegged by quantifiable means such as publications. Given that the success of a scientific paper partly depends on its outcome, researchers tend to publish their findings in high impact peer-reviewed journals^{10, 11} as well as in open access options¹² that

provide the likelihood of it being cited by other authors. By extension, publications that appeared in high-end peer-reviewed journals were associated with knowledge prowess on a particular subject or discipline. Apart from contributing to the knowledge base, publications also inform tenure and future funding directions.¹³

Best Practices in Dissemination of Research Findings

Only 3 (8.1%) scientists reported that they had exposure to media engagement (television and radio shows). From the findings, the publication of research findings in local print and electronic media was limited. Use of social media was cited as another channel that is becoming popular with KEMRI scientists. This survey did not establish the impact of the use of social media on the dissemination or advertisement of research findings.

Uptake of Health Research Findings

This study established that there was a disconnect between researchers' work contributing to national policy formulation and inputs into decision making processes. Scientists pointed out circumstances in which their outputs were used to inform policy and practice. However, the potential consumers of KEMRI's research findings, namely the policy makers and journalists reported that they did not share this view. Synthesis of research into policy/practice by government bodies, organisations and other stakeholders is gravely undermined by the different levels of research awareness and experiences within these teams.¹⁴

Barriers to research dissemination and implementation may occur at multiple levels, namely individual researcher level, organisational, and at market/policy level.¹⁵ These barriers are discussed in the subsequent paragraphs.

At Individual Level

The instructions to authors usually guide the scientific language to be used and how the information is packaged.¹⁶ Many researchers have limited exposure to media. Only a handful of scientists have had previous training in writing and handling media. A strategy is required to overcome '*media phobia*' by scientists. Potential users of research outputs face challenges of synthesising research articles arising from various KEMRI publications. This is consistent with studies conducted elsewhere.^{15,17} This problem is partially aggravated by the high impact journals which have structured guidelines that emphasise on form-over-substance.

Organisational Level

Prior to a change in policy directive, all publications and related outputs had to seek ethical approval from the Office of Director KEMRI. This resulted in publication delays and a backlog of manuscripts, as researchers sort additional authority-to-publish from the institute. By the time of

undertaking this survey, there was a policy directive that manuscripts should be cleared for publication by the centre scientific committees. This was aimed at reducing pile-ups of manuscripts and the time lags that it takes to publish them. One of the participants mentioned that a number of studies carried out in KEMRI are funded by external donors, hence by extension, they partially determine the type of research to be conducted as well as where the findings will be published. Empirical studies have augmented that local utilisation of research outputs will occur once research can address local needs.^{18,19} This can only be realised if the national and county governments prioritise their research needs and source for funding for the same.

Market and Policy Level

The current survey established that priority changes by policy makers and preferences to certain health stories also contributed to the "slow" uptake of KEMRI researchers. Usually, these changes and preferences are not communicated to researchers. This gap probably explained why many KEMRI publications are not used to inform policy and practice.

RECOMMENDATIONS

From this study, the following are the recommendations:-

1. Establish knowledge management and knowledge translation mechanisms at the institute to facilitate the collation, synthesis, packaging, and communication of research findings to decision makers and members of the public.
2. Encourage extensive use of social, online, and print media. This will offer a convenient way of accessing evidence anywhere at any given anytime. These platforms will also offer the chance of a back-and-forth engagement and not just passive dissemination.
3. Continue building on existing dissemination structures and processes which can help the uptake of research outputs. These include the annual KEMRI Annual Scientific Health (KASH) conferences and use of in-house bulletins such as the Bulletin and the Researcher. These will act as aids towards influencing decision making processes, especially when policy makers and implementers require evidence within the shortest period possible.

CONCLUSION

Dissemination strategies at KEMRI should go well beyond making research available through the traditional vehicles of journal publications and scientific conference presentations. This survey established that there are a number of publications generated for local context were of high quality (methodology). Thus, we postulate that it is not the ab-

sence of information, but lack of an institutional mechanism which would facilitate extracting the main messages or key implications derived from research results. The re-packaged or synthesised research publications would possibly be communicated effectively to targeted groups of decision makers and other stakeholders using innovative ways as this would encourage them to factor the research outputs into policy formulation as well as guide practice.

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Post-Ebola Awakening: Urgent Call for Investing in Maintaining Effective Preparedness Capacities at the National and Regional Levels in Sub-Saharan Africa

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ABSTRACT

Background: The 2014 Ebola outbreak reminded us of the importance of preparedness for addressing health security threats. Learning from this experience, we aim to (1) enhance the understanding of preparedness by policy and decision makers, (2) discuss opportunities for Africa to invest in the prevention of health security threats, (3) highlight the value of investing in preventing health security threats, and (4) propose innovations to enhance investments for the prevention or containment of health security threats at the source.

Methods: We used observations of governments' attitudes towards investing in preparedness for health security prevention or containment at the source. We conducted a literature review through PubMed, the World Wide Web, and Mendeley using the keywords: "health emergency financing", "investing in health threats prevention", and "stopping outbreaks at the source".

Results: Countries in sub-Saharan Africa invest inadequately towards building and maintaining critical capacities for preventing, detecting, and containing outbreaks at the source. Global health security emergency funding schemes target responses to outbreaks but neglect their prevention. Governments are not absorbing and maintaining adequately capacity built through GHS, World Bank, and development aid projects – a lost opportunity for building and retaining outbreak prevention capacity.

Recommendations: Governments should (1) allocate adequate national budgets for health honouring the Abuja and related commitments; (2) own and maintain capacities developed through International Development Aids, OH networks, research consortia and projects; (3) establish a regional health security threats prevention fund. The global community and scientists should (1) consider broadening existing health emergency funds to finance the prevention and containment outbreaks at the source and (2) Strengthen economic analyses and case studies as incentives for governments' budget allocations to prevent health security threats.

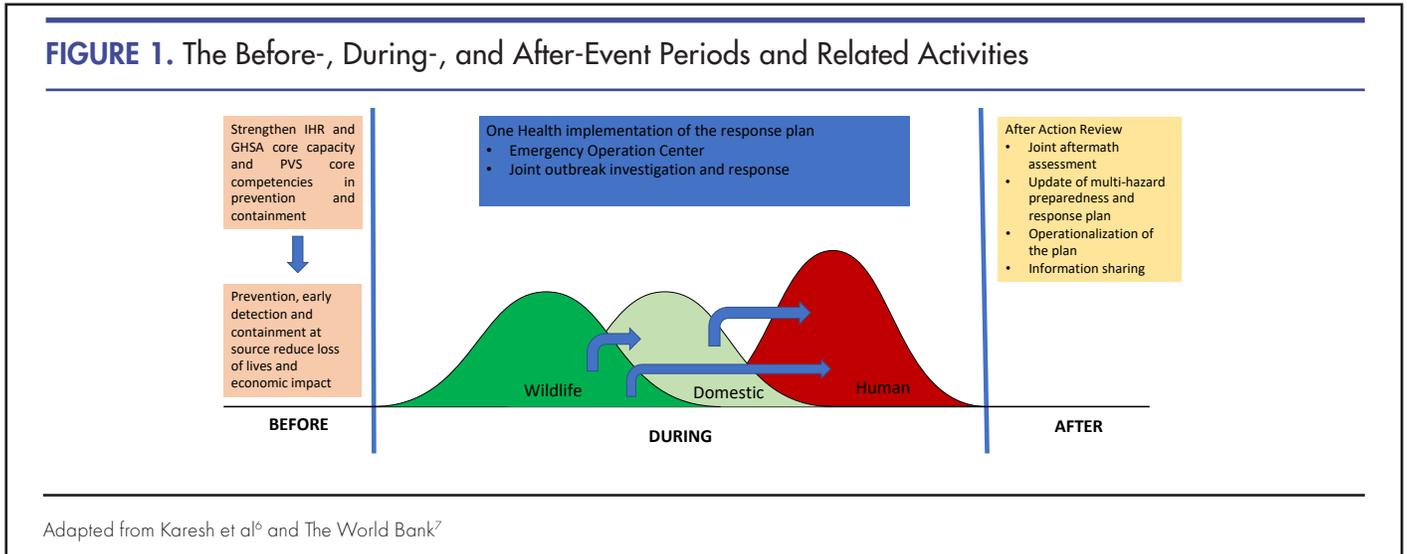
INTRODUCTION

The 2014 Ebola outbreak shock prompted the establishment of the Global Health Security Agenda (GHS). It exposed major health systems weaknesses, common to sub-Saharan African countries, including severe shortages of skilled health workers and gross systems unpreparedness to prevent, detect, and contain outbreaks at the source. Fear and panic due to unpreparedness were compounded by superstition, perceptions and practices among affected populations impeded effective disease containment policies including safe burial.¹⁻⁵

We have observed that major huddles to systems strengthening arise from misconceptions and insufficient understanding of the full spectrum of activities necessary for effective preparedness against health threats among policy and decision makers, and unappreciation of the value of investing in long-term systems strengthening rather than short term interventions with immediate results.

We provide this opinion piece to provoke rethinking and encourage Policy and decision makers to value and invest in preparedness for health threats.

FIGURE 1. The Before-, During-, and After-Event Periods and Related Activities



UNDERSTANDING PREPAREDNESS FOR OUTBREAKS

Natural or human environmental disturbances may trigger spillover of pathogens from the wild to domestic life and eventually to human beings.^{6,7} Failure to rapidly and adequately detect and respond to such spillover can lead to pathogen amplification in animal and human populations, resulting in uncontrollable epidemics or pandemics. This spectrum can be categorised as “before”, “during”, and “after” outbreak periods. Figure 1 summarises the capacities requirements for each period.

THE “BEFORE-OUTBREAK” PERIOD

The “before-outbreak” period is a peaceful time, which makes it optimal for strengthening capacities and collaborations among the human, animal, and environmental health systems to prepare to prevent or contain any outbreak at the source as provided by International Health Regulations (IHR) and World Organization for Animal Health (OIE) Standards on the performance of veterinary services (PVS).^{8,9}

Essential capacities, as summarised in figure 1 (arrows showing pathogen spillover) include disease surveillance and detection, risk assessment and prediction, developing and implementing risk reduction strategies and interventions, mapping and monitoring risk behaviour in response to preventive interventions over time.^{1,2} This is the best period for multisectoral coordination and collaboration to assess, build, and maintain a vibrant mixed disciplines and skills workforce, enhance syndromic surveillance capacity for real-time reporting, and establish joint activities among animal and human health workers teams, hence strengthening multisectoral coordination and collaboration.^{7,10,12} It offers the opportunity to engage communities (traditional and spiritual leaders) and anthropologists to build community trust and strengthen community participation to avoid the kind of mistrust, beliefs and practices fueling outbreaks as evidenced during the 2014 Ebola outbreak.¹¹

It is optimal for engaging the private sector to learn from their best practices, including regular simulation exercises in order to prevent or minimise the negative economic consequences of outbreaks on business, like what happened with Ebola, SARS and previous pandemics.¹³⁻¹⁵

Engaging national finance ministries and departments responsible for national budget allocations, to identify needs, and generate or revise annual national preparedness plans and strategies during this period will enhance their appreciation of the value of prevention before an outbreak especially if presented with economic analyses that highlight the size of potential savings is essential.¹⁶⁻¹⁹

“DURING OUTBREAK” PERIOD

Usually, human case reporting to national health authorities and the World Health Organization (WHO), triggers national and global response and allows access to global emergency funds, while wildlife events are often neglected.

A well-prepared workforce (sufficient in skills and numbers), updated response plan, standard operating procedures (SOPs) and protocols for field epidemiology and laboratory investigations, case identification, management, and contact tracing are necessary during this period. A functional Emergency Operations Centers (EOC) is required to provide responsible leadership with clear lines of command and daily reporting of actions and behaviour of the outbreak. There is growing evidence that good multisectoral coordination optimises mobilisation and use of resources; enhance efficiency, transparency, accountability and the application of effective national and regional policies that minimise negative economic impact.²⁰⁻²³

FIGURE 2. Active Routine Prevention, Detection, and Response Reduce Outbreak Size and Associated Social and Economic Costs

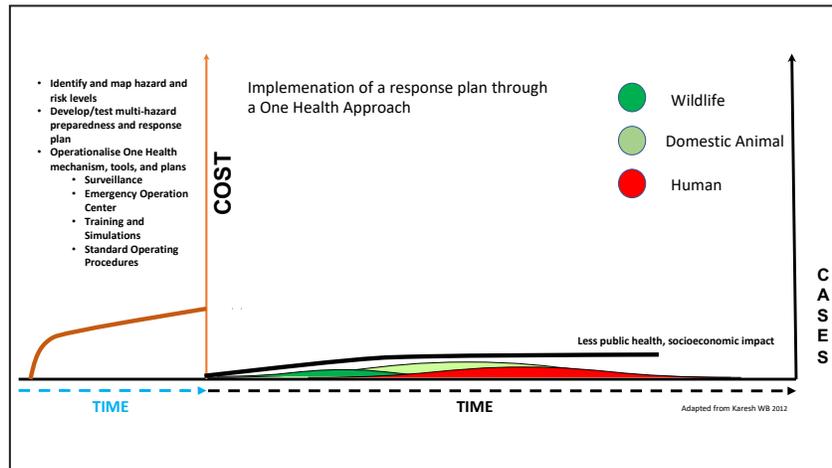
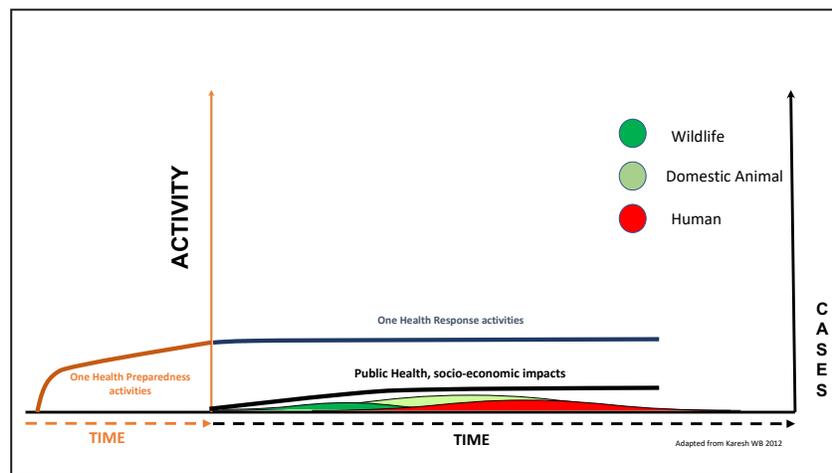


FIGURE 3. Sustained Routine Prevention and Detection Results in Minute Outbreaks and Governments' Savings



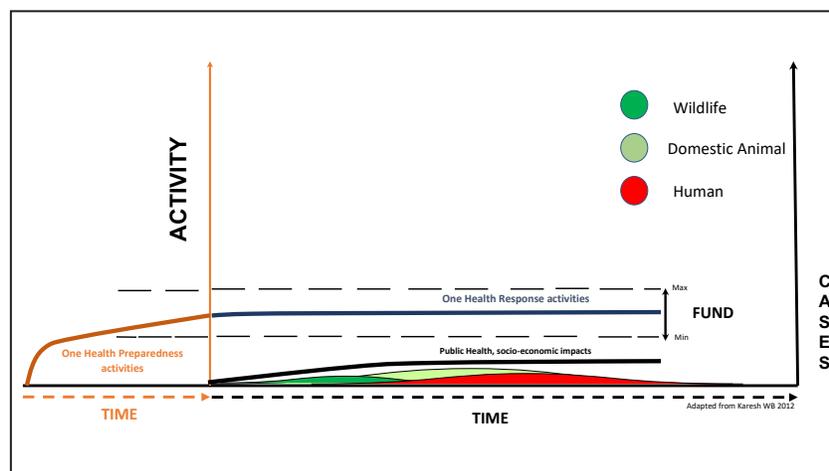
THE "AFTER-OUTBREAK" PERIOD

The "after-outbreak" period is for conducting thorough multisectoral After-Action Reviews (AAR) to determine the strengths of the response and identify related capacity gaps. Findings and lessons learnt are useful for reviewing the preparedness and response plans, response protocols, SOPs and strengthening the operational systems, for future responses. AAR further identifies important research gaps and informs on the effects of existing national and regional policies, guiding their revision.

VALUE OF INVESTING IN PREVENTION AND EARLY DETECTION

There is unequivocal evidence in human and veterinary medicine that prevention is better than cure/response and strategies for disease prevention have been defined.²⁴ Vaccination programmes have provided cost-effective disease prevention, eradication and significantly reduced related death and disabilities.²⁵⁻²⁸ Unfortunately, African governments invest inadequately towards building preventative capacities and implementing preventive interventions during the "be-

FIGURE 4. Funding to Maintain Effective Preparedness, Prevention, Detection, and Response Activities



fore-outbreak” period since the results of this investment are not immediate and visible. Achieving the Abuja declaration goal of 15% allocation for health has been slow.²⁹⁻³¹ Consequently, infrastructure for disease prevention, including laboratories, epidemiological surveillance and research receive inadequate African financial support and heavily rely on external financing. Routine disease prevention receives negligible budgets, and there are far too few health workers in Africa to efficiently and adequately manage the collective burden of illness and injury.^{1,4,29-31}

Effective surveillance and early warning systems operating routinely during the “before event” period (Figure 2 brown line) will trigger early actions preventing or containing outbreaks at the source (Figure 2 black line), reducing the sizes and impact of the outbreak considerably in wildlife (green), domestic animals (yellow) and humans (red). Related social and economic costs become minimal and manageable, as indicated by the black line in Figure 2.

Figure 3 shows a hypothetical situation where the routine cost of continuous One Health preparedness actions (brown and blue continuation) allows prompt detection and containment at the source resulting in less public health and socioeconomic impact (black line). In Figure 4, we hypothesize that the amount of money required to invest and maintain a vibrant prepared workforce and related infrastructure will fluctuate between a minimum during peacetime (dotted lower line) and a maximum during outbreaks (upper dotted line) but remain within limits affordable to national budgets. Investing in routine preparedness will enable countries to reduce epidemics to miniature events (Figure 3 and 4 green, yellow and red). Maintenance of the vibrant prepared workforce and systems’ infrastructure will, therefore, strengthen the resilience of health systems against health threats.

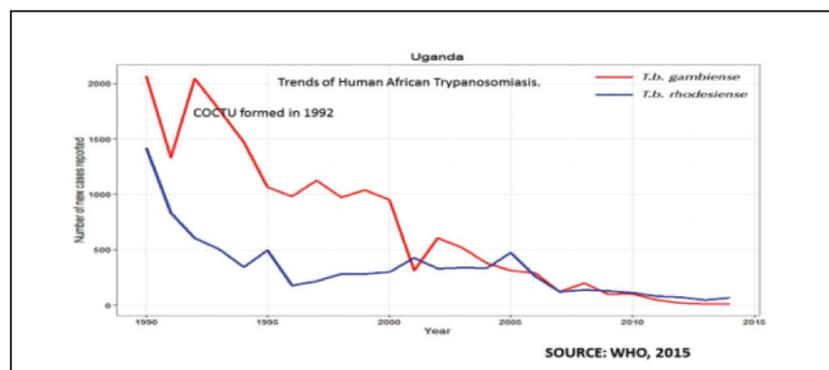
Uganda is exemplary in that it has suffered 4 outbreaks

between January and December 2017, which could have amplified into epidemic levels threatening the East African region. Two large epidemics were stopped and declared as ended (Highly Pathogenic Avian Influenza (HPAI) 15 January to 19 August 2017; Marburg 19th October - 8th December 2017). The others appeared singly and sporadically always contained at the source. Expenditure data, only available for the Marburg outbreak, indicates that Uganda spent Shillings 5.2 billion equivalent to \$ 1.0 million (2018-dollar value). Uganda has stopped and contained human trypanosomiasis outbreaks, previous Ebola outbreaks and these other recent outbreaks at the source by applying a multi sectoral One Health (OH) approach with limited funding.²⁰⁻²² Okello and others have also shown the efficiency and effectiveness of multisectoral coordination mechanisms in preventing and controlling health threats in Nigeria, Tanzania and Uganda.²³ The Uganda Emergency Operations Center (EOC) estimates that a multisectoral OH rapid response team, comprising a veterinary officer, case management physician, social mobiliser, wildlife officer, environmental health officer and epidemiologist using 2 vehicles and drivers to respond to an outbreak within.

In Uganda, the frequency and case fatality caused by epidemics of human trypanosomiasis have rapidly declined following the establishment of the Coordination Office for the Control of trypanosomiasis (COCTU) in 1992²¹⁻²² (Figure 5).

A 3-pronged multisectoral strategy of (1) controlling the vector using both traps and spraying of animals (animal interventions), (2) reducing pathogen density by identifying and treating infected animals, and (3) identifying and treating human cases (human interventions) was applied. Trypanosomiasis is on the verge of elimination in Uganda 27 years after introducing the preventive strategy. Policy and decision makers can learn from the long-term investment (27 years) and long-term maintenance of routine activities for prevention,

FIGURE 5. Trends of Human African Trypanosomiasis, Uganda 1990 to 2015



surveillance, case detection and treatment, with community engagement.

At the global level, major achievements in preventive efforts against human and animal diseases have been the eradication of small-pox and rinderpest, respectively.^{30,31}

RECOMMENDATIONS

Adequate National Budget Allocation

The global community (development agencies, philanthropists and donors) need to work with the WHO and OIE to urge African countries to honour their commitments to invest in health systems strengthening, with stronger ownership and leadership reducing dependency on foreign aids. Allocating 15% of their budget for health and 1% of their GDP for research would allow institutionalisation of capacities built by projects and networks and boost efforts addressing gaps identified through the Joint External Evaluation (JEE) and highlighted by the 2014 Ebola outbreak.

Establishment of a Regional Health Emergency Prevention Fund (RHEPF)

Regional governments facing common threats like the East African community under threat from hemorrhagic syndromes like Ebola, Rift valley fever, Marburg and Crimean Congo Hemorrhagic fevers bear responsibility and motivation to create a regional Prevention Fund aimed at containing disease outbreaks at the source. Ebola should also motivate African countries as a region to create such a fund. An RHEPF has the potential of reducing substantially the overall cost of response, as demonstrated by the case of Uganda.

National multisectoral coordination and collaboration mechanisms provide opportunities to monitor and thoroughly document the results and how funds are utilised. Mechanisms for servicing the fund should be explored, including member states contributions. This is an opportunity to build the essential backbone of the Africa CDC. Donors and devel-

opment aid agents may set complementary levels supporting governments' contributions as part of strengthening One Health approach institutionalisation for transparency and accountability. The fund will invigorate Africa CDC's activities and strengthen its role of providing technical assistance and leadership on innovative strategies for preventing and controlling diseases in Africa. The regional fund may operate through open competitive calls, with clear eligibility criteria in order to maintain quality, strengthen national preparedness capacity, ownership and allow monitoring and documenting achievements over time.

Global Health Emergency Prevention (GHEP) Fund

We recommend expanding the scope of the existing global health emergency funds including the UN Central Emergency Response Fund (CERF-2006), The World Bank Pandemic Emergency Financing Facility (PEF), and the WHO's Contingency Fund for Emergencies (CFE) to include financing preparedness capacity building. Their current scope is limited to financing countries in crisis and does not catalyze investing in routine preparedness capacity building.

CONCLUSION

African governments bear the responsibility of protecting their populations from health threats and, therefore, cannot afford to wait for another Ebola-like event or to neglect the looming threat of antimicrobial resistance. Realising a new public health order for African health security requires investing in preparedness to shield Africa from the catastrophic consequences of uncontrolled health threats.³² Africa awaken!

Disclaimer: The authors' views, and the opinions expressed in this article do not necessarily reflect the official views and positions of the United States Agency for International Development (USAID), the United States Government, or any particular organisations, including authors' institutions of affiliation.

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