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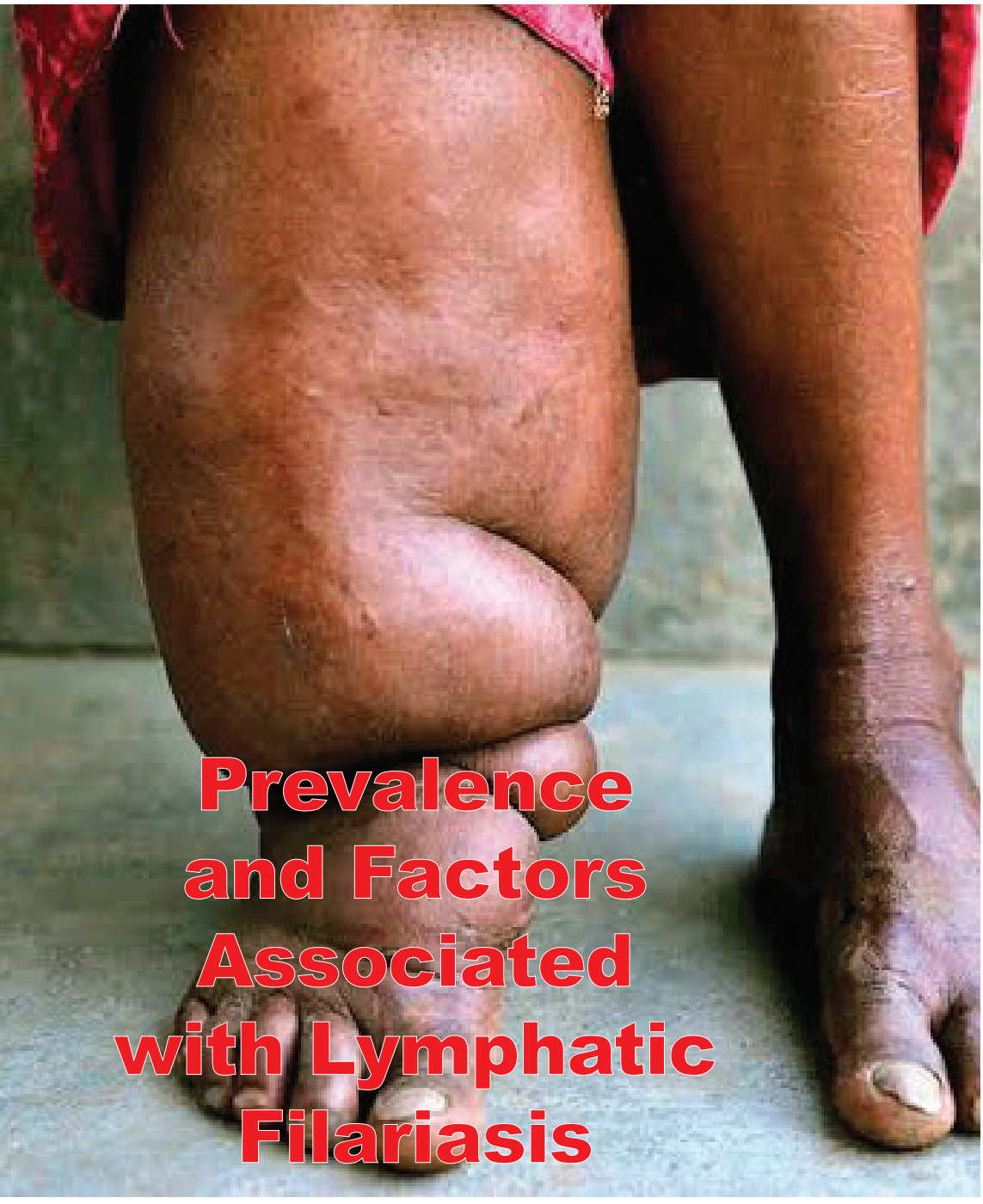

Prevalence and Factors Associated with Lymphatic Filariasis

ESSENTIAL FEATURES

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Contents

Integrated Disease Surveillance and Response (IDSR): Cumulative Report for Three Months, October – December 2023 (Epidemiological week 40 - 52)

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ABSTRACT

Introduction: The Ministry of Health continued to carryout surveillance of reportable diseases and conditions. This paper reports the cumulative data for the period of 3 months from October to December 2023, which are World Health Organization (WHO) epidemiological weeks 40-52. Data were analyzed to assess regional and national performances in terms of timeliness and completeness reporting as well as determining the cumulative number of cases and deaths, and distribution by month and region. Performance was assessed based on the set national standard of ≥ 90%.

Analysis: All 26 regions of Tanzania Mainland submitted weekly reports to the national level with an overall average performance for all months of 94.4% for timeliness and 97.8% for completeness. Cumulatively, a total of 183,521 cases and 32 deaths were reported for all IDSR immediate reportable diseases and conditions. The most commonly reported condition was diarrhea accounting for 56.6% (103,791) of all cases and was reported from all 26 regions. Majority of diarrhea cases were reported from Dar es Salaam 8,535 out of 103,791 (9.2%). Other regions reporting high numbers included Dodoma (8.1%), Mara (7.1%) and Morogoro (5.8%). The months of December had the highest number of cases (67,325; (36.7%)). Of the 32 reported deaths, majority were caused by Severe Acute Respiratory Illness (SARI) (n=19, 59.4%). The condition with highest case fatality rate was suspected cases of cholera with (3.0%) 13 of 430 persons dying from suspected cholera.

Conclusions: The IDSR analyzed data for October to December 2023 (WHO epidemiological week 27-39) showed that the performance based on timeliness and completeness were high based the set national standard of ≥90%. This is encouraging that the Government is better position as the system could manage to detect and report for immediate response to avert disease outbreak to happen. On the other hand, there is an urgent need for the Government to instituting new and reinforcing available preventive and control measures against diarrhea and pneumonia as the two continued to be the leading reportable conditions. Based on high fatality rate of cholera, the Government need reinforce preventive measures such as ensuring community drink and using safe water, washing hands often with soap and safe water (i.e., before, during and preparing food, before eating and after using toilet), safely management of sanitation facilities (using toilet), and cooking food well, covering and eating hot food.

INTRODUCTION

In Tanzania surveillance for reportable diseases and conditions under the Integrated Disease Surveillances and Response (IDSR) are electronically collected, and published weekly and monthly under the Ministry of Health (MoH). It should be noted that IDSR is a strategy for multi-disease surveillance of selected priority diseases or conditions. It links the community, health facility, district and national levels, for providing immediate information for helping public health managers and decision-makers improve detection and response to the leading causes of illness, death, and disability in African countries. The present paper reports cumulative IDSR data for a period of 3 months of October to December 2023, that corresponds to WHO Epidemiological week 40-52. Data were analyzed to assess the national and regional performances in terms of timeliness and completeness reporting as well as determining the cumulative number of cases and deaths, and distribution bay age, sex, month and region.

ANALYSIS OUTCOME

Health Facility Performance

All 26 regions of Tanzania Mainland submitted weekly reports of selected priority reportable conditions to the national level. The overall performance for timeliness and completeness for October to December 2023 was 94.4% and 97.8% respectively. The performance of timeliness and completeness were above the set national standard of ≥ 90%. The Month of November had the highest scores for timeliness (99.5%) and completeness (100.0%), and were above the set national standard of ≥ 90%. (Table 1)

Table 1: Average Timeliness and Completeness of Health Facility Reporting by Month, October – December, 2023

Month	% of Completeness	% of Timeliness
October	97.0	93.2
November	100.0	99.5
December	96.4	90.5
Overall Performance	97.8	94.4

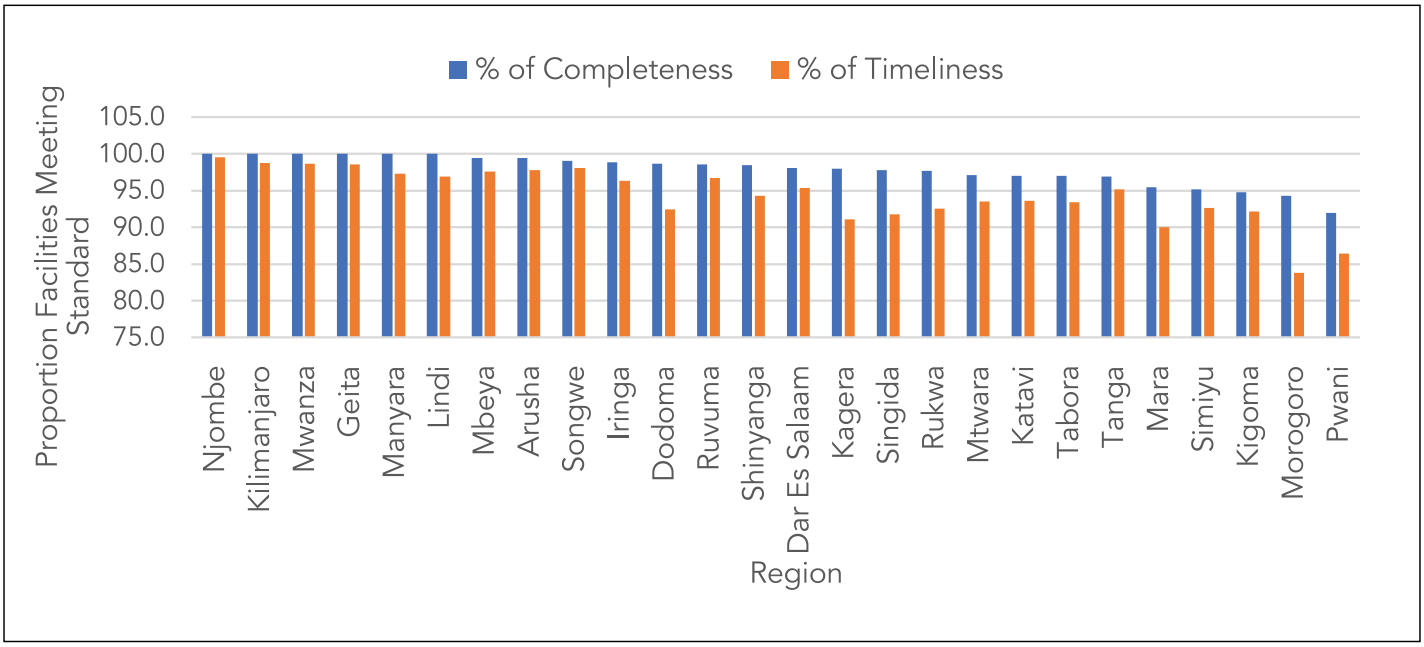

Figure 1: Timeliness and Completeness of Health Facility Reporting from the 26 regions, October – December, 2023

The overall timeliness and completeness of health facilities reporting by all 26 regions are presented in Figure 1. All regions except Morogoro and Pwani regions had the overall timeliness meeting the national target of ≥ 90%. All regions health facilities reporting for completeness met the national target of ≥ 90%.

DISTRIBUTION OF CASES AND DEATHS

Total reported cases for all reportable diseases and conditions from October to December 2023 were 183,521 of which 103,882(56.6%) were cases due to diarrhea diseases (Table 2). During the reporting period, there were a total of 32 deaths whereby majority 19 (89.2%) were due to SARI.

Table 2: Numbers of cases and deaths caused by reportable conditions, October – December, 2023

Condition / Disease	Cases/Deaths	Total
Acute Flaccid Paralysis (AFP)	Case	352
	Death	0
Animal Bites	Case	5,854
	Death	0
Anthrax	Case	24
	Death	0
Bloody Diarrhea	Case	15
	Death	0
Cholera	Case	430
	Death	13
Cerebrospinal Meningitis (CSM)	Case	29
	Death	0
Dengue Fever	Case	5
	Death	0
Diarrhea	Case	103,882
	Death	0
Severe Acute Respiratory Infection (SARI)	Case	4,664
	Death	19
Measles	Case	977
	Death	0
Pneumonia	Case	54,309
	Death	0
Rabies	Case	14
	Death	0
Smallpox	Case	
	Death	
Typhoid	Case	12,965
	Death	0
Total	Case	183,521
	Death	32

Table3: Number of cases and deaths caused by reportable conditions, by month, October – December, 2023

Condition / Disease	October		November		December		Total		CFR%
	Case	Death	Case	Death	Case	Death	Case	Death	
AFP	137	0	99	0	116	0	352	0	0.0
Animal Bites	1,949	0	1,735	0	2,170	0	5,854	0	0.0
Anthrax	13	0	6	0	5	0	24	0	0.0
Bloody Diarrhea	4	0	2	0	9	0	15	0	0.0
Cholera	318	13	75	0	37	0	430	13	3.0
CSM	8	0	13	0	8	0	29	0	0.0
Dengue Fever	3	0	0	0	2	0	5	0	0.0
Diarrhea	35,464	0	31,017	0	37,401	0	103,882	0	0.0
SARI	1,513	6	1,435	0	1,716	13	4,664	19	0.4
Measles	480	0	218	0	279	0	977	0	0.0
Pneumonia	17,250	0	16,576	0	20,483	0	54,309	0	0.0
Rabies	4	0	3	0	7	0	14	0	0.0
Smallpox	1	0	0	0	0	0	1	0	0.0
Typhoid	4,128	0	3,745	0	5,092	0	12,965	0	0.0
Total	**61,272**	**19**	**54,924**	**0**	**67,325**	**13**	**183,521**	**32**	

Table 3 provides the number of cases and deaths caused by immediate reportable conditions each month during October through December 2023. The month total cases varied from 54,924 in October to 67,325 in December. The condition with highest case fatality rate was suspected cases of cholera, 13(3.0%) of 430 persons with suspected cholera ant died.

During the 3 months beginning October 2023, a total of 183,521 cases of reportable conditions were reported whereby all 26 regions reported Acute Flaccid Paralysis (AFP), animal bites, diarrhea, pneumonia and typhoid with one case of smallpox reported in Tanga region. Most cases, 103,882 were due to diarrhea and majority of cases were reported from Dar es Salaam 8,535 (8.2%), Dodoma 8,439 (8.1%), Mara 7,376 (7.1%) and Morogoro 6,009 (5.8%) (Table 4).

Table 4: Number of reported cases of illnesses by region, October – December, 2023.

Region	AFP	Animal Bites	Anthrax	Bloody Diarrhea	Cholera	CSM	Dengue Fever	SARI	Diarrhea	Measles	Pneumonia	Rabies	Smallpox	Typhoid
Arusha	11	479	15	4	185	0	0	88	5,858	53	6,475	1	0	307
Dar Es Salaam	14	342	0	0	0	0	5	1,445	8,535	18	4,443	1	0	624
Dodoma	6	363	0	0	5	0	0	914	8,439	258	3,028	0	0	907
Geita	19	103	0	0	0	0	0	0	3,250	2	1,442	0	0	277
Iringa	7	177	0	0	0	0	0	127	1,463	7	717	1	0	171
Kagera	26	247	0	0	12	0	0	0	2,961	55	1,509	0	0	673
Katavi	12	129	0	0	0	0	0	0	2,556	14	760	0	0	390
Kigoma	16	268	0	0	31	5	0	469	2,374	21	2,008	1	0	212
Kilimanjaro	21	250	0	0	3	0	0	0	2,093	57	3,017	4	0	169
Lindi	6	126	0	0	0	0	0	117	2,348	43	693	0	0	478
Manyara	7	233	0	8	0	0	0	218	2,973	6	2,777	1	0	717
Mara	22	348	0	0	46	0	0	647	7,376	28	2,240	0	0	580
Mbeya	14	259	0	0	0	2	0	162	3,341	48	2,291	0	0	838
Morogoro	7	304	0	0	0	0	0	140	6,009	20	2,897	0	0	1,404
Mtwara	17	120	1	0	0	1	0	25	3,705	30	1,139	0	0	220
Mwanza	26	235	0	0	0	7	0	66	5,092	124	2,099	0	0	519
Njombe	9	87	0	2	0	0	0	0	572	14	543	0	0	350
Pwani	9	306	0	0	0	0	0	45	3,665	0	2,554	0	0	223
Rukwa	17	202	0	0	0	2	0	48	4,999	12	1,557	1	0	495
Ruvuma	4	261	0	1	1	0	0	0	5,248	33	2,274	1	0	892
Shinyanga	18	141	0	0	0	0	0	0	4,188	10	1,912	0	0	685
Simiyu	29	135	0	0	63	0	0	0	2,198	25	686	1	0	148
Singida	10	234	0	0	84	0	0	99	3,915	32	1,165	0	0	509
Songwe	9	49	8	0	0	0	0	0	2,553	15	906	0	0	424
Tabora	5	204	0	0	0	9	0	42	3,779	13	1,892	1	0	614
Tanga	11	252	0	0	0	3	0	12	4,392	39	3,285	1	1	139
Total	**352**	**5,854**	**24**	**15**	**430**	**29**	**5**	**4,664**	**103,882**	**977**	**54,309**	**14**	**1**	**12,965**

CONCLUSIONS

The IDSR analyzed data for October to December 2023 (WHO epidemiological week 27-39) showed that the performance based on timeliness and completeness were high based the set national standard of ≥90%. This is encouraging that the Government is better position as the system could manage to detect and report for immediate response to avert disease outbreak to happen. On the other hand, there is an urgent need for the Government to instituting new and reinforcing available preventive and control measures against diarrhea and pneumonia as the two continued to be the leading reportable conditions. Based on high fatality rate of cholera, the Government need reinforce preventive measures such as ensuring community drink and using safe water, washing hands often with soap and safe water (i.e., before, during and preparing food, before eating and after using toilet), safely management of sanitation facilities (using toilet), and cooking food well, covering and eating hot food.

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AUTHOR DETAILS

1 Ministry of Health

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MUHTASARI

Mkakati wa Ufuatiliaji na Udhibiti wa Magonjwa ya Mlipuko (IDSR): Ripoti ya Miezi Mitatu, Oktoba-Disemba 2023 (Wiki 40-5)

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Usuli: Wizara ya Afya (WAF) hutumia mkakati wa Ufuatiliaji na Udhibiti wa Magonjwa ya Mlipuko (IDSR) kufuatilia magonjwa na hali zinazoripotiwa kugundua na kudhibiti magonjwa ambayo ni chanzo cha vifo, na ulemavu. Makala hii inaripoti matokeo ya uchambuzi wa taarifa za IDSR kwa kipindi cha miezi 3 cha Ocktoba hadi Disemba 2023 ambapo ni wiki ya 40-52 ya Shirika la Afya Duniani (WHO). Takwimu zilichambuliwa kutathmini utendaji wa mikoa katika utoaji wa taarifa na kufahamu idadi ya visa na vifo vya kila ugonjwa kulingana na mwezi na mkoa. Utendaji ulitathminiwa kulingana na kiwango cha kitaifa cha asilimia 90 au zaidi.

Uchambuzi: Mikoa yote 26 ya Tanzania Bara iliwasilisha ripoti za kila wiki kwa ngazi ya kitaifa. Mikoa ilipata wastani wa asilimia 94.4 kwa wakati unaofaa (ufanisi) (kwa mfano, asilimia ya wilaya zinazoripoti kwa wakati kwa ngazi ya kitaifa) na asilimia 97.8 kwa ukamilifu (yaani, asilimia ya wilaya zinazotoa ripoti kamili kwa ngazi ya kitaifa). Katika kipindi cha miezi 3, jumla ya visa 183,521 na vifo 32 viliripotiwa kwa magonjwa yote IDSR. Ugonjwa ulioripotiwa zaidi ni kuhara (n = 103,791, asilimia 56.6) kati ya visa vilivyoripotiwa kutoka mikoa yote 26 ambapo Mkoa wa Dar es Salaam ulikuwa na visa vingi Dar 8,535 kati ya 103,791 (asilimia 9.2). Mikoa mingine iliyokuwa na visa ilijumuisha Dodoma (asilimia 8.1%, Mara (asilimia 7.1) na Morogoro (asilimia 5.8). Mwezi wa Disemba ulikuwa na visa vingi, visa 67,325 kati ya 183,521 (asilimia 36.7). Kati ya vifo 32 vilivyoripotiwa, visa vingi vilisababishwa na maabukizi makali ya njia ya kupumua (Severe Acute Respiratory Infection, SARI) (n = 19, asilimia 59.4). Ugonjwa uliokuwa na kiwango cha juu cha vifo ilikuwa ni kipundupindu. Kati ya visa 430 vilivyoshukiwa kuwa na ugonjwa wa kipindupindu, 13 walikufa (CFR = asilimia 3.0).

Hitimisho: Uchambuzi wa takwimu za IDSR ya Oktoba had Disemba 2023 (wiki ya 40-52 ya WHO) ulionyesha kuwa utendakazi kwa kwa kuzingatia wakati unaofaa (ufanisi) na ukamilifu ukiwa wa juu kulingana na kiwango cha kitaifa cha aslimia ≥90. Hili ni jambo la kutia moyo kuwa Serikali kuwa iko katika nafasi nzuri zaidi kwani mfumo huu wa ufuatiliaji unaweza kubaini na kutoa taarifa kwa ajili ya kuchukua hatua za haraka ili kuzuia mlipuko wa magonjwa kutokea. Kwa upande mwingine, kuna haja ya haraka kwa Serikali kuanzisha mbinu mpya na kuimarisha hatua zilizopo za kujikinga na kudhibiti ugonjwa wa kuhara na nimonia kwani ni magonjwa yanayoendelea kuongoza kuripotiwa. Kwa kuzingatia viwango vya juu vya vifo vya kipindupindu, Serikali inahitaji kuimarisha hatua za kinga kama vile kuhakikisha jamii inakunywa na kutumia maji salama, kunawa mikono mara kwa mara kwa sabuni na maji salama (yaani, kabla, wakati na kuandaa chakula, kabla ya kula na baada ya kutoka chooni). Aidha kuwepo na usimamizi salama wa usafi wa mazingira (kwa kutumia choo), na kupika chakula vizuri, kufunika na kula chakula cha moto.

Factors Associated with Malaria in Regions Implementing Case Based Surveillance in Tanzania from August 2021 to May 2022

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ABSTRACT

Introduction: Following consistent reports of very low parasite prevalence of <1% in Kilimanjaro, Arusha, and Manyara regions in Tanzania, a malaria case-based surveillance system (mCBS) was introduced in the regions targeting malaria elimination by the year 2030. System data has never been analyzed since its initiation. Using the system dataset collected from August 2021 to May 2022, we aimed to determine factors associated with malaria among contacts of local (index) cases.

Methods: This was a cross-sectional study that used mCBS data set collected from August 2021 to May 2022. The dataset included information on index cases from proactive case detection (pro-ACD) and malaria rapid diagnostic test (RDT) results of contacts from reactive case detection (re-ACD). Under permission from the National Malaria Control Program, we cleaned and analyzed the data using Stata version 15. Multivariate logistic regression was used to identify factors associated with malaria among contacts of index cases. Statistical significance was tested at 95% confidence interval and p-value ≤ 0.05.

Results: A total of 949 malaria index cases were identified during pro-ACD from August 2021 to May 2022, where 63.8% (605/949) were over 16 years, the median age of 20 years (IQR = 10 - 31) and most were local - introduced 96.5% (916/949). Males accounted for 54.8% (520/949) of index cases. Arusha region had most of the index cases at 53.1% (504/949). During re-ACD, 642 contacts were tested for malaria, most of them were females 50.9% (327/642) with a median age of 20 years (IQR = 7- 34). Only 3.7% (24/642) of contacts tested malaria positive, and 58.3% (14/24) of them were local indigenous. Households with family size ≥ 6 members had 89% times lower odds of having a positive RDT compared to families with ≤3 members (aOR = 0.11, 95% CI = 0.02 – 0.62). Household members who had no history of fever 3 days before re-ACD had 97% times lower odds of testing positive compared to those who had fever (aOR = 0.03, 95% CI = 0.01 –0.14). Household members who had no history of contact with individuals known to be on malaria treatment in the past 28 days had 99% times lower odds of having a positive RDT compared to those who had such contact (aOR = 0.01, 95% CI = 0.004 – 0.04). Individuals with no history of traveling to malaria-endemic areas in the past 28 days had 76% times lower odds of testing positive for malaria (aOR = 0.24, 95% CI = 0.06 – 0.92).

Conclusion: Having a history of contact with a household member who had been treated for malaria or had traveled to a malaria endemic area in the past 28 days as well as a family size of ≤3 members are risk factors for malaria in regions implementing case-based surveillance in Tanzania

INTRODUCTION

Malaria remains to be a global disease of public health concern. In 2021, nearly 247 million malaria cases were reported worldwide in which 95% of them (234 million cases) were in Africa. Malaria-related deaths have reduced from 897,000 deaths in 2000 to 619,000 deaths in 2021 [1].

In Mainland Tanzania, the disease prevalence has declined from 18.1% in 2008 to 7.5% in 2017 [2], with the target of eliminating the disease by the year 2030 [3]. However, there has been reports of uneven disease distribution among regions such that some regions such as Kilimanjaro, Arusha, and Manyara have been reporting a very low malaria prevalence of up to <1% [4,5]. These regions were categorised as regions under malaria elimination in Tanzania and in year 2020 a malaria case-based surveillance (mCBS) system was introduced as an interventional strategy to ensure that local malaria cases are eliminated.

The mCBS system determines whether an infection was acquired locally, the likely location of infection, and whether indigenous transmission leading to onward transmission. Through passive case detection (pro-ACD), local index malaria case are identified and a reactive case detection (re-ACD) is then conducted to households of identified index cases, where every contact member is tested for malaria using a malaria rapid diagnostic test (RDT). Those found positive are treated and classified as either local indigenous or local introduced cases [6].

Nations such as China achieved zero indigenous malaria cases, proving the effectiveness of a case-based surveillance system in contributing to the country's efforts to malaria elimination [7]. In the context of Tanzania, since the implementation of mCBS in year 2020, system data has never been analyzed for decision making. We used mCBS dataset collected from August 2021 to June 2022 to determine factors associated with malaria among household members of the identified index cases. The results of this analysis will guide the National Malaria Control Program (NMCP) during setting up interventional priorities to attain disease elimination in the region by year 2030.

METHODS

The analysis used malaria case-based surveillance (mCBS) system dataset collected from August 2021 to May 2022. The dataset included local malaria cases recorded on passive case detection (pro-ACD) and contact cases recorded after reactive case detection (re-ACD) from health facilities implementing mCBS. The data were cleaned and analyzed using Stata (version 15). Categorical variables were coded as either 0 (for a negative result) or 1 (for a positive result) to aid in data analysis. Multivariate Logistic regression was used to determine factors associated with malaria among household members of the identified index cases. Statistical significance was tested at 95% CI and p–value ≤ 0.05

Ethical Considerations

The permission to conduct the analysis was granted by the Muhimbili University of Health and Allied Sciences. Approval to use the data was granted by the National Malaria Control Program (NMCP) Dodoma, Tanzania. The data were kept confidential and never shared with any third party. Names and addresses of individuals in the dataset were not recorded during data collection.

RESULTS

Demographic Characteristics of Participants

A total of 2667 malaria cases were reported in the system August 2021 to May 2022. Of these, 949 cases (35.5%) were reported as local (index) cases. Majority of the index cases were over 16 years old, 63.8% (605/949). Males accounted for most of the index cases by 54.8% (520/949) and the median age of these cases was 20 years (IQR) = 10 - 31). Most of the index cases were classified as local - introduced cases 96.5% (916/949).

On the other hand, of 949 index cases, 642 household/contact members were tested for malaria during re-ACD. Majority of the contacts 57.6% (370/642) were over 16 years old. Female were most of the reported contacts by 51% (327/642) and had median age 20 years old (IQR = 7- 34). Of the 642 contacts, only 24 (3.7%) had a positive RDT. Most of the malaria positive contacts were classified as local – indigenous 58.3% (14/24). Arusha region had most of index cases 53% (504/949) and contact members 73% (472/642) (Table 1).

Table 1: Characteristics of index and contact cases reported from regions implementing mCBS from August 2021 to May 2022

Characteristic	Index cases		Contact members	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Age (years)				
≤5	167	17.6	115	17.9
6 – 15	177	18.7	157	24.5
≥16	605	63.8	370	57.6
Region				
Kilimanjaro	153	16.1	31	4.8
Arusha	504	53.1	472	73.5
Manyara	292	31.8	139	21.7
Sex				
Male	520	54.8	315	49.1
Female	429	45.2	327	50.9
*RDT test results				
Positive	949	100	24	3.7
Negative	0	0	618	96.3
Local case classification				
Indigenous	33	3.5	14	58.3
Introduced	916	96.5	10	41.7

**RDT = Malaria Rapid Diagnostic Test*

Factors associated with malaria among tested household members/contacts of index cases during re-ACD from August 2021 to June 2022

Factors such as age, sex, family size, history of fever in past 3 days prior to re-ACD, history of contact with a person who had been treated for malaria in the same household in the past 28 days, as well as history of travel to a malaria endemic area in the past 28 days were identified from the dataset and analyzed to assess their association with testing positive for malaria among contact cases

A multivariate analysis showed that, the odds of a positive RDT test decreased with increase in family size such that, households whose family size were ≥6 members, had 81% lower odds of having a positive RDT compared to households with family size ≤3 members (aOR = 0.19, 95% CI = 0.05 – 0.72). Similarly, household members who had history of contact with a household member who had been treated for malaria in the past 28 days had 2.6 time the odds of having a positive RDT compared to those who had not contacted household members known to have been on malaria treatment (aOR = 2.60, 95% CI = 1.11 – 6.06). On the other hand, significant findings showed that, household members who had history of travel to malaria endemic area in the past 28 days had about 4 times the odds of testing positive for malaria compared to those who hadn't travelled (aOR = 3.67, 95% CI = 1.47 – 9.20) (Table 2).

Table 2: Bivariate and Multivariate Logistic regression analysis of factors associated with Malaria among tested contacts during re-ACD from August 2021 to June 2022

Characteristics	RDT results		Bivariate analysis		Multivariate analysis	
	Positive n (%)	Negative n (%)	cOR* (95% CI)	p-value	aOR* (95% CI)	p-value
Age (Years)						
≤ 5	6 (5.2)	109 (94.8)	1.6 (0.60 – 4.48)	0.33		
6 – 15	6 (3.8)	151 (96.2)	1.2 (0.44 – 3.22)	0.74		
≥16	12 (3.2)	358 (96.8)	1			
Sex						
Male	8 (2.5)	307 (97.5)	0.51 (0.21 – 1.20)	0.12	0.46 (0.19 –1.12)	0.09
Female	16 (4.9)	311 (95.1)	1			
Family size						
≤ 3	9 (7.1)	117 (92.9)	1			
4 - 5	12 (4.1)	280 (95.9)	0.56 (0.23 – 1.36)	0.20	0.66(0.27 – 1.66)	0.38
≥6	3 (1.3)	221 (98.7)	0.18 (0.05 – 0.66)	0.01	0.19(0.05 – 0.72)	0.02
History of fever 3 days prior to re-ACD						
Yes	11 (4.1)	257 (95.9)	1.19 (0.52 - 2.70)	0.68		
No	13 (3.5)	361 (96.5)	1			
Contact with a house member treated for malaria past 28 days						
Yes	14 (5.9)	224 (94.1)	2.46(1.08 -5.63)	0.03	2.60 (1.11 - 6.06)	0.03
No	10 (2.5)	394 (97.5)	1			
Travel to malaria endemic area in the past 28 days						
Yes	8 (9.2)	79 (90.8)	3.41 (1.41 – 8.23)	<0.01	3.67 (1.47– 9.20)	<0.01
No	16 (2.9)	539 (97.1)	1			

**cOR = Crude Odds Ratio, aOR = Adjusted Odds Ratio*

DISCUSSION

This study investigated factors associated with malaria infection (as measured by RDT positivity) in regions implementing Case Based Surveillance in Tanzania from August 2021 to May 2022. The findings suggest that having history of contact with a household member who had been on malaria treatment in the past 28 days as well as having a history of travel in a malaria endemic area within past 28 days are significantly associated with increased odds of malaria positivity, whereas having a family size of more than 6 members is significantly associated with reduced odds of malaria positivity.

We observed significant higher odds of having a positive

malaria test in individuals with history of contact with a person previously treated for malaria in the past 28 days. Similar findings have been reported by previous literatures [8–11]especially insecticide treated nets (ITN. This concern may have been contributed by either delayed in obtaining a malaria treatment or non-adherence to antimalarial drugs, which may have all contributed to increased risk of disease transmission from index cases to contacts. Increased malaria infectivity has been reported by individuals who had delayed or had not adhered to malaria treatment [12]. These factors may have made these individuals act as reservoirs for ongoing transmission of malaria parasites from one individual to another in the household. Lack of index case's data on drug adherence and schedules from this dataset provides a setback to making comparison with other studies.

Furthermore, our analysis showed that history of travel to malaria endemic area in the past 28 days before re-ACD was significantly associated with increased risk of having positive malaria test. These results are congruent with the findings reported from a meta-analysis study that reported travel as a key risk factor to malaria transmission in pre-elimination settings [13]. Similarly, our results are also similar to previous literatures [14–16]. Being regions of potential tourism interest, Kilimanjaro, Arusha and Manyara regions are likely to be visited by different individuals across the world who might be potential sources of the infection. However, use of ultra-sensitive diagnostic tests such loop-mediated isothermal amplification polymerase chain reaction has been suggested as an alternative approach to early detection for travel-associated malaria at key border entry points [17].

Surprisingly, our analysis has revealed that, the higher the family size of more than 6 members, the lower the risk of malaria infection. This finding is contrary to what has been reported by other literatures on an increased risk of malaria infection with increasing family size [18–20]northcentral Ethiopia. Methods. A cross-sectional study was conducted among 422 participants who visited Shewa Robit Health Center between 01/10/2017 and 30/04/2018, using a simple random sampling. Sociodemographic characteristics were recorded using a pre-tested semi-structured questionnaire and infection was confirmed by microscopic examination. Data were analyzed using the Statistical Program for Social Sciences (SPSS. Other studies have found no significant association between family size and risk of malaria transmission[21,22]. However, households with larger family sizes have been associated with having good knowledge and positive attitude about malaria[23]. Therefore, households with large family size, are more likely to use their good knowledge engaging in malaria prevention practices enough to cover a large area of house surroundings during cleaning.

LIMITATIONS

The mCBS system captures few variables such that other factors that might have contributed to malaria transmission such as level of malaria knowledge, family wealth/income and ownership and use of mosquito treated bed nets were not assessed. Moreover, mCBS relies on testing individuals using a rapid diagnostic test, which might miss cases with low parasitaemia. Moreover, the number of index cases were more than their contacts, which provides a gap to analyze further.

CONCLUSIONS

Having a history of contact with a household member who had been treated for malaria or had travelled to a malaria endemic area in the past 28 days as well as a family size of ≤3 members are risk factors for positive malaria test among contacts of index cases in Kilimanjaro, Arusha and Manyara regions under malaria surveillance. Based on limitation encountered in this analysis, the ministry of health (MoH) Tanzania need to revise the mCBS system reporting tool to include more variables so that analyzed data may be more informative.

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MUHTASARI
Visababishi Vinayohusiana na Uwepo wa Ugonjwa wa Malaria katika Mikoa Inayotekeleza Ufuatiliaji Kulingana na Visa vya Ugonjwa wa Malaria nchini Tanzania Kuanzia Agosti 2021 hadi Mei 2022

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Utangulizi: Kufuatia ripoti thabiti za kiwango cha chini sana cha maambukizi ya vimelea vya malaria chini ya aslimia 1 (aslimia <1) katika mikoa ya Kilimanjaro, Arusha, na Manyara nchini Tanzania, mfumo wa ufuatiliaji wa visa vya malaria (mCBS) ulianzishwa katika mikoa inayolenga kutokomeza malaria ifikapo mwaka 2030. Takwimu za mfumo huu hazijawahi kuchambuliwa tangu kuanzishwa kwake. Kwa kutumia takwimu za mfumo huu zilizokusanywa kuanzia Agosti 2021 hadi Mei 2022, tulilenga kubainisha visababishi vinavyohusiana na uwepo wa malaria kati ya watu wanaoishi pamoja ambapo kisa cha kwanza cha mgonjwa wa malaria kimetokea, kuripotiwa na kutibiwa(index cases).

Mbinu: Huu ulikuwa utafiti wa mara moja ambao ulitumia takwimu za mCBS zilizokusanywa kuanzia Agosti 2021 hadi Mei 2022. Takwimu hizi zilijumuisha taarifa kuhusu visa vya malaria kutoka kwenye utaratibu wa wagonjwa kutafuta matibabu kwenye vituo vya kutolea huduma ya afya (pro-ACD) na matokeo ya uchunguzi wa kipimo cha haraka cha malaria (RDT) ya watu wanaoishi pamoja na visa vya malaria vilivyo ripotiwa na kupata matibabu kwenye vituo vya kutolea huduma ya afya (re-ACD). Ruhusa ya kufanya uchanganuzi wa takwimu ulipatikana kutoka Wizara ya Afya, Mpango wa Kitaifa wa Kudhibiti Malaria, ambapo twakwimu zilihakikiwa ubora na ufanisi wake (kusafishwa) na kuchanganuliwa ili kuainisha visababishi ambavyo vinahusiana na uwepo visa vya malaria kati wa watu wanaoishi na wagonjwa waliopata matibabu ya malaria kwenye vituo vya kutolea huduma ya afya.

Matokeo: Jumla ya visa 949 vya malaria kwanjia ya pro-ACD vilitambuliwa kuanzia Agosti 2021 hadi Mei 2022, ambapo asilimia 63.8 (605/949) walikuwa ni wale wenye zaidi ya miaka 16, umri wa wastani ulikuwa miaka 20 (IQR = 10 - 31). Wengi wa visa hivyo walikuwa ni wale ambao hawakutoka ama kusafiri nje ya mikoa yao local-introduced) kwa kiasi cha asilimia 96.5 (916/949). Wanaume walichangia kiasi cha aslimia 54.8 (520/949) ya visa fahirisi vilivyopata malaria [vilivyo pata malaria, kuripotiwa na kutibitwa kwenye vutuo vya kutolea huduma ya afya]. Mkoa wa Arusha ulikuwa na visa vingi vya fahirisi kwa asilimia 53.1 (504/949). Wakati wa re-ACD, watu 642 walipimwa malaria, wengi wao walikuwa wanawake kwa asilimia 50.9 (327/642) wenye umri wa wastani wa miaka 20 (IQR = 7- 34). Ni asilimia 3.7 tu (24/642) ya watu walioishi na visa fasirisi wakutwa na vimalea vya malaria, na asilimia 58.3 (14/24) kati yao walikuwa wazawa wenyeji. Kaya zilizo na ukubwa wa familia sawa ama zaidi wanakaya 6 (≥6) zilikuwa na uwezekano wa chini wa asilimia 89.0 wa kuwa na majibu chanya ya kipimo cha RDT ikilinganishwa na familia zilizo na wanakaya chini ama sawa 3 (≤3) (aOR = 0.11, 95% CI = 0.02 – 0.62). Wanakaya ambao hawakuwa na historia ya homa siku 3 kabla ya re-ACD walikuwa na uwezekano wa chini wa asilimia 97.0 wakuwa chanya kwa kipimo cha RDT ikilinganishwa na wale ambao walikuwa na homa (aOR = 0.03, 95% CI = 0.01 –0.14). Wanakaya ambao hawakuwa na historia ya kuishi pamoja na watu wanaojulikana kuwa kwenye matibabu ya malaria katika kipind siku 28 zilizopita walikuwa na uwezekano wa chini wa asilimia 99.0 wa kuwa chanya kwa kipimo cha RDT ikilinganishwa na wale ambao walikuwa wanaishi nao (aOR = 0.01, 95% CI = 0.004 – 0.04). Watu ambao hawakuwa na historia ya kusafiri katika maeneo yenye tatizo kubwa la malaria (endemic) katika siku 28 zilizopita walikuwa na uwezekano wa chini wa asilimia 76.0 wa kupimwa na kuwa na malaria (aOR = 0.24, 95% CI = 0.06 – 0.92).

Hitimisho: Kuwa na historia ya kuishi na mwanakaya ambaye alikuwa ametibiwa malaria au alisafiri hadi katika maeneo yenye tatizo kubwa la malaria (endemic) katika siku 28 zilizopita pamoja na ukubwa wa familia ya wanakaya chini ama wa 3 (≤3) ni visababishi hatarishi kwa uwepo wa malaria katika mikoa inayotekeleza ufuatiliaji wa visa vya ugonjwa wa malaria nchini Tanzania wenye lengo la kutokomeza malaria.

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Prevalence and Factors Associated with Lymphatic Filariasis among Persons Five Years and above in Pangani District Council.

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ABSTRACT

Introduction: About 863 million people in 47 countries worldwide remain threatened by lymphatic filariasis (LF). More than 45 million individuals are estimated to be infected in Africa, where *Wuchereria bancrofti,* a filarial worm, is the sole cause of LF. Despite great efforts made by the Ministry of Health (MoH) in eliminating LF in Tanzania including 14 rounds of ivermectin and Albendazole Mass Drug Administration (IVM + ALB MDA) in Pangani district council, the district is still endemic. A survey done in 2019, the district had a prevalence of 2.7% which is above the elimination target of ≤ 2%. We report the current prevalence and factors associated with LF transmission in Pangani district council that provides guidance for its elimination.

Methods: Dataset was extracted from android powered mobile phone through the Secure Data Kit (SDK) platform used during the cross-sectional community-based survey conducted in Pangani District in February 2022. STATA version 15.0 was used for data management and analysis. Descriptive statistics were summarized using frequency for categorical variables whereas continuous variables were summarized with the measure of central tendency-median with respective measures of dispersion -Interquartile Range. Bivariate and multivariate logistic regression were performed to determine factors associated with LF. A P value< 0.05 was used to declare statistical significance.

Results: A total of 922 individuals (57.3% females) were screened for circulating filarial antigens. The prevalence of LF was 2.3% (21/922; 95% CI: 1.5–3.5) with significant heterogeneity between villages (range 1.3% to 3.0%). Lymphatic Filariasis positivity was higher in males 3.6% (14/21) than female, and correlated with increasing age (p < 0.005). Multivariate logistic regression analysis of risk factors for LF demonstrated increased risk of time 2.6 for males as opposed to females (AOR=2.6, 95% CI:1.0-6.7, P=0.04). The odds of developing LF among persons aged 30-44 years was 16.5 times more likely compared to other age groups (AOR=16.5, 95% CI:2.0-132.9, P=0.007).

Conclusion: The study indicated clear evidence of ongoing transmission of LF in Pangani DC despite the 14 rounds of MDA using ivermectin and albendazole whereby gender and age were independently associated with LF. Therefore, we recommend for the Neglected Tropical Disease Control Program to conduct further studies to investigate the other factors/barriers causing the persistence transmission of LF in these areas and take appropriate action including determining the resistance patterns of ivermectin and albendazole, their characteristics, and their distributions mechanisms across the district.

Key words: Prevalence, Lymphatic Filariasis, risk factors, Pangani district

INTRODUCTION

Lymphatic Filariasis is a human parasitic disease caused by Wuchereria bancrofti, Brugia malayi, and Brugia timori. Infection is transmitted to humans through different species of mosquitoes Culex, Anopheles, and Aedes [1]. About 863 million people in 47 countries worldwide remain threatened by LF. More than 45 million individuals are estimated to be infected in Africa, where ***Wuchereria bancrofti***, a filarial worm, is the sole cause of LF[1–3]. Tanzania is among the LF endemic countries, prevalent in all 184 councils. In 2009, Tanzania established the Neglected Tropical Diseases Control Programme (NTDCP) with the mission to integrate all efforts in controlling and eliminating LF in all 184 councils in the country through Ivermectin and Albendazole Mass Drug Administration (IVM + ALB MDA). By February 2022, a total of 111 (93.3%) councils out of 119 LF met the criteria for stopping IVM + ALB MDA for LF. However, Pangani district council (DC) is one of the eight councils still endemic with LF [4,5].

Different studies have been done to quantify the progress toward the elimination of LF and identify areas for which additional efforts are still needed. Studies reported that IVM + ALB MDA have a significant impact in reducing LF infections however some areas were reported to still have a high LF prevalence. Some of the challenges reported were low coverage of MDA in some communities, high baseline endemicity, and climatic conditions [6–11]we studied the epidemiology of LF in two endemic villages in the Democratic Republic of the Congo. Methods: Dependent variables were Wuchereria bancrofti antigenaemia detected with filarial test strips (FTS.

Great efforts have been made by the Ministry of Health (MoH) in eliminating LF in Tanzania including 14 rounds of IVM + ALB MDA for LF in Pangani DC. In a Survey conducted in 2019, in

the district, the prevalence of LF was 2.7% which is above the elimination target of ≤ 2% [4,5]. The current prevalence and factors associated with LF in Pangani DC are not well understood and have not been examined. The paper highlights areas that require disease control and prevention, and provides a guide for MoH to prioritize interventions for the most affected population.

METHODS

Study design and setting

Analysis was done using secondary data from a cross-sectional survey on LF conducted in three villages of Mkalamo, Mkwanja, and Kwakibuyu in Pangani DC in Tanga Region. Pangani DC is located between 5°15.5–6° S and 38°35–39°00 E on the southern coast of the Tanga region along the Indian Ocean coastline covering an area of 1803.8 km^2. According to the 2022 national census the district had a total population of 75,642 people, and is characterized by a long rainy season from March to June, and short rains between November and December.

Study population

This analysis involved a population aged five years and above who were enrolled in a survey conducted in Pangani DC in February 2022.

Data Abstraction Procedure

The dataset was extracted from an android powered mobile phone through the Secure Data Kit (SDK) platform. SDK platform is used to capture information such as antigenemia test results, demographic information i.e., age, gender, residence, and documentation of informed consent during the survey. The data set analyzed was data from Transmission assessment survey conducted in Pangani DC in February 2022.

Variables

The dependent variable was lymphatic filariasis and the independent variables were demographic information of individuals which includes age, gender, and residence.

Data Analysis

Data cleaning and analysis were performed using Microsoft Excel and STATA version 15 (Stata Corp. 2017. Stata: Release 15. Statistical Software. College Station, TX: Stata Corp LLC). A preliminary exploration of the data was done to check for missing values, duplications, and unusual observations before analysis. Missing values on the outcomes of interest were dropped from the analysis. Descriptive statistics were summarized using frequency for categorical variables whereas continuous variables were summarized with the measure of central tendency-median with respective measures of dispersion -Interquartile Range. Bivariate logistic regression was performed to determine factors associated with LF. The prevalence odds ratio with their corresponding 95% confidence interval (CI) was presented. Variables with P≤0.2 in the bivariate analysis were then entered in the multivariable logistic regression model to obtain the adjusted odds ratio and 95% CI for LF. In both models, a P value < 0.05 was used to declare statistical significance.

Ethical considerations

Permission and access to the dataset were granted by MoH, Neglected Tropical Diseases Control Program. Data were extracted by unique ID numbers instead of names to prevent patient identification. Confidentiality was exercised for handling extracted data

RESULTS

Demographic characteristics of the study respondents enrolled in the survey

A total of 922 individuals were screened for circulating filarial antigen. The median age of participants was 25 years (IQR =25-42 years). Majority of participants were those aged between 5-14 years 32.1% (296/992). Females contributed 57.3% (528/922) of the study participants. (Table 1)

Table 1:Sociodemographic characteristics of individuals five years and above in Pangani District February 2022 (N = 922)

VARIABLE	FREQUENCY (%)
Age Category	
5-14	296 (32.1)
15-29	229 (24.8)
30-44	195 (21.2)
45-59	108 (11.7)
≥60	94 (10.2)
Gender	
Female	528 (57.23)
Male	394 (42.7)
Residence (village/street)	
Kwa Kibuyu	304 (33.0)
Mkalamo	305 (33.1)
Mkwaja	313 (33.9)

Prevalence of Lymphatic Filariasis among individuals five years and above in Pangani District in February 2022 (N = 922).

The prevalence of LF by Filarial Test Strip was 2.3% (21/922) [95% CI, 1.5-3.5]. There was a gradual increase in the disease prevalence with age, reaching a peak in the 30-44 age group 9 (4.6%) before the decline with a P value < 0.05 (Table 2). Males were more infected 14 (3.6%) compared to females with a p-value of <0.05). The prevalence of antigenemia varied insignificantly between villages ranging from 1.3% to 3.0% in Mkwaja and Mkalamo respectively (Table 2).

Table 2: Prevalence of LF by socio-demographic factors among individuals five years and above in Pangani District February 2022 (N = 922).

Variable	Categories	LF Positive n (%)	LF Negative n (%)	p-value
Sex	Female	7 (1.3)	521 (98.7)	0.025
	Male	14 (3.5)	380 (96.5)	
Age category	5-15	1 (0.3)	295 (99.7)	0.002
	15-29	2 (0.9)	227 (99.1)	
	30-44	9 (4.6)	186 (95.4)	
	45-59	4 (3.7)	104 (96.3)	
	≥60	5 (5.3)	89 (94.7)	
Village street	Kwa kibuyu	8 (2.6)	296 (97.4)	0.333
	Mkalamo	9 (3.0)	296 (97.0)	
	Mkwaja	4 (1.3)	309 (98.7)	

Factors associated with LF among individuals five years and above in Pangani DC in February 2022 (N = 922).

The risk factors of gender, residence, and age were analyzed in bivariate and multivariate logistic regression, in multivariate logistic regression among gender the odds of a male having LF was 2.6 times more likely compared to a female (AOR=2.6, 95% CI:1.0-6.7, P=0.04). The odds of developing LF among persons aged 30-44 years was 16.5 times more likely compared to other age groups (AOR=16.5, 95% Cl:2.0-132.9, P=0.007). (Table 4).

Table 2: Associated factors of Lymphatic Filariasis among individuals five years and above in Pangani District February 2022 (N = 922).

Variable	LF results		Bivariate analysis			Multivariate analysis		
	Positive n (%)	Negative n (%)	COR	95% CI	P-value	AOR	95% CI	P-value
Age category								
5-14	1 (0.3)	296 (99.7)	(Ref)	(Ref)	(Ref)	(Ref)	(Ref)	(Ref)
15-29	2 (0.9)	227 (99.1)	2.1	0.2-23.6	0.539	2.6	0.2-29	0.326
30-44	9 (4.6)	186 (95.4)	13.0	1.6-0.103.6	0.015	16.5	2.0-132.9	0.007
45-59	4 (3.7)	104 (96.3)	10.4	1.1-93.7	0.038	11.2	1.22-102.0	0.026
≥60	5 (5.3)	89 (94.7)	15.1	1.7-131.1	0.014	14.0	1.6-122.6	0.013
Gender								
Female	7 (1.3)	521 (97.67)	(Ref)	(Ref)	(Ref)	(Ref)	(Ref)	(Ref)
Male	14 (3.5)	380 (96.5)	2.7	1.1-6.9	0.031	2.6	1.0-6.7	0.04
Village								
Kwa kibuyu	8 (2.6)	296 (97.4)	1.13	0.43-3.0	0.800			
Mkwaja	4 (1.3)	309 (98.7)	2.34	0.7-7.7	0.259			
Mkalamo	9 (2.9)	296 (97.1)	(Ref)	(Ref)	(Ref)			

COR: Crude Odds Ratio, AOR: Adjusted Odds Ratio

DISCUSSION

Findings from this survey indicates that there are still ongoing transmissions in Pangani DC, whereby age and gender were observed to have an association with LF.

This study indicated a gradual increase in prevalence with the increasing age range, there was a decline in prevalence at the age range of 45-59 and above 60 years. This observation is in line with results reported from other studies[12,13]. Decline in prevalence in older age categories is suggested to be due to resistance of infection based on acquired immunity. A peak prevalence recorded in the 30-44 age group, this is the same as from previous studies [12] and it has been suggested that this age group is involved in intense occupational activities such as farming and fishing hence they are exposed more to bite of mosquito vectors [12,13].

The prevalence was observed to insignificantly vary between villages in this study. This is could be explained by similarity of villages based on socioeconomic statuses among individuals and

the local environmental conditions of villages, which is in line with results reported elsewhere [14]. Furthermore, it has been reported that climate and environmental variables contribute to a high prevalence of LF. It should be noted that, most houses in these villages had mud walls, thatched roofs, and no ceiling; hence permitting the movement of vector mosquitoes in and out as was earlier reported [12,14].

The prevalence of LF was significantly higher in males than females. The observed high prevalence of antigenemia in males as compared to females is in congruent with results from other studies reported elsewhere [6,9]we studied the epidemiology of LF in two endemic villages in the Democratic Republic of the Congo. Methods: Dependent variables were Wuchereria bancrofti antigenaemia detected with filarial test strips (FTS. Higher LF infections among males have been suggested that males as opposed to females are engaging in different outdoors activities like farming and fishing which expose them to infectious mosquito bites. Also findings from previous studies reported that males had a high tendency of missing MDAs schedules, due to their constant absence from their homes during drug distribution rounds, as well as refusal to take drugs as a result of misconceptions of the adverse events of the drugs used for MDA [6,9,15American Samoa had 16.5% prevalence of lymphatic filariasis (LF]. Hesitance of males in seeking medical care from health facilities can contributes as compared to females whom are more concerned about their health status than men [14–16].

Lymphatic filariasis was significantly associated with age. As age increases the odds of developing LF was also increasing in each group similar to other previous studies [6]. The study similarly revealed a statistically significant association between gender and lymphatic filariasis. Our results are in line with previous studies conducted in the Democratic Republic of the Congo [6], where similar study populations, risk factors, and environmental influences may have contributed to the consistency of these findings. Interestingly, our findings differed from a study conducted in Nigeria, where gender was not found to be associated with lymphatic filariasis [12,13]. This discrepancy can be attributed to variations in geographical locations and risk factors.

LIMITATIONS

Some important socioeconomic and clinical data that may be associated with LF outcomes were not collected and analyzed in the survey.

CONCLUSION

The study indicated clear evidence of ongoing transmission of LF in Pangani DC despite the 14 rounds of MDA using ivermectin and albendazole. Gender and Age were independently associated with LF. Therefore, we recommend for the Neglected Tropical Disease Control Program to conduct further studies to investigate the other factors/barriers causing the persistence transmission of LF in these areas and take appropriate action including determining the resistance patterns of ivermectin and albendazole, their characteristics, and their distributions mechanisms across the district.

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MUHTASARI

Ukubwa wa Maambukizi na Visababishi Vinavyohusishwa na Ugonjwa wa Mabusha na Matende Miongoni mwa Watu Wenye Umri wa Miaka Mitano na Kuendelea Katika Halmashauri ya Wilaya ya Pangani.

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Utangulizi: Takriban watu milioni 863 katika nchi 47 duniani kote bado wanatishiwa na ugonjwa wa Mabusha na Matende (Lymphatic filariasis, LF). Zaidi ya watu milioni 45 wanakadiriwa kuambukizwa barani Afrika, ambapo mnyoo ujulikanao kwa jina la Wuchereria bancrofti, ndiyo chanzo pekee cha ugonjwa wa Mabusha na Matende. Licha ya juhudi kubwa zilizofanywa na Wizara ya Afya (WAF) katika kutokomeza ugonjwa wa Mabusha na Matende nchini Tanzania kupitia umezeshaji wa kingatiba wa dawa ya ivermectin na Albendazole kwa watu wote [ivermectin and Albendazole Mass Drug Administration (IVM + ALB MDA)].

Mwaka 2019, Halmashauri ya wilaya ya Pangani ilibainika kuwa na ukubwa wa maambukizi wa asilimia 2.7 ambao ni juu ya lengo la kutokomeza LF la chini ama sawa na asilimia 2 (≤ 2). Tunaripoti ukubwa wa maambukizi kwa sasa na visababishi vinavyohusiana na maambukizi ya LF katika halmashauri ya wilaya ya Pangani, matokeo ambayo yatatoa mwongozo kwa utokomezaji wa LF.

Mbinu: Seti ya Takwimu ilipakuliwa kutoka kwenye simu ya mkononi kupitia mfumo wa Secure Data Kit (SDK) uliotumika wakati wa utafiti kwa jamii uliofanyika katika wilaya ya Pangani Februari 2022. Kwa kutumia programu ya sayansi ya kitakwimu ya STATA toleo la 15, takwimu zilizopakuliwa zilichambuliwa na kuchanganuliwa ili kujua ukubwa wa maambukizi na visababishi vinavyohusiana na maambukizi ya LF.

Matokeo: Jumla ya watu 922 (asilimia 57.3 wanawake) walichunguzwa kuona kama wana maambukizi kwa kupima uwepo wa antijeni za minyoo ya LF. Ukubwa wa maambukizi wa LF ulikuwa asilimia 2.3 (21/922; 95% CI: 1.5-3.5) na kulikuwa na tofauti kubwa kati ya vijiji (kutoka asilimia 1.3 hadi 3.0). Ukubwa wa maambukizi ulikuwa juu kwa wanaume ambapo ulikuwa asilimia 3.6 (14/21) kuliko wanawake, na uliwiana na kuongezeka kwa umri (p <0.005). Uchanganuzi wa visababishi vya maambukizi ya LF ulionyesha hatari ya kuongezeka kwa kiwango cha mara 2.6 kwa wanaume ikilinganishwa na wanawake (AOR=2.6, 95% CI:1.0-6.7, P=0.04). Uwezekano wa kupata LF miongoni mwa watu wenye umri wa miaka 30-44 ulikuwa kwa kiwango cha mara 16.5 zaidi ikilinganishwa na makundi mengine ya umri (AOR=16.5, 95% Cl:2.0-132.9, P=0.007).

Hitimisho: Utafiti ulionyesha ushahidi dhahiri wa maambukizi ya LF yanayoendelea kutokea katika Halmashauri ya Wilaya ya Pangani licha ya raundi/mizunguko 14 ya MDA kutumia dawa ya ivermectin na albendazole. Aidha jinsia na umri vilihusishwa moja kwa moja kuwa visababishi vya maambukizi ya LF. Kwa hivyo, tunapendekeza kwa Mpango wa Udhibiti wa Magonjwa Yaliyokuwa Hayapewi Kipaumbele kufanya tafiti zaidi ili kuchunguza visababishi/vizuizi vingine vinavyosababisha uambukizaji wa LF kuendelea katika maeneo haya na kuchukua hatua zinazofaa ikiwa ni pamoja na kubainisha usugu wa minyoo kwa dawa za ivermectin na albendazole. Hii ikiwa ni Pamoja na kutambua sifa zao na mifumo ya usambaaji katika wilaya nzima.

Maneno Muhimu: Ukubwa, Ugonjwa wa Mabusha na Matende, Visababishi vya Maambukizi, Wilaya ya Pangani

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Initiative Measures in the Implementation of Phasing Down Use of Dental Amalgam in Tanzania.

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ABSTRACT

Introduction: Worldwide, dental amalgam has been used for many years as restorative material for dental caries. Amalgam is formed by triturating a mixture of powdered alloy of metals consisting of silver, tin, and copper and liquid elemental mercury. The elemental mercury however forms approximately half (50%) of dental amalgam by weight. However, in recent years mercury has been listed as one of the top ten toxic chemicals causing public health and environmental concern. This has led an international outcry that mercury used in dental amalgam should be considered hazardous. Therefore, initiatives have been instituted to phase down its use and be replaced with alternative non-mercury restorative materials.

Initiatives: Due to reported hazards of dental mercury to health and to the environment, the Minamata convention on mercury of 2013 recommended restriction use of dental amalgam as restorative materials and directed phasing down by 2030. Few countries had already phased down dental amalgam, but the number of countries is anticipated to increase by 2030. In Tanzania, the phasing down process started in 2020 by restrict its use in children under the age of 15 years and pregnant women, stopped ordering of mercury and distributing to health facilities. Alternatives to dental amalgam include composites, glass ionomer and resin ionomer. These alternatives are currently available in health facilities, but are expensive, moisture sensitive that may lead to colour change with time and are less strong compared to amalgam.

Public implications: Phasing down of amalgam as dental restorative material is inevitable and the public is required to take note on the adoption of non-mercury containing restorative materials. The public also need to be aware about costs and other consequences and benefits related to the alternatives. Based on consequences and benefits related to amalgam alternatives, there is a need to minimize teeth restorative care services due to extensive carious lesions. Extensive carious lesions result from delay of seeking health care, therefore, it is recommended that the public need to be sensitized and exercise frequent oral health check-up at least once per year. This approach will ensure patient well-being leading to early detection and instituting preventive measures against dental caries. Oral heath preventive measures such as use of fluoride, by harnessing the beneficial effect of fluoridated tooth pastes on dental caries prevention coupled by improving quality, accessibility and affordability so that communities can access it and use. In addition to early diagnosis, emphasized and efforts should be made towards training in dental schools on appropriate use of alternative restorative materials and for the Government making them readily available and at an affordable cost. To protect the environment, a mechanism should be in place on collection of non-used elemental mercury and its alloys and encapsulated amalgam which has been purchased but not used for proper handling and disposal.

Key Words: Dental amalgam; Dental caries; Minamata Convention on mercury, Phase down; Mercury free materials

INTRODUCTION

Dental caries is the most prevalent oral disease affecting 60-90% of school children in industrialized countries and almost every adult person worldwide [1]. Prevention of dental caries can be achieved through minimization of added sugars in diet as well as adequate oral hygiene and exposure of teeth to fluoride [2]. However, the onset of disease can course through various stages and its progression depends upon the host response and chronicity of the lesion [3]. Dental amalgam has been the material of choice for extensive carious lesions of a tooth [4].

The International Caries Detection and Assessment System, when used in conjunction with the Lesion Activity Assessment (ICDAS-LAA), reflects the dynamic caries process and allows the classification of carious lesions according to their severity and progression, which is essential for selecting the appropriate treatment and choice of direct restorative material [5]. The materials used for direct restorations are divided into four categories which can be dental amalgam, resin-based composites, glass ionomer, or resin-modified glass ionomer [6]. The selection of the appropriate direct restorative material is dependent on the location of the tooth, affected surface, depth and the size of the lesion [7]. Other factors considered in selection of a material are whether it releases fluoride, its wear resistance, strength and ease of use.

Of these materials, dental amalgam has been widely used for over 150 years in restoration of decayed teeth in all countries regardless of the socio-economic status. Its usage has been prompted by it being safe and effective and especially suitable for heavy-load-bearing teeth [8]. The elemental mercury however forms approximately half (50%) of dental amalgam by weight and is known as one of the ten toxic chemicals listed by WHO as chemicals of public health and environmental concern [9].

Dental amalgam is formed by triturating a mixture of powdered alloy of metals consisting of silver, tin, and copper and liquid elemental mercury and its handling was a challenge. To avoid these challenges the encapsulated form was introduced and it has measured proportions of powder and mercury and subsequently in 1998 FDI provided mercury hygiene statement on how to handle mercury containing material during its General Assembly and revised in 2007 [10]. Other concerns are related to occupational exposure of mercury while handling patients in dental clinics. Dental amalgam capsules have been used for restoration of decayed teeth for over three decades in Tanzania, however, amalgam capsules and other forms of amalgam wastes continue to be incinerated together with other health acre waste generated from dental clinics. This is contrary to FDI Policy Statement on safe management of waste and mercury released in 2021[11]. The incinerated amalgam and its products get released into the environment [4]. It is these environmental concerns regarding mercury that have fuelled legislative and regulatory actions in some countries to phase down amalgam use [12]. Other concerns that were raised include the release of mercury vapour from amalgam surfaces into the mouth and lung [13].

INITIATIVES FOR PHASING DOWN USE OF DENTAL AMALGAM

Initiatives towards minimization of environmental pollution caused by mercury started in the early 2000 and environmental activists increased awareness and recognition of complications caused by mercury release [14]. This prompted a series of international negotiations which later led to the signing of a legally binding agreement in Japan on October 2013 called the Minamata Convention on Mercury. The increased awareness on complications caused by mercury has gained attention not only by environmentalist but also by both dentists as well as the patients they serve [15].

The Minamata convention stipulates that each country intending to phase down the use of dental amalgam is required to take into account local circumstances and relevant international guidance [16]. The convention gives each country opportunity to employ two or more measures to attain the phase down. Following ratification of this convention, each country is required to set strategies towards minimization of use of dental amalgam. These measures include setting guidelines which limits the use of amalgam in children under 15 years and pregnant women, installation of amalgam separators or banning its use in restoration of decayed teeth.

According to the report issued by WHO in 2021 on country monitoring towards phasing down use of dental amalgam, it was reported that there are ten countries that have phased down use of dental amalgam. The distribution of these countries per continent was: America (4), Europe (5) and Asia (1) [17]. The number of countries that will have phased down use of dental amalgam is anticipated to increase by 2030. The list might include African countries as at present already 50% of have ratified the Minamata Convention. Tanzania ratified the Minamata Convention since 2019 and in its attempts to phase down the use of dental amalgam the Ministry responsible for Health developed guidelines in 2020 which restricted use of amalgam fillings in children under of 15 years and pregnant women [18]. Additionally, the Ministry responsible for environment through the Environment Management Act 2004 under section 230(1) and (2)(f) made regulations for controlling and managing mercury and mercury compounds which were signed in 2020 by Minister responsible for Environment [19,20].

These regulations emphasize the gradual phasing down use of dental amalgam and advocate the use of alternatives which are composites, glass ionomer and resin ionomer. Regulations also prohibit use of mercury in bulk form during restoration of teeth as well as in artisanal small-scale mining. The breach of these regulations is subject to offences and penalties. The regulations stipulate that dental amalgam can continue to be used in this timeframe of phasing down and health facilities are required to employ best management practices. This entails installation of amalgam separators so that they retain and collect the amalgam waste particles. The regulations also prohibit burning of health care waste containing amalgams which at present are being incinerated.

Many developing countries are at different stages of ratifying the convention, however in order to realize that the environment is no longer contaminated with mercury there are challenges that needs to be mitigated. Tanzania is not exception to these challenges despite that restorative dental care is minimal [21]. Challenges that need to be mitigated include prevention and early detection of dental caries coupled with compromised infrastructure for restorative care. This will reduce the presence of extensive lesions requiring dental amalgam thereby reducing environmental pollution and in turn reduce the added costs of installing amalgam separators and plans for disposing of the collected amalgam waste.

The phase down has brought in a shift from a long-time restorative model towards a preventive and minimal intervention dentistry which is an opportunity to strengthen oral health promotion and oral disease prevention. With the on-going rural electrification in Tanzania as well as investment in the health sector including dental services in primary health facilities the country, the practice of using mercury free materials can be attained.

The efforts to phase down use of dental amalgam might be successful if approach suggested by Fischer et al 2019 is implemented [22]. The approach is a combination of three strategic interventions which are: health care waste management; knowledge management and health system strengthening. Even though there is no study which has been carried out to evaluate the effect of awareness raising campaigns towards use of alternatives of dental amalgam, a noted proportion of clients denying its use is increasing. As part of system strengthening, the Government through Medical Store Department had stopped the bulk procurement of dental amalgam previously done for public health facilities, instead alternative materials are procured to comply with regulations. The other best

opportunity to facilitate use of alternative materials is for the National Health Insurance company to include in their list for treatment and reimbursing restoration made using non mercury containing materials. Furthermore, based on Fischer's approach, it is deemed necessary to continue providing training as continuous professional development to those who are already in practice on used of alternatives

PUBLIC IMPLICATIONS AND RECOMMENDATIONS

One of the challenges of non-amalgam restoration or tooth-coloured restorative materials is the negative effect to clients seeking tooth restoration for extensive lesions. However, dental schools worldwide are revising their training and education curricula to equip students with the appropriate skills to identify lesions that can be restored using tooth-coloured restorative materials and to adequately perform these procedures.

This highlights the need for more research to be conducted on use of alternative dental restorative materials and their impact to health as emphasis continue to be put on adoption of non-mercury containing restorative materials. Another assessment approach is through routine data from health facilities, where trends in use of dental restorative materials indicating nature of materials, type and site of restoration, and type patient (e.g., child, adult, and old age) [4] are collected and analysed.

Thus, to protect the environment and patient well-being, it is recommended that in phasing down the use of dental amalgam there is a need to reduce provision of restorative care services by promoting oral health prevention strategies such as use of fluoride. This could be achieved by harnessing the beneficial effect of fluoridated tooth pastes on dental caries prevention coupled by improving quality, accessibility and affordability so that communities can access it and use.

Furthermore, early diagnosis should be emphasized and efforts should be made towards training in use of alternative materials and making them readily available and at an affordable cost. There should be a mechanism in place on collection of non-used elemental mercury and its alloys and encapsulated amalgam which has been purchased but not used for proper handling and disposal.

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MUHTASARI

Hatua za Awali katika Utekelezaji wa Kuondoa Matumizi ya Amalgam kwa kuzibia Meno nchini Tanzania.

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Utangulizi: Ulimwenguni kote, amalgam imetumika kwa miaka mingi kama dawa ya kuzibia meno yaliyotoboka. Amalgam ni mchanganyiko wa unga au poda inayojumuisha madini aina ya fedha, bati, na shaba pamoja na zebaki. Zebaki hata hivyo huunda takriban nusu (asilimia 50) ya amalgam kwa uzito/uzani. Hata hivyo, katika miaka ya hivi karibuni zebaki imeorodheshwa kuwa mojawapo ya kemikali kumi kuu zenye sumu zinazosababisha madhara ya afya kwa umma na mazingira. Hii imesababisha kilio kimataifa kwamba zebaki inayotumiwa katika mchanganyiko wa amalgam ya kuzibia meno yaliyotoboka inapaswa kuzingatiwa kuwa hatari. Kwa hiyo, mipango imeanzishwa ili kupunguza matumizi yake na kubadilishwa na dawa mbadala zisizo za zebaki kwa minajiri ya kuzibia meno yaliyotoboka.

Hatua zilizochukuliwa: Kutokana na taarifa za hatari za zebaki kwa afya na mazingira, mkataba wa Minamata kuhusu zebaki wa mwaka 2013 ulipendekeza kuzuia matumizi ya mchanganyiko wa amalgam kama dawa ya kuzibia meno yaliyotoboka na kuagizwa kuondolewa katika matumizi ifikapo mwaka 2030. Nchi chache zilikuwa tayari zimeondoa matumizi ya mchanganyiko wa amalgam kuzibia meno yaliyotoboka, lakini idadi ya nchi inatarajiwa kuongezeka ifikapo mwaka 2030. Nchini Tanzania, mchakato wa kuondoa matumizi wa mchanganyiko wa amalgam ulianza mwaka 2020 kwa kuzuia matumizi yake kwa watoto chini ya umri wa miaka 15 na mama wajawazito, pia kuacha kuagiza zebaki na kusambaza kwenye vituo vya kutolea huduma za afya. Dawa mbadala za mchanganyiko wa amalgam ni pamoja na composites, glass ionomer and resin ionomer. Dawa hizi mbadala kwa sasa zinapatikana katika vituo vya kutolea huduma za afya, lakini ni ghali, huaathirika na unyevu wakati wa kutumika na zinaweza kuwa na mabadiliko ya rangi baada ya wakati na siyo ngumu ikilinganishwa na mchanganyiko wa amalgam.

Manufaa kwa umma na Mapendekezo: Kuondoa matumizi ya mchanganyiko wa amalgam kama dawa ya kuzibia meno yaliyotoboka ni jambo lisiloepukika na umma unahitajika kuzingatia upitishwaji wa dawa mbadala zisizo za zebaki. Umma pia unahitaji kufahamu kuhusu gharama na matokeo mengine

ikiwa ni pamoja na faida zinazohusiana na dawa mbadala. Kulingana na madhara na manufaa yanayohusiana na dawa mbadala za amalgam, kuna haja ya kuhakikisha jino linazibwa tundu likingali dogo.. Tundu la jino huwa kubwa kwa kutoboka sana kutokana na watu kuchelewa kutafuta huduma za afya, kwa hivyo, inashauriwa kuwa umma unahitaji kuhamasishwa kufanya uchunguzi wa afya ya kinywa mara kwa mara angalau mara moja kwa mwaka. Mbinu hii itahakikisha ustawi wa afya bora ambapo kutawezesha ugunduzi wa mapema na kuanzisha hatua za kuzuia dhidi ya kutoboka kwa meno. Haduma ya Afya ya Kinywa na meno ya kudhibiti kutoboka meno ni kuongeza matumizi ya floridi. Hii itawezekana endapo matumizi ya dawa za meno zilizo na floridi juu ya uzuiaji wa meno kutoboka pamoja na kuboresha uimara na ubora wa meno zitakuzwa. Aidha hatua hii itakuwa ya manufaa endapo upatikanaji na uwezo wa kumudu utazingatiwa ili jamii ziweze kupata na kutumia. Mbali na utambuzi wa mapema, imesisitizwa na juhudi zinapaswa kufanywa kwa mafunzo katika shule za utabibu wa kinywa na meno juu ya matumizi sahihi ya dawa mbadala za kuzibia meno yaliyotoboka na kwa Serikali kuzifanya dawa hizi zipatikane kwa urahisi na kwa gharama nafuu. Ili kulinda mazingira, lazima kuwe na utaratibu wa kukusanya zebaki isiyotumika na amalgam iliyoingizwa ambayo imenunuliwa lakini haijatumika nakuteketezwa kwa kwa usahihi.

Maneno Muhimu: Mchanganyiko wa Amalgam; Meno kutoboka, Mkutano wa Minamata kuhusu zebaki; kuondolewa katika matumizi; Dawa zisizo na zebaki

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Investigations into the Drivers of Tanzania's High Incidence Rates of Esophageal Cancer

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KEY MESSAGES

- Tanzania has very high rates of esophageal squamous cell carcinoma (ESCC), in particular in the Kilimanjaro region.
- Investigation of the risk factors for ESCC in Tanzania revealed several environment and lifestyle risk factors associated with development of this cancer.
  - ESCC risk is increased through tobacco smoking, use of smokeless tobacco and alcohol consumption such as the male-dominated consumption of home brewed beers, banana wine, and chang'aa (distilled spirits). ESCC risk is also increased from hot beverages which are consumed at particularly high temperatures in Tanzania.
  - Exposure to polycyclic aromatic hydrocarbons, often through the burning of biomass fuels for heating and cooking, increases the risk of ESCC.
  - Poor oral health, characterised by missing teeth and not frequently brushing teeth is associated with an increased risk of ESCC, but the mechanisms are not fully understood.
  - Consumption of fruits and vegetables may reduce the risk of developing ESCC.
- Cancer control measures in Tanzania need to promote the elimination of all forms of tobacco use, reduce alcohol consumption, encourage lower sip temperature and sip volumes when consuming hot beverages, and promote clean cooking fuels.

BACKGROUND AND PROBLEM STATEMENT

Esophageal cancer (EC) is a devastating cancer in which the primary site of malignancy is in the esophagus, i.e. the food pipe or digestive muscular tube through which all ingested food and drink passes to the stomach. The global distribution of this cancer varies widely, and the aetiology is not fully understood. Worldwide, there are two specific areas of high incidence, notably the Asian Esophageal Cancer Belt (with extremely high rates in parts of north central China) and the African Esophageal Cancer Corridor, which spans an easterly lying region of Africa from Ethiopia to eastern parts of South Africa [1]. In each of the very high incidence areas, incidence rates of this cancer tend to be higher in lower socioeconomic rural populations. Tanzania, which lies within the African EC corridor, has an estimated age-standardized incidence rate of 11.8 and a mortality rate of 11.4 per 100,000 [2]. In 2022, there were an estimated 3,532 new EC cases in Tanzania and almost as many people (3,350) died from this disease. The high mortality to incidence ratio speaks to the fatality of an EC diagnosis. EC is associated with immense suffering, weight loss, dehydration and emaciation, as the patient cannot swallow first solids then liquids. Treatment options in Tanzania often first involve placement of a self-expanding metal stent, so as to restore the ability to swallow and improve nutritional intake, and if the disease spread is not extensive, surgery, chemotherapy and radiotherapy are used to treat the malignancy. In general, however, EC survival rates at 5-years are under 25% even in high-income countries.

The Northern Zone of Tanzania, in particular the Kilimanjaro Region, has been known for decades to have particularly high incidence rates of EC. Indeed, in seminal work conducted by Professor PR Hiza in 1979, "Malignant Disease in Tanzania, "he had already identified these localized areas of high incidence. Of the two major histological types of EC, esophageal squamous cell carcinoma (ESCC) makes up the vast majority in Tanzania (over 90%) in contrast to Europe where EC incidence rates are much lower overall and most is esophageal adenocarcinoma (EAC). For example, comparing Tanzania to the UK, rates of ESCC are at least five times higher in Tanzania, whilst rates of EAC are not excessively high in generally but are higher in the UK than Tanzania, especially amongst men.

With this background, over the past decade studies aiming to investigate the aetiology of ESCC in Tanzania have been conducted. They have been based in Dar es Salaam, capturing patients referred from across the country, and in Kilimanjaro, the ESCCAPE study which encompasses a more local northern catchment population. These studies aimed to examine the environmental, lifestyle and genetic risk factors contributing to Tanzania's ESCC burden and, alongside clinical research and training in clinical management, form part of the African Esophageal Cancer Consortium AfrECC. The risk factors that have been investigated included all those found to be associated with the disease in other settings, but

with exposure sources – particularly for alcohol – tailored to the Tanzania setting. The factors under investigation included alcohol consumption[3-5], tobacco smoking[3-6], smokeless tobacco use[6], exposure to household smoke [4,5], hot food and beverages [4,5,7] diet [4,5], and poor oral health [4,8].

METHODS

The two main ESCC etiology studies that have been conducted were case-control in design and were conducted between 2013 and 2019. Their full protocol details can be found in associated publications [5,8]. In the study in the north of the country, study participants were recruited at the Kilimanjaro Christian Medical Centre (KCMC) in Moshi, including patients from Huruma Hospital (Rombo), Siha, Hai and Machame hospitals, and in the second study conducted in Dar es Salaam participants were recruited from Muhimbili National Hospital (MNH) and Ocean Road Cancer Institute (ORCI). In both studies, eligible cases were adults who received a histological diagnosis of ESCC or, without histological confirmation, were considered as ESCC patients based on barium swallow, endoscopy findings, or specific symptoms (weight loss and severe dysphagia). The minimum eligible age for study inclusion was 18 years in the Kilimanjaro study and 30 years in the Dar es Salaam study. Controls were recruited in a 1:1 ratio with cases, and either through frequency or individual matching on age and sex. The controls were recruited from the same hospitals as cases and included outpatients, inpatients, and hospital visitors who were not being treated for or have symptoms of cancer or any other digestive disease. Consenting participants were interviewed in person by trained research assistants in local vernaculars using a structured questionnaire. The questionnaire was designed, among other demographic and clinical information, to elicit information on various established and putative risk factors for ESCC. Several articles from these two studies, focused upon specific exposures and ESCC risk, have already been published [3-6]. In those articles, logistic regression models adjusting for design factors were used to estimate odds ratio for ESCC. In the present article, we summarize these findings to provide an overview of the emerging etiology of ESCC in Tanzania.

RESULTS

Patient profile

In total, 781 esophageal cancer patients were interviewed, 310 in Kilimanjaro and 471 in Dar es Salaam. A similar number of controls were also interviewed. The mean age of ESCC patients was 59 years in Dar es Salaam and 63 years in Kilimanjaro. Like in other parts of the African ESCC corridor, but rarely seen elsewhere worldwide, a substantial number of young people (over 100 were <40 years) were also affected by this disease. In both settings, more men were affected by the disease: 69% of patients in Dar es Salaam were male and 76% in Kilimanjaro. Whilst the Kilimanjaro recruitment was generally of patients from that region, in Dar es Salaam, the main residential zones of the ESCC patients was referrals from the Coastal zone (46%), Northern (23% - i.e. including Kilimanjaro), and 11-12% each from the Central and Southern Highlands. The high percentage was possibly influenced by migration to the national hospital and cancer institute. The table below summaries the major findings from both studies, providing references to the full publications.

Table: A summary of major risk factors for esophageal cancer found in two Tanzanian case-control studies of esophageal cancer, one in Dar es Salaam and one in Kilimanjaro.

Table: A summary of major risk factors for esophageal cancer found in two Tanzanian case-control studies of esophageal cancer, one in Dar es Salaam and one in Kilimanjaro.

Exposure Reference first author (year) – exposure contrast	Odds Ratio (95% CI)		
Alcohol Consumption			
Middleton-D (2021) – Alcohol use (ever v never)	1.96	1.20	3.20
Buckle-G (2022) - Age 30-44 years (Home brewed)	1.64	0.57	4.72
Buckle-G (2022) - Age 45+ years (Home brewed)	2.08	1.26	3.41
Hot food and beverage consumption			
Mmbaga (2021) - Burnt tongue in the past year	1.02	0.76	1.37
Buckle (2022) - Age 30-44 years (+1 hot drink/day)	1.99	1.13	3.50
Buckle (2022) - Age 45+ years (+1 hot drink/day)	1.60	1.13	2.27
Masukume-G (2022) - Very hot tea/coffee Tanzania	1.93	1.26	2.96
Masukume-G (2022) - Very hot porridge Tanzania	1.65	1.06	2.58
Tobacco use			
Mmbaga-E (2021) - Current smoker vs never	2.23	1.42	3.51
Mmbaga-E (2021) - Former smoker vs never	1.84	1.28	2.65
Buckle (2022) – Ever smoked (Yes n no) among 45+ y	2.04	1.33	3.12
Simba-H (2023) – smoking Yes v No – among men	3.58	1.96	6.52
Simba-H (2023) – smoking Yes v No – among women	2.47	0.72	8.50
Simba-H (2023) – Tobacco uses yes v No	3.09	1.83	5.23
Simba-H (2023) - Smokeless tobacco use Yes v No	2.38	0.99	5.75
Oral health			
Mmbaga-BT (2020) - Less than daily brusher	2.77	1.20	6.43
Mmbaga-BT (2020) - Chewed stick vs Modern toothbrush	2.28	1.27	4.09
Mmbaga-BT (2020) - Use of charcoal to clean teeth	2.33	1.33	4.07
Mmbaga-BT (2020) – DMFT(Decayed+missing+filled) 10+	3.26	1.77	6.02
Mmbaga-BT (2020) - TFI fluorosis index 4	3.51	1.72	7.13
Mmbaga-BT (2020) - TFI fluorosis index 5+	13.5	5.70	31.9
Buckle-G (2022)-Age 30-44 y (Less than daily teeth cleaning)	9.79	1.90	50.54
Buckle-G (2022) - Age 45+ y (Less than daily teeth cleaning)	1.55	0.99	2.41
Household smoke exposure			
Mmbaga-E (2021) - Cooking (firewood)	2.22	1.59	3.10
Mmbaga-E (2021) - Slept near a fire as child	1.28	0.94	1.75
Buckle-G (2022) – Use firewood for cooking, among 30-44 y	1.21	0.51	2.88
Buckle-G (2022) – Use firewood for cooking, among 45+y	1.54	1.00	2.37
Fruits and vegetables consumption			
Mmbaga-E (2021) - Raw greens	0.36	0.16	0.80
Mmbaga-E (2021) – Fruit	0.47	0.27	0.82
Buckle-G (2022) - Raw greens daily (Age 30-44 years)	0.20	0.05	0.88
Buckle-G (2022) - Raw greens daily (Age 45+ years)	0.44	0.23	0.85

TFI : Thystrup Fejerskov fluorosis index

Summary of risk factors

Alcohol consumption, tobacco use (smoking and smokeless), exposure to household smoke, poor oral health, and consumption of hot tea and beverages were identified as risk factors for ESCC. Consumption of fruits and vegetables was protective for ESCC risk.

Our assessment of alcohol consumption attempted to capture detailed context-specific intake. It included many legal and illicit alcohols, both traditionally and commercially produced. They comprised, as well as beer and wine, for example mbege (a banana beer), chang'aa (distilled spirits) (Figure 1) and banana wine. In both study locations, alcohol consumers were twice as likely to develop ESCC [3,4]. There was a clear increase in cancer risk with greater amounts of alcohol consumed regularly [3].

Figure 1: Chang'aa production (distillery), Moshi Tanzania

Tobacco smoking – both of commercial cigarettes and self-rolled – was found to be an important risk factor for ESCC in both studies (Figure 2). In Dar es Salaam, smokers were twice as likely to develop ESCC compared to non-smokers [4,5], whilst in Kilimanjaro, tobacco smokers had a 3-fold increased risk of developing ESCC compared to non-smokers [6]. The role of exclusive smokeless tobacco was also investigated in Kilimanjaro. In contrast to tobacco smoking, this habit was more common in women. Smokeless tobacco users had a 2-fold increased risk for ESCC than those who did not [6].

Figure 2: Tobacco smoking (self-rolled)

An increased risk of ESCC was found in those who consumed hot food and beverages. In Kilimanjaro, consuming very hot tea or coffee and having very hot porridge increased risk of ESCC by approximately two-fold [7] These results are consistent with previous observations in from Iran and China. A previous study in Moshi had already established that the first sip temperature is particularly high, at 70 degrees Celsius [9]. The high-altitude areas and thus cold temperatures at night around Mount Kilimanjaro may explain the hot tea drinking habits in this area (Figure 3).

Figure 3: Hot tea in Moshi, Kilimanjaro

Exposure to household smoke through cooking with firewood [4,5], and sleeping near a fire as a child [5] was found to increase the risk of developing ESCC in the Dar es Salaam study (Figure 4).

Oral health and oral hygiene may be implicated in ESCC although the mechanisms are not well understood. They may involve inflammatory pathways or products of the oral and esophageal microbiome. Similar to findings in other high-ESCC risk areas of the world, several indicators of poor oral health and hygiene were associated with increased ESCC risk [10,4]. They include less than daily tooth brushing, using a chewed stick or

using charcoal to clean teeth, more decayed or missing teeth and the presence of fluorosis. Further studies, including with a full professional dental examination, are needed of the assessment of fluorosis, to address the potential of exposure misclassification and to identify correlates of high-fluoride drinking water, or the impact of severe dental pitting on the oral microbiome.

Figure 4: Indoor air pollution from wood smoke. Exposures in women are particularly high.

Consumption of fruits and vegetables was protective for ESCC in the study from Dar es Salaam. Eating raw greens and fruits reduced the risk of developing ESCC by more than 50% in a study [4,5].

HEALTH POLICY AND RESEARCH RECOMMENDATIONS

- **The prevention potential:** There are many modifiable and therefore preventable risk factors for ESCC in the Tanzanian setting. A reduction in the occurrence of ESCC, especially in men, may be possible through lifestyle changes. Engagement with relevant stakeholders to implement prevention programs for alcohol and tobacco will reap benefits beyond ESCC.
- **Primary Prevention Strategies:** Improve awareness of ESCC risk factors in the community and promote social and physical environments that promote healthy lifestyles, cultures and habits for their adoption. Expansion of the availability of affordable clean fuels may contribute to ESCC prevention, especially for women.
- **Secondary Prevention:** Strengthen early detection of ESCC, through symptom awareness in the community, amongst traditional leaders and in the health workforce. Clarify and accelerate referral pathways for patients with new onset dysphagia. Such strategies require inclusion of early onset (<40 years) risk populations.
- **Treatment:** Improve the capacity for ESCC diagnosis and treatment, through and expansion of training programs and stent supply across East Africa.
- **Cancer Control Plans:** Include ESCC primary and secondary prevention, as specified above, in future plans for Tanzania's National Cancer Control Strategy [11]
- **Aetiologic Research:** There remain many unknowns in explaining such high ESCC incidence rates and in explaining whether certain associations are causal, false-positives, biased or confounded. Future ESCC research would benefit from including the contribution of inherited genetic susceptibility, mechanistic studies of the role of the oral health and oral and esophageal microbiome in ESCC in Tanzania, and mechanisms of action of indoor air pollution and thermal injury. Behavioural research to effectively modify lifestyle-related ESCC risk factors are warranted.
- **Clinical Research:** Research on the early detection of ESCC needs expanding. Research on the potential of swallowed sponges that remain attached to a string and are retracted using it may form scalable appropriate health technologies for the early diagnosis of ESCC or its precursors in this setting. Research to improve the quality of life of ESCC patients needs expansion.

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Uchunguzi wa Vichochezi vya Matukio ya Viwango vya Juu vya Saratani ya Koromeo/Koo Nchini Tanzania

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UJUMBE MHIMU

» Tanzania ina viwango vya juu sana vya a saratani ya koromeo (esophageal cancer, EC) aina ya esophageal squamous cell carcinoma (ESCC)] ambayo inashambulia sehemu yoyote ya koromeo, hasa katika mkoa wa Kilimanjaro.

» Utafiti juu ya vihatarishi vya ESCC nchini Tanzania umebaini mambo kadhaa hatarishi ya mazingira na mtindo wa maisha yanayohusiana na uwepo wa saratani hii.

- Hatari ya ESCC inaongezeka kupitia uvutaji wa tumbaku, utumiaji wa tumbaku isiyo ya kuvuta na unywaji pombe kama vile unywaji wa pombe zinazotengenezwa nyumbani kwa wanaume, divai ya ndizi na chang'aa. Hatari ya ESCC pia inaongezeka kutoka kwa vinywaji vya moto vinavyotumiwa vikiwa bado moto sana nchini Tanzania
- Kukaa katika maeneo yanayofuka moshi (polycyclic aromatic hydrocarbons), ambapo mara nyingi hutokea kipindi ambapo moto unawashwa kwa ajili ya kuota (hasa wakati wa baridi) na kupikia chakula, hali hii huongeza hatari ya ESCC.
- Afya mbaya ya kinywa, inayoambatana na kukosa meno (mapengo) na kutokupiga mswaki mara kwa mara inahusishwa na hatari ya kuongezeka kwa ESCC, lakini jinsi inavyo tokea bado taarifa hazieleweki kikamilifu.
- Ulaji wa matunda na mboga unaweza kupunguza hatari ya kupata ESCC.

» Hatua za kudhibiti saratani nchini Tanzania zinahitaji kuhimiza uondoaji wa aina zote za matumizi ya tumbaku, kupunguza matumizi ya pombe, kuhimiza kupunguza kiasi cha vinywaji vya moto na kunywa vikiwa siyo vya moto sana, na kukuza utumiaji wa nishati safi ya kupikia.

TAARIFA ZA CHIMBUKO LA TATIZO

Saratani ya koromeo (esophageal carcinoma, EC) ni saratani mbaya ambayo kimsingi inashambulia na kusambaa kwenye koromeo, yaani, bomba la chakula au mrija wa misuli ya kumeng'enya (kusaga) chakula ambapo vyakula na vinywaji vyote vinavyomezwa hupita kwenda tumboni. Usambaaji wa saratani hii kimataifa unatofautiana sana, na chanzo chake hakieleweki kikamilifu. Ulimwenguni kote, kuna maeneo mawili mahususi yenye matukio mengi, hususan Ukanda wa Saratani ya Koromeo wa Asia (wenye viwango vya juu sana hasa sehemu za kaskazini ya kati mwa China) na Ukanda wa Saratani ya Koromeo wa Afrika, ambao unazunguka eneo la mwambao wa mashariki mwa Afrika kutoka Ethiopia hadi sehemu za mashariki ya Afrika Kusini [1]. Katika maeneo yote yenye matukio mengi, viwango vya matukio ya saratani hii huwa juu zaidi katika jamii ya watu wa vijijini wenye uchumi mdogo. Tanzania, ambayo iko ndani ya ukanda wa Afrika wa EC, inakadiriwa kuwa na matukio ya kiwango cha idadi ya wagonjwa 11.8 na kiwango cha vifo cha 11.4 katika kila watu 100,000 [2]. Mwaka 2022, kulikuwa visa vipya 3,532 vya EC nchini Tanzania na karibu watu wengi (3,350) walikufa kutokana na ugonjwa huu. Matukio ya juu, pamoja na viwango vya juu vya vifo, inathibitisha kuwa uchunguzi wa EC unaonesha kuua watu wengi. ESCC inahusishwa na mateso makubwa, kupungua uzito, upungufu wa maji mwilini na kupungua, kwani mgonjwa kwanza hushindwa kumeza vitu vigumu kisha vimiminika. Chaguzi za matibabu nchini Tanzania mara nyingi awali huhusisha uwekaji wa chuma inayojitanua yenyewe, ili kurejesha uwezo wa kumeza na kuboresha ulaji wa chakula, na ikiwa ugonjwa haujaenea sana, matibabu kwa ya upasuaji, kumeza daya na mionzi (radiotherapy) hutumiwa kutibu ugonjwa huo. Kwa ujumla, hata hivyo, viwango vya wagonjwa wa kansa ya koromeo kuishi katika miaka 5 ni chini ya asilimia 25 hata katika nchi za kipato cha juu.

Ukanda wa Kaskazini mwa Tanzania, hususan Mkoa wa Kilimanjaro, umejulikana kwa miongo kadhaa kuwa na viwango vya juu vya matukio ya saratani ya koromeo (EC). Kwa hakika, katika kazi ya mwisho iliyofanywa na Profesa PR Hiza mwaka 1979 "Malignant Disease in Tanzania," hapa tayari alikuwa amebainisha maeneo haya yenye matukio mengi. Kati ya aina mbili kuu za histolojia za EC, esophageal squamous cell carcinoma (ESCC) ndiyo inaathiri idadi kubwa zaidi Tanzania (zaidi ya asilimia 90) tofauti na Ulaya ambapo kwa ujumla viwango vya matukio ya EC viko chini sana, hata hivyo ania ya esophageal adenocarcinoma (EAC) ni kubwa zaidi.Kwa mfano, ukilinganisha Tanzania na Uingereza, viwango vya ESCC ni angalau mara tano zaidi nchini

Tanzania, wakati viwango vya EAC kwa ujumla si vya juu kupita kiasi lakini viwango viko juu nchini Uingereza kuliko Tanzania, hasa kwa wanaume.

Kwa utangulizi huu, katika kipindi cha muongo mmoja uliopita tafiti zinazolenga kuchunguza chanzo cha ESCC nchini Tanzania zimefanyika. Tafiti hizi zimejikita jijini Dar es Salaam, wakihusisha wagonjwa waliopewa rufaa kutoka nchi nzima, na mkoani Kilimanjaro, utafiti wa ESCAPE ambao unajumuisha zaidi wakazi wengi wa eneo la kaskazini. Tafiti hizi zililenga kuchunguza mazingira, mtindo wa maisha na hatari ya vinasaba zinazochangia ukubwa wa ESCC nchini Tanzania. Hii ni pamoja na utafiti wa kimatibabu na mafunzo katika usimamizi wa matibabu, ikiwa ni sehemu ya mradi mkubwa wa African Esophageal Cancer Consortium (AfrECC). Sababu za hatari ambazo zimechunguzwa ni pamoja na zile zote zilizopatikana kuhusishwa na ugonjwa huo katika mazingira mengine, lakini kwa vyanzo vya kuwemo hatarini - haswa kwa pombe - kulingana na mazingira ya Tanzania. Sababu zilizochunguzwa zilijumuisha unywaji wa pombe [3-5], uvutaji wa tumbaku [3-6], matumizi ya tumbaku isiyo ya kuvuta [6], kuwemo hatarini ya kuathiriwa na moshi wa nyumbani [4,5], chakula cha moto na vinywaji [4,5,7] aina ya chakula [4, 5], na afya mbaya ya kinywa [4,8].

MBINU

Tafiti kuu mbili zilizofanya uchunguzi wa chanzo cha ESCC zilikuwa za muundo wa watu wenye ugonjwa wa na wasio na ugonjwa wa ESCC (case-control) na zilifanyika kati ya mwaka 2013 na 2019. Maelezo yao kamili ya miradi yanaweza kupatikana katika machapisho yanayohusiana na kazi hii [5,8]. Upande wa kaskazini washiriki wa utafiti huo walipatikana kutoka katika Hospitali ya Kilimanjaro Christian Medical Centre (KCMC) mjini Moshi, wakiwemo wagonjwa kutoka Hospitali ya Huruma (Rombo), Siha, Hai na Machame, na katika utafiti wa pili uliofanyika jijini Dar es Salaam washiriki walipatikana kutoka Hospitali ya Taifa Muhimbili (MNH)) na Taasisi ya Saratani ya Ocean Road (ORCI).

Katika tafiti zote mbili, wagonjwa waliokubalika kushiriki ni watu wazima ambao walipata uchunguzi wa kihistologia wa ESCC au, bila uthibitisho wa kihistologia, walizingatiwa kama wagonjwa wa ESCC kulingana na kumeza dawa aina ya bariamu, matokeo ya uchunguzi wa endoscopy, au dalili maalum (kupungua uzito na kushindwa kumeza maji au chakula). Umri wa chini uliostahili kujumuishwa katika utafiti ulikuwa miaka 18 katika utafiri wa Kilimanjaro na angalau miaka 30 katika utafiti wa Dar es Salaam. Wale ambao hawakuwa na ugonjwa wa saratani walioshabihishwa na wagonjwa (controls) waliwekwa katika uwiano wa 1:1 na wagonjwa (cases), na kulinganishwa na mtu binafsi kwa umri na jinsia. Watu wa kulinganisha wasio kuwa wagonjwa wa ESCC (controls) walichukuliwa kutoka hospitali zilezile za wagonjwa na ilijumuisha wagonjwa wa nje, wagonjwa waliolazwa, na watu wengine waliotembela hospitali ambao hawakuwa na saratani au ugonjwa mwingine wowote unaohusu njia ya mmeng'enyo (usagaji) wa chakula.

Washiriki waliokubali kushiriki waliulizwa maswali kila mtu kibinafsi na wasaidizi wa utafiti waliokuwa wamepata mafunzo ya maadili ya utafiti. Maswali yaliulizwa katika lugha za kabila husika (kienyeji) kwa kutumia dodoso lililoandaliwa. Dodoso lilitengenezwa ili kupata taarifa mbalimbali, miongoni mwa taarifa nyingine ikiwa ni pamoja na taarifa za kidemografia na kimatibabu, ilikuwa ni kupata taarifa kuhusu vipengele mbalimbali vya hatari vilivyothibitishwa na vilivyohisiwa kuwa ni vyanzo hatarishi vya saratani ya koromeo (ESCC). Nakala kadhaa kutoka katika tafiti hizi mbili, zilizolenga juu ya udhihirisho maalum na hatari ya kupata ESCC, tayari zimeishachapishwa [3-6]. Katika makala hizo, uchambuzi wa takwimu ulifanywa ili kukadiria uwiano wa viashiria vinavyoweza kusabisha saratani ya koromeo. Nakala kadhaa kutoka katika tafiti hizi mbili, zilizolenga juu ya udhihirisho maalum na hatari ya kupata ESCC, tayari zimechapishwa [3-6]. Katika makala hizo, uchambuzi ulifanywa ili kukadiria uwiano wa viashiria vinavyoweza kusabisha ESCC. Katika makala haya, tunatoa muhtasari wa matokeo haya ili kutoa mwanga wa vyanzo vinavyosabibisha kuibuka kwa tatizo la saratani ya koromeo nchini Tanzania.

MATOKEO

Wasifu wa mgonjwa

Kwa jumla, wagonjwa wa saratani ya Koromeo 781 walisailiwa, 310 kutoka Kilimanjaro na 471 kutoka Dar es Salaam. Idadi sawa ya watu wasio na ugonjwa walioshabihiana (contols) pia walisailiwa. Wastani wa umri wa wagonjwa wa ESCC ulikuwa miaka 59 kwa Dar es Salaam na miaka 63 kwa Kilimanjaro. Kama ilivyo katika sehemu nyingine za ukanda wa ESCC wa Afrika, lakini hazionekani sana kwingineko duniani kote, idadi kubwa ya vijana (zaidi ya 100 walikuwa chini ya miaka 40) pia waliathiriwa na ugonjwa huu. Katika sehemu zote mbili, wanaume zaidi waliathiriwa na ugonjwa huu: asilimia 69 ya wagonjwa wa Dar es Salaam walikuwa wanaume na asilimia 76 Kilimanjaro. Wakati washiriki wa Kilimanjaro kwa ujumla walikuwa wagonjwa kutoka mkoa huo, Dar es Salaam, kanda kuu za makazi ya wagonjwa wa ESCC yalikuwa ni rufaa kutoka ukanda wa Pwani (asilimia 46), Kaskazini (asilimia 23- yaani ikijumuisha Kilimanjaro), na asimia 11-12 kila moja kutoka Nyanda za Juu za Kati na Kusini. Kwa asilimia kubwa hali hii huenda inatokana na uhamiaji kufuata huduma kutoka hospitali ya kitaifa na taasisi ya saratani. Jedwali la 1 linatoa muhtasari wa matokeo makuu kutoka kwa tafiti zote mbili, likitoa marejeo ya machapisho kamili.

Jedwali la 1: Muhtasari wa sababu kuu za hatari kwa saratani ya koromeo iliyopatikana katika tafiti mbili kwa saratani ya koromeo nchini Tanzania, moja Dar es Salaam na nyingine mkoani Kilimanjaro.

Exposure Reference first author (year) – exposure contrast	Odds Ratio (95% CI)		
Matumizi ya Pombe			
Middleton-D (2021) – Alcohol use (ever vs never)	1.96	1.20	3.20
Buckle-G (2022) - Age 30-44 years (Home brewed)	1.64	0.57	4.72
Buckle-G (2022) - Age 45+ years (Home brewed)	2.08	1.26	3.41
Matumizi ya chakula na vinywaji vya moto			
Mmbaga (2021) - Burnt tongue in the past year	1.02	0.76	1.37
Buckle (2022) - Age 30-44 years (+1 hot drink/day)	1.99	1.13	3.5
Buckle (2022) - Age 45+ years (+1 hot drink/day)	1.60	1.13	2.27
Masukume-G (2022) - Very hot tea/coffee Tanzania	1.93	1.26	2.96
Masukume-G (2022) - Very hot porridge Tanzania	1.65	1.06	2.58
Matumizi ya Tumbaku			
Mmbaga-E (2021) - Current smoker vs never	2.23	1.42	3.51
Mmbaga-E (2021) - Former smoker vs never	1.84	1.28	2.65
Buckle (2022) – Ever smoked (Yes vs no) among 45+ years	2.04	1.33	3.12
Simba-H (2023) – smoking Yes vs No – among men	3.58	1.96	6.52
Simba-H (2023) – smoking Yes vs No – among women	2.47	0.72	8.50
Simba-H (2023) – Tobacco use yes vs No	3.09	1.83	5.23
Simba-H (2023) - Smokeless tobacco use Yes vs No	2.38	0.99	5.75
Afya ya Kinywa			
Mmbaga-BT (2020) - Less than daily brusher	2.77	1.20	6.43
Mmbaga-BT (2020) - Chewed stick vs Modern toothbrush	2.28	1.27	4.09
Mmbaga-BT (2020) - Use of charcoal to clean teeth	2.33	1.33	4.07
Mmbaga-BT (2020) – DMFT(Decayed+missing+filled) 10+	3.26	1.77	6.02
Mmbaga-BT (2020) - TFI fluorosis index 4	3.51	1.72	7.13
Mmbaga-BT (2020) - TFI fluorosis index 5+	13.5	5.70	31.9
Buckle-G (2022)-Age 30-44 y (Less than daily teeth cleaning)	9.79	1.90	50.54
Buckle-G (2022) - Age 45+ y (Less than daily teeth cleaning)	1.55	0.99	2.41
Kujiweka katika Hatari ya Moshi Majumbani			
Mmbaga-E (2021) - Cooking (firewood)	2.22	1.59	3.10
Mmbaga-E (2021) - Slept near a fire as child	1.28	0.94	1.75
Buckle-G (2022) – Use firewood for cooking, among 30-44 y	1.21	0.51	2.88
Buckle-G (2022) – Use firewood for cooking, among 45+y	1.54	1.00	2.37
Ulaji wa Matunda na Mboga Mboga			
Mmbaga-E (2021) - Raw greens	0.36	0.16	0.80
Mmbaga-E (2021) – Fruit	0.47	0.27	0.82
Buckle-G (2022) - Raw greens daily (Age 30-44 years)	0.20	0.05	0.88
Buckle-G (2022) - Raw greens daily (Age 45+ years)	0.44	0.23	0.85

TFI: Thystrup Fejerskov fluorosis index

Muhtasari wa Mambo ya Hatari

Unywaji wa pombe, matumizi ya tumbaku (kuvuta sigara na matumizi mengine yasiyo ya kuvuta), kuwa kwenye moshi wa nyumbani, afya mbaya ya kinywa na unywaji wa chai moto na vinywaji vingine vilitambuliwa kuwa sababu za hatari kwa ESCC. Ulaji wa matunda na mboga ulikuwa kinga kwa hatari ya ESCC.

Tathmini yetu ya unywaji pombe ilijaribu kupata unywaji wa kina wa muktadha mahususi. Ilijumuisha pombe nyingi zilizoruhusiwa kisheria na haramu, zote za jadi na za viwandani zinazouzwa kibiashara. Zilijumuisha, pamoja na bia na divai, kwa mfano mbege, chang'aa (Kielelezo cha 1) na divai ya ndizi. Katika maeneo yote mawili ya utafiti, watumiaji wa pombe walikuwa na uwezekano mara mbili wa kupata ESCC [3,4]. Kulikuwa na ongezeko la wazi la hatari ya kupata saratani kutoka na kiasi kikubwa cha pombe kinapotumika mara kwa mara [3].

Kielelezo cha 1: Uzalishaji wa Chang'aa (kiwanda cha kutengeneza pombe), Moshi Tanzania

Uvutaji wa tumbaku - sigara zote za kutengenezwa viwandani na za kusokota wenyewe - ilionekana kuwa sababu muhimu ya hatari kwa ESCC katika tafiti maeneo yote mawili (Kilelezo cha 2). Jijini Dar es Salaam, wavutaji sigara walikuwa na uwezekano maradufu wa kupata ESCC ikilinganishwa na wasiovuta [4,5], ilhali huko Kilimanjaro, wavutaji tumbaku walikuwa na hatari mara 3 ya kupata ESCC ikilinganishwa na wasiovuta [6]. Utumiaji wa tumbaku isiyo ya kuvuta (kama ugoro) pia ilifanyiwa utafiti mkoani Kilimanjaro. Tofauti na uvutaji wa tumbaku, tabia utumiaji wa tumbaku isiyo ya kuvuta ilikuwa ya kawaida zaidi kwa wanawake. Watumiaji wa tumbaku isiyo ya kuvuta walikuwa na hatari ya kuongezeka kupata ESCC mara mbili kuliko wale ambao hawakutumia [6].

Kielelezo cha 2: Uvutaji wa tumbaku (ya kusokota)

Hatari ya kupata ESCC iliongezeka kwa wale ambao walitumia chakula cha moto na vinywaji vya moto. Huko Kilimanjaro, unywaji wa chai au kahawa moto sana na uji wa moto sana uliongeza hatari ya kupata ESCC kwa takriban mara mbili [7]. Matokeo haya yanawiana na utafiti wa awali kutoka Iran na China. Utafiti wa awali huko Moshi tayari ulithibitisha kuwa joto la funda la kwanza ni kubwa sana, kiasi cha nyuzi joto 70 Celsius [9]. Maeneo ya mwinuko wa juu yanakuwa na baridi sana wakati wa usiku hususan karibu na Mlima Kilimanjaro yanaweza kuwa kielelezo cha tabia za unywaji wa chai moto katika eneo hili (Kielelezo Cha 3)

Kielelezo cha 3: Chai ya Moto, Moshi, Kilimanjaro

Kujiweka katika hatari ya moshi majumbani kupitia kupikia kuni [4,5], na kulala karibu na moto ukiwa mtoto [5] ilionekana kuongeza hatari ya kupatwa na ESCC katika utafiti uliofanyika Dar es Salaam (Kielelezo cha 4).

Afya ya kinywa na usafi wa kinywa vinaweza kuhusishwa na ESCC ingawa haieleweki vyema kwa jinsi gani. Inaweza kuhusisha kuvimba kwa njia ya chakula au masalia ya mdomoni na vimelea vya kwenye koromeo. Sawa na matokeo ya tafiti katika maeneo mengine ya hatari ya juu ya ESCC duniani, viashiria kadhaa vitokanavyo na afya mbaya ya kinywa na upungufu wa usafi vilihusishwa na ongezeko la hatari ya ESCC [10,4]. Hii inajumuisha pamoja na upigaji mswaki wa kiwango cha chini kwa siku, kutumia miswaki ya miti au kutumia mkaa kusafisha meno, meno yaliyooza zaidi au mapengo na uwepo wa ugonjwa wa fluorosis. Tafiti zaidi, ikiwa ni pamoja na uchunguzi kamili wa kitaalamu wa meno, unahitajika kwa ajili ya tathmini ya ugonjwa wa fluorosis, kushughulikia uwezekano wa uainishaji usio sahihi na kutambua uhusiano wa maji ya kunywa yenye floridi nyingi, au athari za kutoboka kwa meno unaotokana na vimelea va kinywani.

Kielelezo cha 4: Uchafuzi wa hewa ya ndani kutokana na moshi wa kuni. Hali hii inawaweka wanawake kwenye hali hatarishi ya juu sana.

Ulaji wa matunda na mboga ulikuwa kinga kwa ESCC katika utafiti kutoka Dar es Salaam. Kula mboga mbichi na matunda kulipunguza hatari ya kupata ESCC kwa zaidi ya asilimia 50 katika utafiti [4,5].

SERA YA AFYA NA MAPENDEKEZO YA UTAFITI

Uwezo wa Kuzuia: Kuna vitu vingi vya hatari vinazoweza kurekebishwa na hivyo kuzuilika kwa hatari ya kupata ESCC katika mazingira ya Tanzania. Kupungua kwa matukio ya ESCC, hasa kwa wanaume, kunaweza kuwapo na uwezekano kwa kupitia mabadiliko ya maisha. Kushirikiana na wadau husika kutekeleza programu za kuzuia matumizi ya pombe na tumbaku kutaleta manufaa zaidi ya kukabili ESCC.

- **Mikakati ya Kimsingi ya Kuzuia:** Boresha ufahamu juu ya hatari za ESCC katika jamii na kukuza ushiriki wao katika mazingira yao ya kijamii ambayo yanaleta maendeleo ya mabadiliko ya maisha yanayo boresha afya, tamaduni na tabia zao. Kupanuka kwa upatikanaji wa nishati safi ya bei nafuu ambapo kunaweza kuchangia kuzuia ESCC, haswa kwa wanawake.
  - **Kinga Zingine:** Imarisha utambuzi wa mapema wa ESCC, kupitia ufahamu wa dalili za ugonjwa katika jamii, miongoni mwa viongozi wa kimila na wafanyakazi wa afya. Fafanua na uharakishe

njia za rufaa kwa wagonjwa walio na dalili mpya za kushindwa kumeza chakula ama vivywaji. Mikakati kama hii inahitaji kujumuishwa kwa watu walio na hatari ya kupata ugonjwa mapema hususan walio chini ya umri wa miaka 40.

» **Matibabu:** Boresha uwezo wa utambuzi na matibabu ya ESCC, kupitia na upanuzi wa programu za mafunzo na usambazaji thabiti wa vitendea kazi kote Afrika Mashariki

» **Mipango ya Kudhibiti Saratani:** Jumuisha kinga ya msingi na zingine za ESCC, kama ilivyobainishwa hapo juu, katika mipango ya baadaye ya Mkakati wa Kitaifa wa Kudhibiti Saratani Tanzania [11].

» **Utafiti wa Kubaini Chanzo:** Kunasalia mambo mengi yasiyojulikana katika kueleza viwango hivyo vya juu vya matukio ya ESCC. Endapo katika kueleza ikiwa ni kweli kuna uhusiano kuwa ni chanzo/sababu, kuonekana watu wanaugonjwa kumbe hawana (mtazamo chanya wa uwongo), majibu yasiyo na uhalisia au majibu yameathiriwa na vitu vingine. Utafiti wa baadaye wa ESCC ungefaidika kutokana na kujumuisha kuangalia mchango na uhusianao wa urithi wa vinasaba, tafiti za kuchunguza dhima ya afya ya kinywa na meno na vimelea vya koromeo juu ya ESCC nchini Tanzania. Pia kutafiti ni kwa jinsi gani uchafuzi wa hewa ndani ya nyumba na majeraha yatokanayo na unywaji wa vitu vya joto unasababisha ESCC. Utafiti wa tabia unafaa kufanyika ili kurekebisha ipasavyo vipengele vya hatari vya ESCC vinavyohusiana na mtindo wa Maisha

» **Utafiti wa Kimatibabu:** Utafiti kuhusu utambuzi wa mapema wa ESCC unahitaji kupanuliwa. Utafiti wa kumeza kitanzi cha sponji kinachobakia kimeshikilia kwenye uzi, kikivutwa kinaweza kutoa teknolojia zinazofaa kiafya za utambuzi wa mapema wa ESCC au vitangulizi vyake. Utafiti wa kuboresha ubora wa maisha ya wagonjwa wa ESCC unahitaji kufanyika kwa ukubwa zaidi.

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