

Uptake of anthrax digital health messages and associated factors in Selela and Esilalei villages of Monduli district of Arusha Tanzania

Abstract

Background: Worldwide Anthrax remains endemic in Africa and Asia. A study done in northern Tanzania reported human Anthrax incidence risk was much higher in Arusha followed by Kilimanjaro region.

Objective: To determine the level of uptake of Anthrax Digital Health Message and associated factors in Selela and Esilalei villages of Monduli District.

Methodology: Cross-Sectional study design was conducted in April 2021 in only two villages namely Selela and Esilalei of Monduli District which was implementing digital health intervention on Anthrax in Tanzania. The household was the study unit and a total of 366 study participants (household) was selected using systematic random sampling after the enumeration of all households in these villages. Socio-demographic characteristics and other associated factors were collected using interviewer-administered questionnaires. Proportions were calculated and the difference between uptake from media sources was done by using Pearson Chi-Square test while analysis for unadjusted, adjusted, control for confounders and statistical significance was done by Modified Poisson Logistic regression adjusted for cluster effect of villages (Selela and Esilalei) using STATA software.

Results: The majority of the study population were males 266 (72.68%). The mean age and standard deviation of participants were 42.42 (13.25) years. The majority were Masai tribe 86.10%. The overall proportional uptake of Anthrax Digital Messages was 60.10%, 95% CI= (55 - 65), the difference in uptake between these two villages was statistically significant, p-value <0.001. Proportional uptake of Anthrax messages from various media sources was 60.1% for digital platforms followed by 41% peer group, and the difference was statistically significant, p-value < 0.001. The study found that health literacy was associated with the uptake of Anthrax Digital messages (PRR=2.59, 95% CI = 2.51 -2.68, p-value < 0.001 and skills to operate smartphones (PRR=1.44, 95% CI = 1.00 -2.09), p-value = 0.050.

Conclusion: Health literacy and skills to operate smartphones was the only factors associated with uptake of Anthrax Digital Messages in Selected villages of Monduli District.

Keywords: uptake, anthrax, digital health messages, Arusha, Tanzania

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Introduction

Anthrax is one of the zoonotic diseases caused by bacteria known as *Bacillus anthracis*, these bacteria are primarily inhabiting herbivores (wildlife and livestock) and are usually fatal among these animals and it affects humans with high mortality if not properly diagnosed and treated.¹ A study done in northern Tanzania reported human anthrax incidence risk in 2013 was 16 per 100,000 populations was much higher in Arusha region (7.88/100,000) followed by Kilimanjaro region (6.64/100,000).² Interventions for the Prevention and Control of Anthrax in these communities are needed to be well-framed with a clear understanding of social mechanisms for improving health literacy on Anthrax in a particular community.^{3,4} There are several Preventive and control measures of Anthrax outbreaks including public awareness campaigns which are implemented using the One Health approach in the hotspot districts of Northern Tanzania.⁴ Numerous studies with varying methodological strengths have shown that limited health literacy contributes to poor health outcomes (higher mortality rates and worse overall health status), health disparities, and increased costs.⁵ Globally, the increased use of digital technology (Provision of Health knowledge using the digital platform) expanded the global connectedness and offers a

wealth of resources for improving varieties of literacies. In May 2018 the WHO member states approved Resolution on Digital Health on its World Health Assembly to demonstrate a collective recognition of the value of digital technologies to contribute to advancing universal health coverage (UHC).⁶ This also accelerates toward achieving health-related Sustainable Development Goal number 3 and in the health sector, this revolution is considered as the fourth industrial revolution.^{7,8}

Use of digital health technology like the use of mobile phones which is characterized by communication and the delivery of health services via text messages, smartphone applications, websites, and social media which have been used in treatment programs and have shown positive results as it is easy to access, cheap on accessing knowledge and support confidentiality.⁹ Thus, most health risk communication is of digital technology and most Government around the World offers abundances of digitalized information.¹⁰ Currently, Digital Health Intervention is globally promoted as a means or vital tool to promote health literacy, keep the world safe, and serve the vulnerable.¹¹ Through this global movement, Tanzania is conducting Digital Inclusion Project (DigI) covering two districts Monduli and Iringa Rural, four villages Selela, Esilalei, Migori, and Izazi, two in each district respectively.

DigiI project in Selela and Esilalei villages of Monduli District is non-discriminating to internet access (free provision of Basic internet) has incorporated Anthrax health message in a digital platform as the way to enhance knowledge. This paper assess the uptake of Anthrax messages from other media sources and identify associated factors in Selected villages with different social dynamics, for scaling up intervention, health aims of sustainable Development Goals(SDGs).^{6,8}

Material and methods

The study was conducted in two selected villages of the Monduli district (Selela and Esilalei) as part of the larger project of Digital Health Tanzania. The household was the study unit; 360 household representatives were systematic randomly selected from village household registers. The number of participants in each village was calculated based on proportional weight Selela = 210 and Esilalei = 150 households.¹² A cross-sectional study design was conducted from February 2021 to April 2021.

Proportions of uptake were calculated, Pearson Chi-Square test was done to measure association while modified Poisson regression analysis adjusted for cluster effect of villages (Selela and Esilalei) was computed using STATA software to measure association and statistical significance of independent variables and uptake of Anthrax Digital Messages.

Results

Characteristics of participants

A total of 366 randomly selected participants were aged between 18 years and above, the majorities were males 266 (72.68%). The mean age was 42.42 and the standard deviation (SD) was 13.25 Years. 86.10% were Maasai tribe (Table 1)

Uptake of Anthrax messages

The overall Digital Uptake of Anthrax messages was estimated at 220 (60.1%) 95% CI= (55- 65) of which there was high uptake at Esilalei Village 141 (64.09%), the observed difference between these two villages was statistically significant, p-value <0.001 (Figure 1).

Table 1 Socio-demographic characteristics of study participants in selected villages of Monduli District

Variable	Frequency(n)	Percentage (%)	Variable	Frequency(n)	Percentage (%)
Age group.			Tribe.		
18-30	83	22.7	Maasai	315	86.1
31-50	195	53.3	Chaga	19	5.2
51-70	76	20.7	Sukuma	8	2.2
71 and Above	12	3.3	Others	24	6.6
Mean (SD) 42.42 (13.25)			Education level.		
Sex.			None	103	28.1
Female	100	27.3	Primary	202	55.2
Male	266	72.7	Secondary	51	13.8
			Above secondary	10	2.7

Table 2 Chi-Square Test of Uptake of Anthrax messages from other educational media sources

Variable	Response		Chi-Square	P-Value
	Yes	No		
Peer groups	132	88	82.46	< 0.001
Radio Station	125	95	65.91	< 0.001
Heard from someone	16	204	93.53	< 0.001
Flyers	7	213	11.54	0.001

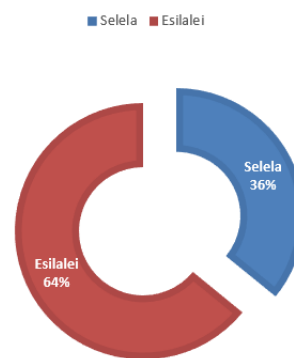


Figure 1 Proportional uptake of Anthrax Digital Messages in Selela and Esilalei villages in Monduli District, Tanzania, 2021.

The uptake of Anthrax messages through various media sources were; Digital platform 60.1%, peer group 41%, Radio station 39.9% (Figure 2).

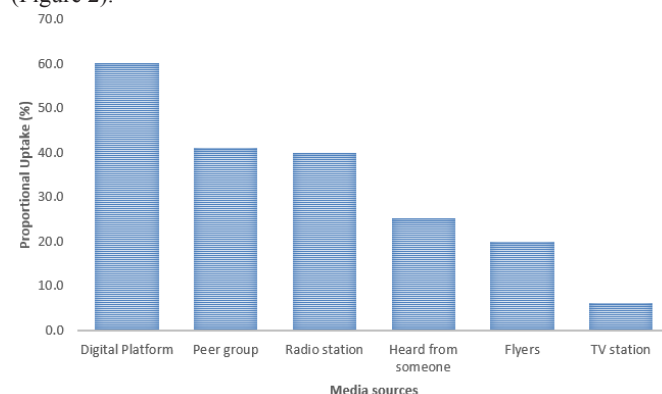


Figure 2 Proportion (%) uptake of Anthrax Messages from various media sources in Selela and Esilalei villages of Monduli District in Tanzania, 2021.

Chi-square test analysis revealed a significant difference between Uptake of Anthrax Messages through Digital platform and peer groups, p-value < 0.001. (Table 2)

Multiple variable modified Poisson regression analysis revealed a significant association between Health literacy and skills to operate smartphones with the uptake of Anthrax digital messages (Table 3). Participants with general health literacy were 2.59 times more likely to uptake digital health messages intervention (95% CI 2.50 - 2.78; $p < 0.001$). Participants with skills to operate smartphones were 1.44

times more likely to uptake Anthrax Digital messages (95% CI = 1.00 - 2.09; p -value = 0.050). However, age, sex, education level, smartphone affordability, free access to the internet and ability to read and write were shown to have a weak association and it was not statistically significant.

Table 3

Attribute	UPRR [95% CI]	p-value	APRR [95% CI]	p-value
Sex				
Male	1.31 [0.82 -2.10]	0.256	1.12 [0.89 -1.42]	0.34
Female	Reference		Reference	
Educational level				
No formal education	0.93 [0.84 -1.04]	0.189	0.94 [0.77 -1.15]	0.567
Primary education	1.37 [0.87 – 2.15]	0.178	1.07 [0.77 -1.48]	0.679
Secondary education	1.14 [0.39 - 3.30]	0.813	0.94 [0.46 -1.93]	0.87
Above Secondary education	Reference		Reference	
Smartphone affordability				
Yes	1.21 [0.90 -1.64]	0.205	1.02 [0.97 -1.08]	0.336
No	Reference		Reference	
Skills to operate a smartphone				
Yes	1.82 [1.56 -2.12]	< 0.001	1.44 [1.00 -2.09]	0.05
No	Reference		Reference	
Health literacy				
Yes	2.79 [2.60 -2.99]	< 0.001	2.59 [2.50 -2.68]	< 0.001
No	Reference		Reference	
Age Category				
18-30	0.62 [0.17 -2.31]	0.477		
31-50	1.13 [0.41 -3.10]	0.82		
51-70	1.24 [0.50 -3.07]	0.641		
71 and above	Reference			
Access to free internet				
Yes	1.28 [0.72 -2.28]	0.404		
No	Reference			
Ability to read and write				
Yes	1.23 [0.72 -2.09]	0.453		
No	Reference			

Discussion

This novel study aimed to explore evidence on uptake of Anthrax Digital messages and associated factors in Selela and Esilalei villages of Monduli District in Arusha Tanzania to improve intervention on Anthrax prevention. The factors identified were Health literacy and ability/ skills to operate a smartphone.

The study found that the proportion of ADM uptake was higher for the studied population compared to some few studies of digital health-based interventions in developed countries which reported to have uptake which was less and some were almost similar to this study.^{13,14} This might be due to the nature of the residing community, nature of the message found in the platform (video clip) which were easily captured even to those who were unable to read and write. Also, a Similar cross-sectional study conducted in 2015, assessing uptake of a web-based program to support healthy eating and physical activity policies and practices had reported uptake which was higher than our study.¹⁵ This was either due to a high level of health literacy, skills to operate a smartphone, easy access to the internet and the nature of the community settings.

The second objective of the study was to determine the commonly used media sources of uptake of Anthrax messages among residing community under study. The media sources were classified depending on all available sources to provide sufficient options to respondents. Using percentage analysis, data showed that 60.1% of the respondents used a digital platform to view Anthrax messages as higher compared to other media sources available as peer group 41%, Radio station 39.9%, and Heard from someone 25.1%, Flyers 19.9% and TV station 6%. This is similar to the study conducted in Nigeria that shows 39.3% of the respondents used the internet to seek health information compared to other media sources.¹⁶ This implies that the digital platform is the most preferred media source of seeking Anthrax messages in the communities and also other communities sharing the same characteristics.

Also, the study found that skills to operate smartphone was independently associated with uptake of ADM when adjusted by other factors, and the association was statistically significant. This is similar to other study that showed the skills to operate smartphone increases in the community digital inequalities on accessing health information decreases.¹⁷ To support the essence of skills to operate smartphones to influence the uptake of ADM, the surveys conducted by Pew Internet

& American Life Project showed that 61% of American adults search online for health information, indicating that Digital literacy level is higher in the community.¹⁸ The findings of this study were similar to other studies for explanatory skills to operate smartphones to have an association with uptake to ADM,

The ability to read and write was also independently associated with ADM uptake but there was no enough evidence to support the association statistically when adjusted for sex, education level, health literacy, smartphone affordability, and skills to operate a smartphone.

Also, the study reveals there was a strong association between health literacy and Anthrax digital messages uptake with a high level of significance. This implies that when the community is adjusted for education level, sex, access to free internet, ability to read and write, and skills to operate a smartphone, individuals with a high level of health literacy have a great risk to uptake Anthrax Digital Messages compared to individuals with a low level of health literacy.^{17,19,20}

Study limitation and mitigation

The cluster effect of selected samples from two villages of Selela and Esilalei was considered during analysis by conducting modified Poisson regression and included cluster effect to minimize sampling bias. Not only cluster effect was considered but also weighting during sample size collection was considered to minimize sampling bias. The collinearity effect between explanatory variables was checked to have the best fit model.

Conclusion and recommendations

The study found that residing communities of Selela and Esilalei villages are increasingly using the digital platform for accessing Anthrax messages. This was due to health literacy and skills to operate smartphones which were found significantly associated with uptake of Anthrax digital messages. The study findings can support global movements toward achieving Universal Health Coverage (UHC) through the digital platform, and also can serve as alternative means to physical approaches to medical issues due to the current global pandemic of COVID-19 which emphasize lockdown, physical distancing and restriction to movement in order to minimize transmission.

The findings point to the Ministry of Health, health partners and other non-discriminative internet partners (DigI) to scale up the digital platform intervention in other villages of Tanzania with similar characteristics and where there are overwhelming Anthrax health issues and other diseases. This would also be a sustainable solution to a critical shortage of human resources in the healthcare sector.

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Conflicts of interest

The authors declare no conflict of interest.

References

1. Muturi M, Gachohi J, Mwatondo A, et al. Recurrent anthrax outbreaks in humans, livestock, and wildlife in the same locality, Kenya, 2014–2017. *Am J Trop Med Hyg.* 2018;99(4):833–839.
2. Mwakapeje ER, Høgset S, Fyumagwa R, et al. Anthrax outbreaks in the humans - livestock and wildlife interface areas of northern Tanzania : a retrospective record review 2006–2016. *BMC Public Health.* 2018;18(1):106.
3. Services H. *National Action Plan to Improve Health Literacy.*
4. Mwakapeje ER, Høgset S, Softic A, et al. Risk factors for human cutaneous anthrax outbreaks in the hotspot districts of Northern Tanzania: An unmatched case-control study. *R Soc Open Sci.* 2018;5(9):180479.
5. Zarcadoolas C, Pleasant A, Greer DS. Understanding health literacy : an expanded model summary. *Health Promot Int.* 2005;20(2):195–203.
6. WHO Guideline. *Food and nutrition bulletin.* 2019;2:p. 1–3.
7. De Cocker K. Digital health interventions in everyday settings. *Int J Environ Res Public Health.* 2020;17(8):2702.
8. Johnston RB. Arsenic and the 2030 agenda for sustainable development. *Arsen Res Glob Sustain - Proc 6th Int Congr Arsen Environ AS.* 2016;12–14.
9. Fan X, She R, Liu C, et al. Evaluation of smartphone APP-based case-management services among antiretroviral treatment-naïve HIV-positive men who have sex with men : a randomized controlled trial protocol. *BMC Public Health.* 2020;20(1):85.
10. Lukenbill B. Enhancing literacy and curriculum using digitalized collections and approaches. 2010;1–8.
11. WHO guideline. *Food and nutrition bulletin.* 1980;2(3):1–3.
12. URT. *2012 Population and housing census.* 2013;
13. Van Der Vaart R, Drossaert C. Development of the digital health literacy instrument: Measuring a broad spectrum of health 1.0 and health 2.0 skills. *J Med Internet Res.* 2017;19(1):e27.
14. Feroz A, Jabeen R, Saleem S. Using mobile phones to improve community health workers performance in low-and-middle-income countries. *BMC Public Health.* 2020;20(1):49.
15. Yoong SL, Williams CM, Finch M, et al. Childcare service centers' preferences and intentions to use a web-based Program to Implement Healthy Eating and Physical Activity Policies and Practices: A Cross-Sectional Study. *J Med Internet Res.* 2015;17(5) :e108.
16. Akpoghiran IP. Communication Source of Seeking Health Information among Women : A Study in Orerokpe, Delta State, Nigeria. *KIU Journal of Social Sciences.* 2020;6(1):319–328.
17. Nutbeam D, Levin-zamir D, Rowlands G. Health Literacy in Context. *Int J Environ Res Public Health.* 2018;15(12):2657.
18. Holst C, Sukums F, Radovanovic D, et al. Sub-Saharan Africa—the new breeding ground for global digital health. *Lancet Digit Heal.* 2020;2(4):e160–e162.
19. Nielsen-bohlman L, Panzer AM, Kindig DA. Health literacy, a prescription to end confusion. 2004.
20. Tanzania statistics Act, 2005.