LIVESTOCK ANTHRAX VACCINATION COVERAGE AND ITS ASSOCIATED FACTORS AMONG LIVESTOCK FARMERS IN MOMBA DISTRICT COUNCIL, TANZANIA

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Department of Epidemiology and Biostatistics

LIVESTOCK ANTHRAX VACCINATION COVERAGE AND ITS ASSOCIATED FACTORS AMONG LIVESTOCK FARMERS IN MOMBA DISTRICT COUNCIL, TANZANIA

By

Helman Velegirio Nyigo

A Dissertation Submitted in (Partial) Fulfillment of the Requirements for the Degree of Master of Science (Applied Epidemiology) of

Muhimbili University of Health and Allied Sciences
October, 2024

CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled; **''Livestock anthrax vaccination coverage and its associated factors among Livestock farmers in Momba District Council, Tanzania'',** in (partial) fulfilment of the requirements for the degree of Master of Science (Applied Epidemiology) of Muhimbili University of Health and Allied Sciences.

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Prof. Gideon Kwesigabo

(Supervisor)

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Date



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Dr. Elibariki Ruben Mwakapeje

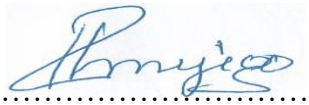
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DECLARATION AND COPYRIGHT

I, **Helman Velegirio Nyigo**, declare that this **dissertation** is my original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award.

Signature  **Date**……

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ABSTRACT

Background: Anthrax, caused by *Bacillus anthracis,* poses significant risks to both human and animal health. Despite the availability of effective vaccines, livestock anthrax vaccination coverage remains critically low in Momba District Council, Tanzania, leading to recurrent outbreaks. This study aimed to determine livestock anthrax vaccination coverage and factors contributing to low uptake among farmers in Momba District Council.

Methodology: A community-based cross-sectional study was conducted from May to June 2024 using a structured questionnaire administered to livestock farmers in Momba District Council. Participants were selected through a multistage cluster sampling technique where a district was first divided into clusters of wards followed by clusters of villages, then study participants were randomly selected, ensuring a representative sample. Data on demographic factors, socio-economic status, and barriers to vaccination were collected. Descriptive statistical analysis was performed for the demographic factors, followed by modified Poisson regression to identify significant factors associated with low livestock anthrax vaccination coverage.

Results: A total of 435 livestock farmers were included, with a median age of 41 years IQR (34-52 years). The majority were male 404/435 (92.87%) and had low education levels: 48.97% had primary education and 45.75% had no formal education. The median household size was 8 people (IQR 6-13). The overall anthrax vaccination coverage was 32.8%, with 37.8% (11698/30,968) for cattle, 22.3% (2125/9534) for goats, and 18.4% (712/3862) for sheep. Factors associated with low anthrax vaccination coverage included lack of information about vaccination schedules (adjusted prevalence ratio [aPR] 1.41, 95% CI 1.18-1.68), having primary education (aPR 0.74, 95% CI 0.67-0.94) compared to no formal education, household size with 1-10 members (aPR 0.82, 95% CI 0.72-0.94) compared to households with ≥40 members, and seasonal migration of livestock (aPR 0.73, 95% CI 0.64-0.84) compared to those without seasonal migration in search of pasture

Conclusion: Momba District Council livestock anthrax vaccination coverage is below the 70% recommendation by the World Organization of Animal Health, posing a public health risk. A One Health approach, including regular training, timely vaccination schedules, and stronger collaboration between veterinarians and human health officers, is recommended to raise up the livestock anthrax vaccination coverage.

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ABBREVIATIONS

ABV	MEANING
BQ	Black Quarter Disease
CBPP	Contagious Bovine Pleural Pneumonia
CCPP	Contagious Caprine Pleural Pneumonia
CDC	Centre for Disease Control and prevention
CFR	Case Fatality Rate
CI	Confidence Interval
DC	District Council
DED	District Executive Council
eIDSR	Electronic Integrated Disease Surveillance and Response
FELTP	Field Epidemiology and Laboratory Training Programs
HH	House hold
LSD	Lumpy Skin Disease
MLF	Ministry of Livestock and Fisheries
MoH	Ministry of Health
PEPFAR	The U.S President's Emergency Plan for AIDS Relief
PoRALG	President Office Regional Administration and Local Government
PPR	Pest des Petis Ruminant
RVF	Rift Valley Fever
TVI	Tanzania Vaccine Institute
TVLA	Tanzania Veterinary Laboratory Agency
TLAVC	Total livestock anthrax vaccination coverage

DEFINITIONS OF TERMS

Anthrax	A zoonotic disease caused by *Bacillus anthracis* affecting domestic animals, wildlife animals and Human being
Animal Health Officers	Include Veterinarians and Livestock field officers who take care for the Animal health
Bacillus anthracis	Are gram positive spore forming bacteria which cause Anthrax
Livestock farmers	These are livestock keepers
***Bacillus anthracis* Spores**	Are specialized dormant structures produced by Bacillus anthracis which germinate on favorable environmental condition to cause anthrax
Vaccine	These are biological preparation which induce immune response to animal body after inoculation
Vaccination	Vaccine administration to Animal body
Anthrax Vaccination coverage rate	Number of animals vaccinated against Anthrax to the total number of animals in a given geographical area (National, District, ward or village)
Vaccination constraints	All barriers for the Livestock vaccine uptake among livestock farmers
Domestic animals	Animals kept by human being including cattle, goat, sheep, Dog, Poultry and Cat
Wildlife animals	Animals not kept by human being, they are found in National parks, game reserve and wild areas

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Anthrax is a zoonotic disease that poses a significant threat to both animal and human health. It is caused by a Gram-positive, spore-forming bacterium called *Bacillus anthracis* (1,2). This bacterium is naturally found in soil and can survive for decades, resisting many disinfectants (3). *Bacillus anthracis* primarily affects domestic and wild animals such as cattle, sheep, goats, and horses, with pigs being more resistant than sheep and horses, while dogs and cats are relatively resistant (4,5). Animals acquire anthrax through ingestion of spores while grazing or through flies, which play a significant role during outbreaks (1). Humans typically become infected through contact with infected animals or their products, making anthrax primarily an occupational hazard for handlers of processed hides, goat hair, bone products, wool, and infected wildlife. It can also be contracted through contact with infected meat (6,7).

A retrospective study conducted in Tanzania by retrieving data from the years 2006-2016 has revealed higher anthrax incidence in the Arusha region (7.88 per 100,000), followed by the Kilimanjaro region (6.64 per 100,000). Furthermore, 187 and 143 human anthrax cases were reported from the Arusha and Kilimanjaro regions, respectively (8). Out of 161 livestock tested for anthrax for a period from 2006-2016 in Arusha and Kilimanjaro regions, 103 tested positive, while out of 57 wildlife samples tested, 18 were anthrax positive (8).

Anthrax is one among zoonotic diseases of priority in Tanzania, as indicated on the National One health strategic plan of 2022 to 2027(9)

The disease primarily affects herbivorous animals; thus, its control in both animals and humans relies heavily on its prevention in livestock (principally cattle, sheep, goats, and horses), good hygienic practices when an animal dies of anthrax, and antibiotic treatment when a case occurs. Given the critical need for prevention in livestock to control anthrax, vaccination becomes a cornerstone of effective disease management.

The anthrax vaccine is designed to elicit an immune response against anthrax when administered to an animal or human. It has demonstrated dramatic protective efficacy in animals, resulting in a marked reduction or complete absence of anthrax outbreaks in vaccinated animals (10). Vaccination can be used for disease prevention or as part of outbreak management (1). To measure the effectiveness of vaccination programs, livestock anthrax vaccination coverage is assessed, which refers to the proportion of vaccinated animals in a population compared to the total number of animals. This coverage can be expressed for specific species, such as cattle, goats, sheep, and equines. The World Organization of Animal Health (WOAH) recommends that vaccination coverage for each animal disease should be 70% and above, which member countries must achieve to be safe against specific diseases through herd immunity (11).

Tanzania uses livestock anthrax vaccines as a preventive measure against outbreaks in both livestock and humans. The Ministry of Livestock and Fisheries has included anthrax in the list of 13 priority livestock diseases (12). The country has developed a five-year Anthrax Prevention and Control Strategic Plan, highlighting livestock vaccination as the best strategy to prevent outbreaks in both domestic animals and humans (13). The Animals Disease Act No. 17 of 2003 provides regulations for disease prevention and control, including vaccination activities (14),Where the presence of Tanzania Vaccine Institute (TVI) in Kibaha produces various vaccines for domestic animals, including the anthrax vaccine.

Despite these efforts, the anthrax vaccination status and factors associated with livestock anthrax vaccination coverage among livestock farmers in Momba DC, Tanzania, are not yet documented. This study aims to determine the anthrax vaccination coverage and associated factors among livestock farmers in Momba DC, which experienced anthrax outbreaks in 2019, 2021, and 2022. The ultimate goal is to provide actionable insights for intervention strategies to enhance livestock anthrax vaccine uptake among farmers and prevent further outbreaks in Momba while safeguarding human health.

1.2 Problem Statement

Anthrax outbreaks continue to pose significant public health and economic challenges in Tanzania, particularly in regions with substantial livestock populations(15). Despite the availability of effective anthrax vaccines, vaccination coverage among livestock remains alarmingly low. In Momba District Council (DC), where anthrax is a persistent concern, the anthrax vaccination coverage has seen a dramatic decline over recent years.

In 2019, a total of 60,112 cattle were vaccinated out of the 129,218 cattle population in Momba DC. By 2022, however, this number had decreased to 37,834 vaccinated cattle out of a population of 120,928, resulting in a vaccination coverage rate of only 31.3%. For smaller livestock, the figures are even more concerning where only 387 goats were vaccinated out of a population of 75,000 (0.52% coverage), and just 33 sheep were vaccinated out of 10,000 (0.33% coverage) according to data from the Ministry of Livestock and Fisheries (16).

The significant disparity between the potential benefits of livestock vaccination and the actual coverage rates suggests that there are underlying factors associated to the low uptake of anthrax vaccination among livestock farmers in Momba DC. Failure to address these barriers leaves livestock populations vulnerable to future anthrax outbreaks, which could result in significant economic losses for individual livestock owners and the broader community (17).

Moreover, inadequate livestock vaccination coverage heightens the risk of human exposure to anthrax, a zoonotic disease that can cause illness and fatalities in humans. Without proper intervention, including comprehensive vaccination efforts, Momba DC could continue to experience recurring cycles of anthrax outbreaks. These outbreaks represent not only a public health threat but also an ongoing economic burden for the district (18)

To date, few comprehensive studies have explored livestock anthrax vaccination coverage and its associated factors among livestock farmers in Tanzania, particularly in Momba DC. Existing research has primarily focused on the epidemiology of anthrax and the risk factors for its occurrence.

Therefore, this study aims to fill this critical gap by assessing the livestock anthrax vaccination coverage and the factors influencing its uptake among livestock farmers in Momba District. Addressing these factors is essential for improving livestock vaccination coverage, protecting livestock and human health, and mitigating future outbreaks.

1.3 Conceptual Framework

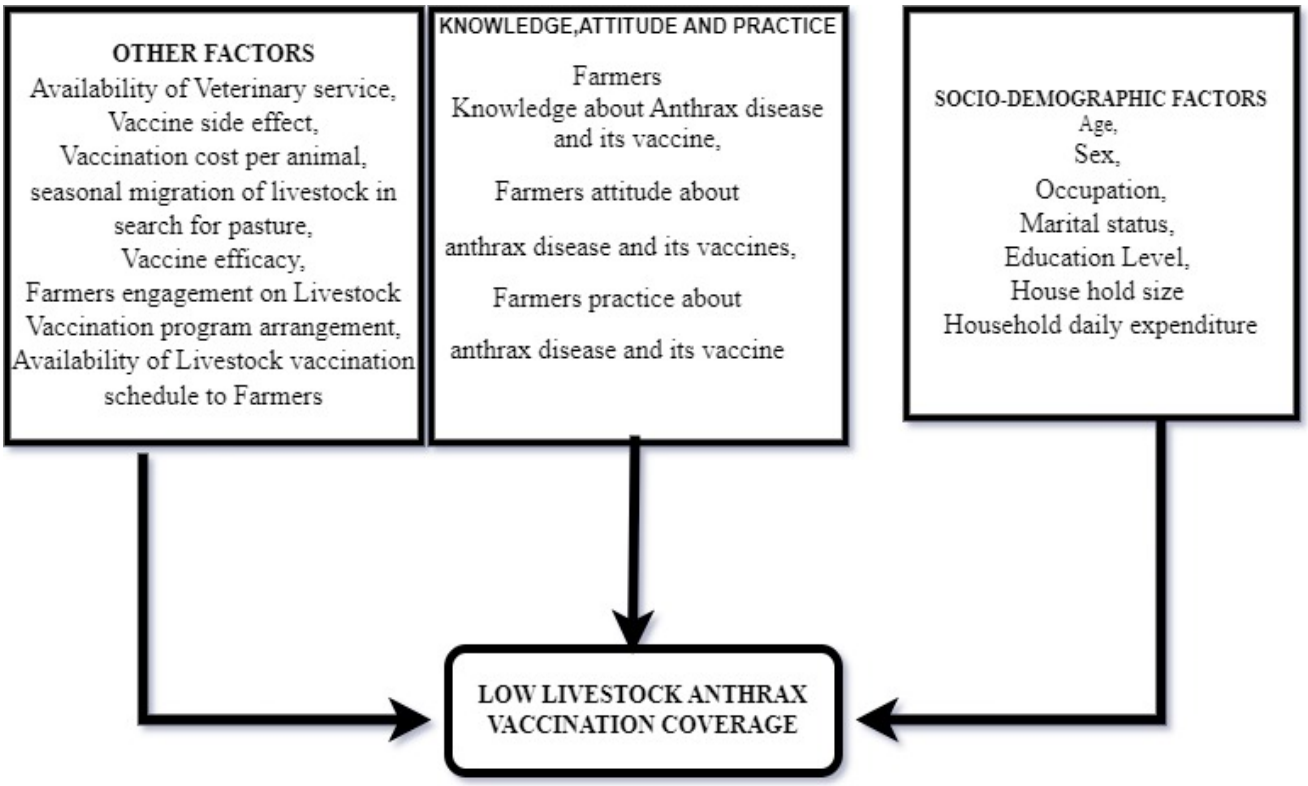


Figure 1: A conceptual framework for factors associated with livestock Anthrax vaccination coverage among livestock farmers (source: researcher's own source, 2023)

The dependent variable in this study was low livestock anthrax vaccination coverage, which is categorized as low or high depending on the recommendation by WOAH that the vaccination coverage is low if it is below 70% and high if the coverage is greater or equal to 70%.

The independent variables included demographic, socio-economic, and other factors. Such as age, sex, household size, occupation, and education status of livestock farmers impact livestock anthrax vaccination coverage, leading to low anthrax vaccination coverage.

Additionally, socio-economic and behavioural factors like lack of information on livestock anthrax vaccination schedules, seasonal migration of livestock in search of pasture and water, and the perception that vaccines do not offer protection against disease (low efficacy) were found to be associated with low anthrax vaccination coverage among livestock farmers who participated in the study in Momba district council. Subsequently, all independent variables, including demographic, socio-economic, and other factors, influence each other.

This conceptual framework was self-developed to illustrate how the dependent and independent variables are associated.

1.4 Rationale of the Study

Findings from this study are useful in setting appropriate intervention strategies to enhance livestock anthrax vaccination coverage among livestock farmers and to emphasize the need to increase anthrax vaccination coverage among various livestock species susceptible to anthrax, such as cattle (bovine), goats (caprine), and sheep (ovine).

Furthermore, findings are the cornerstone to providing community-based awareness creation and community engagement in all matters concerning livestock vaccination against anthrax.

1.5 Research Question

1.5.1 Main research question

What is the livestock anthrax vaccination coverage, and what are the factors associated with low anthrax vaccination coverage among livestock farmers in Momba DC?

1.5.2 Specific research questions

i. What is the livestock anthrax vaccination coverage status among livestock farmers in Momba, DC?
ii. What are the factors associated with low livestock anthrax vaccination coverage status among livestock farmers in Momba DC?

1.6 Objectives of the study

1.6.1 Broad objective

To determine the livestock anthrax vaccination coverage and associated factors among livestock farmers in Momba District Council, Tanzania, in the year 2024.

1.6.2 Specific objectives

i. To determine the livestock anthrax vaccination coverage status among livestock farmers in Momba DC.
ii. To determine the factors associated with low livestock anthrax vaccination coverage among livestock farmers in Momba DC, Tanzania.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Livestock anthrax vaccination coverage among livestock farmers in Tanzania

Anthrax remains a significant public health concern in Tanzania, affecting both livestock and humans. Vaccination is a critical preventive measure recommended to mitigate outbreaks (13). Studies indicate that livestock farmers' knowledge and attitudes towards anthrax influence vaccination coverage (19). In Tanzania, despite anthrax being designated as a priority preventable disease, vaccination rates remain below the World Organization for Animal Health's (WOAH) recommended threshold of 70% and above (11). Momba District exemplifies this challenge, with declining vaccination coverage rates observed from 2019 to 2022, where for the year 2019; 60,112 cattle vaccinated out of 129,218 (46.5%), and for the year 2022; 37,834 cattle vaccinated out of 120,928 (31.3%); 387 goats vaccinated out of 75,000 (0.52%); and 33 sheep vaccinated out of 10,000 (0.33%) (16).

2.2 Factors associated with Livestock anthrax vaccination coverage among livestock farmers

i. **Socio-economic Factors**

Globally, socio-economic factors such as household income, educational attainment, occupational status, and herd size significantly influence livestock vaccination uptake. Studies indicate that livestock anthrax vaccination is more prevalent among farmers with higher household incomes and those with secondary education or higher education like university (25,26). In Tanzania, however, there is a lack of specific studies documenting these socio-economic influences on livestock anthrax vaccination among farmers in different regions

ii. **Accessibility to veterinary services and animal health officers**

Accessibility to veterinary services, including the availability of district veterinarians, livestock field officers, and anthrax vaccines, plays a crucial role in vaccination uptake. Studies from Bangladesh highlight barriers such as the absence of veterinarians, limited field officers, and vaccine unavailability (22). Similar findings in Uganda and Kenya emphasize challenges like vaccine availability, distance to vaccination centers, and vaccination costs (23), while another study in Uganda and Kenya revealed availability of anthrax vaccine, distance to vaccination centers and cost of vaccination as the barriers of Livestock anthrax vaccination coverage(24) In Tanzania, studies have shown that vaccine availability and affordability, as well as access to veterinary services, are critical barriers to livestock vaccination uptake (25). These issues are particularly relevant in Momba district, where anthrax outbreaks persist despite the availability of vaccines.

iii. **Cultural and traditional practices**

Cultural and traditional practices related to livestock can either encourage or discourage vaccination among farmers. Studies in Uganda and Kenya reveal that in some communities, cultural practices deter livestock vaccination efforts (23). In Tanzania, the influence of cultural practices on anthrax vaccination uptake has not been extensively studied. Research in Momba district aims to explore these dynamics further.

iv. **Awareness and attitudes about anthrax and livestock anthrax vaccination among livestock farmers**

Awareness of anthrax risks and preventive measures significantly impacts vaccination uptake. Farmers with better knowledge of anthrax and its prevention are more likely to vaccinate their livestock (26). Similar trends have been observed in Ghana, Kenya, and Uganda, where awareness campaigns positively correlated with vaccination rates (28, 30). In Tanzania, studies underscore the role of awareness deficits in low anthrax vaccination rates (28). This study in Momba District aims to assess farmers' awareness levels regarding anthrax and vaccination practices.

v. **Livestock vaccination programs, policies, and regulations**

In Tanzania, livestock disease control falls under the Ministry of Livestock and Fisheries, governed by various acts and regulations. The national livestock development policy and associated regulations underscore the importance of vaccination as a disease control strategy (25). Anthrax is prioritized among other livestock diseases, with vaccines produced locally and distributed according to a national vaccination calendar (12).Despite these efforts, Momba District continues to experience low anthrax vaccination coverage, contributing to recurrent outbreaks.

CHAPTER THREE

3.0 MATERIAL AND METHOD

3.1 Study Area

The study was conducted in Momba District Council located in the northwestern part of Songwe Region, Tanzania. Geographically, Momba DC lies between latitudes 8°10' South and 9°15' South of the Equator, and longitudes 32°5' East and 32°45' East of the Greenwich Meridian. The district shares borders with Sumbawanga and Kalambo districts of Rukwa region and Zambia to the West, Mbozi district to the East, Chunya district to the North, and Ileje district to the south. Momba DC covers an area of 5,856 square kilometers, which constitutes approximately 21.17% of the total area of Songwe Region (27,656 square kilometers)(29).

Topographically, the district is situated between 900 and 2,750 meters above sea level. It receives an average annual rainfall ranging from 1,350 mm to 1,550 mm, with temperatures fluctuating between 20°C and 28°C. According to the 2022 Tanzania National Census, Momba DC has a population of 259,781, comprising 124,524 females and 135,257 males(30).

The primary economic activities in Momba DC are agriculture and livestock farming. The district had livestock population including; 120,294 Cattle, 73,497 Goats, 9,884 Sheep, 7,753 dogs, and 2,970 cats by the Livestock census of 2020(31).Livestock vaccination programs in the district is carried out by the District councils under the supervision of District veterinary officer where per each animal vaccinated livestock farmer have to pay Tshs 1000/= as vaccination fee

Momba DC experienced Anthrax outbreak for the years 2019, 2021, 2022 and 2023 respectively(16).

3.2 Study design

A Community based cross sectional study design was conducted to determine livestock anthrax vaccination Coverage and its associated factors among livestock farmers in Momba DC.

3.3 Study Population

The study population for this study were all Livestock Farmers in Momba DC raising cattle, goat and Sheep.

3.4 Sample size estimation

The sample size for the study is determine by the formula

$n = ((Z\alpha^2 * P(1-P))/e^2)$

Where

n=Sample size

Zα= 95% Confidence Interval (1.96)

P=Proportion (Prevalence 0.5)

E=Precision (5%)

Then = (1.96^2)0.5(1-0.5)/0.05^2

Sample size required(n) = 384 (Minimum Sample size)

Formula for Non-response is: (Adjusted sample size(n)=minimum sample size/1-0.1= 427 (Adjusted sample size)

The adjusted sample size of this study was 427 but in the field a total of 435 data were collected above the adjusted sample size indicating that data collection exercise was very successful since it has exceeded the adjusted sample size

Non response rate= [(1-Actual sample size/Adjusted sample size) *100%]

Non -response rate= [1-435/427) *100%] = -1.87

Negative Non-response rate indicate all respondents were willing to participate and hence no any Non- response rate encountered during data collection.

3.5 Sampling Procedure

A multistage cluster sampling approach was employed to select study participants for our study in Momba District Council. The procedure involved the following steps:

- Cluster formation procedure: The first stage involved dividing Momba District Council into clusters. The clusters were based on administrative wards and villages within the district.
- Ward selection: Out of the 14 wards in Momba district council, five wards, namely Kamsamba, Mkulwe, Chilulumo, Mkomba, and Ivuna, were randomly selected to ensure a representative sample of the district for the study.
- Village selection: Within each selected ward, villages were further clustered. A total of 18 villages were randomly chosen from the five wards (Kamsamba ward 3 villages, Mkulwe 4 villages, Mkomba ward 4 villages, Ivuna ward 5 villages, and Chilulumo ward 2 villages), where villages in each ward were proportionately selected (proportional to size sampling).
- Study participant recruitment: In each selected village, livestock farmers were identified and recruited for the study. The selection of farmers was done randomly to avoid bias and ensure that every livestock farmer had an equal chance of being included in the study.

Therefore, a total of 435 livestock farmers were recruited from the 18 villages, providing a sufficient sample size to achieve the study objectives and ensure the statistical validity of our study.

3.6 Study Variables

3.6.1 Dependent variables of the study

The dependent variable of this study is livestock anthrax vaccination coverage. This is categorized as "high" or "low" based on the World Organization for Animal Health's (WOAH) recommendation of a vaccination coverage rate of 70% or above to attain herd immunity for disease elimination in all member states. Therefore, livestock vaccination coverage above 70% is categorized as “high,” and below 70% is categorized as “low,” according to WOAH.

3.6.2 Independent variables of the study

The independent variables include socio-demographic factors and other factors associated with low anthrax vaccination coverage among livestock farmers. These are detailed as follows:

3.6.2.1 Socio-demographic factors;

Includes age, gender, occupation, marital status, household size, and household daily expenditure.

3.6.2.1 Factors associated with anthrax vaccination coverage

These included factors like lack of access to animal health officers at the village level, high anthrax vaccination cost per animal, lack of information about the anthrax vaccination schedule, seasonal migration of livestock in search of water and pasture, Lack of knowledge about livestock vaccines/vaccination, farmers not engaged in vaccination program arrangements at the district level, Farmers concerns about vaccine side effects, and belief that vaccines do not offer protection against diseases.

These independent variables, their range, patterns, and arrangements are clearly shown in the data collection tool (questionnaire) (Appendix I).3.7 Study participant inclusion and exclusion criteria

Inclusion criteria

We included the following as study participants;

i. Livestock farmers residing within Momba District Council.
ii. Livestock farmers aged 18 years and above.

iii. Livestock farmers who keep Cattle, Goats, or Sheep.

Exclusion criteria

In this study we excluded to be study participants;

i. Livestock farmers residing outside Momba District Council.
ii. Livestock farmers in Momba District Council who are below 18 years of age.
iii. Livestock farmers who only keep domestic animals other than Cattle, Goats, and Sheep.

3.8 Data validity and reliability

3.8.1 Reliability of data collected

To ensure the reliability of the data, all respondents in the study were administered the same set of questions, ensuring uniformity and consistency in data collection. Additionally, the data collection process was standardized, with trained investigators following a consistent protocol to minimize variations in how questions were asked and responses recorded.

Reliability was further enhanced through the use of pre-tested questionnaires, regular supervision, and periodic checks for consistency and accuracy during data collection.

3.8.2 Validity of data collected

The validity of the collected data was ensured through targeted study participant selection, where the study questionnaire was administered only to livestock farmers with animals (cattle, goats, and sheep) residing in Momba DC. This criterion ensured that the respondents met specific criteria relevant to the study objectives.

To further enhance validity, the questionnaire was designed to cover all relevant aspects of livestock farming and was reviewed by subject matter experts to ensure it captured the necessary information accurately.

Pre-testing of the questionnaire was also conducted to identify and rectify any ambiguities or biases, thereby ensuring that the data collected truly reflected the situation of the target population.

3.9 Data collection procedures

Data about livestock anthrax vaccination coverage and its associated factors among livestock farmers of Momba District Council were collected through households to interview with livestock farmers using a well-structured questionnaire in the Kobo collect tool, where every livestock farmer (head of household) who was willing to participate was interviewed by the principle researcher and assistant researchers in the respective ward, village, and household of Momba District Council.

The questionnaire tool was divided into four sections, including a consent form section, a sociodemographic characteristic section, a section about animals owned by livestock farmers, and a section of livestock vaccination information with the number of animals vaccinated and factors associated with livestock anthrax vaccination coverage among livestock farmers. The anthrax data collection tool is attached to the appendix (Appendix iv).

3.10 Data cleaning and analysis

3.10.1 Data Cleaning

Data collected through kobo collect toolbox were retrieved and cleaned using Microsoft Excel software.

3.10.2 Data analysis procedures

3.10.2.1 To determine the livestock anthrax vaccination Coverage among livestock farmers in Momba DC.

Livestock anthrax vaccination coverage was calculated using Microsoft Excel. This choice is because Livestock vaccination coverage was a very simple calculation which was easily performed using Excel rather than other strong and robust software like STATA software.

A formula below was applied;

- Anthrax vaccination coverage= (Total number of animals vaccinated/Total number of Animals owned by farmers) *100%
- Where total number of Livestock vaccinated (numerator)= Sum of all Vaccinated cattle, Goat and Sheep among livestock farmers who participated in the study

- ❖ Total number of Animals(denominator)= sum of all animals owned by the Livestock farmers participated in the study (Total of cattle, Goat and Sheep).

3.10.2.2 To determine factors associated with Livestock anthrax vaccination among livestock farmers in Momba DC

i. Univariate Analysis

Univariate analysis was conducted on the STATA program software by observing the association of single independent variable to the outcome variable using Chi square where finally all factors with p value below 0.2 were taken for Multivariate analysis.

ii. Bivariate Analysis

Bivariate analysis was performed in STATA software program using Modified Poisson regression model to explore the association between each independent variable and the outcome of interest (Low livestock anthrax vaccination coverage) whether is significantly associated or not significantly associated, also p value and Confidence interval for each independent variable was recorded in the Table 2.

iii. Multivariate Analysis

Variables with p value ≤ 0.2 on bivariate analysis were include in multivariate analysis in STATA software using modified Poisson regression model analysis to factors independently associated with low livestock anthrax vaccination coverage among livestock farmers.

3.11 Ethical consideration

The study protocol was approved by the Senate and Publications Committee of Muhimbili University of Health and Allied Sciences (MUHAS) with approval number MUHAS-REC-04-2024-2122. Additionally, permission to collect data in Momba District Council was obtained from the President's Office Regional Administration and Local Government (PORALG), the Regional Administrative Secretary (RAS) of Songwe Region, and the District Executive Director (DED) of Momba District Council.

CHAPTER FOUR

4.0 RESULTS

4.1 Socio demographic characteristics of the Livestock farmers who participated in the study at Momba District Council, Tanzania in 2024.

A community based cross-sectional study conducted in Momba District Council in 2024 included 435 livestock farmers with non-response rate [-1.87] indicating that data collection was very successful**.** The median age of the Livestock farmers recruited for the study was 41 years IQR (34-52 years). Majority of them were male 404/435 (92.87%) and married 416/435 (95.63%). Most of the Livestock farmers included in the study had primary school education 213/435(48.97) and no formal education 199/435(45. 75%).The median household size of livestock farmers recruited for the study was 8 people per household IQR (6-13 People) and Household daily expenditure was 7,000 Tanzania shillings IQR (5,000-10,000 Tanzania shillings). The overall results of Socio demographic characteristic of Livestock farmers in Momba District Council are on (Table 1)

Table 1: Social demographic characteristics of Livestock farmers who participated in study at Momba District Council, 2024 (n=435)

Variable	Frequency(n=435)	Proportion(%)
Sex		
Male	404	92.86
Female	31	7.14
Age (Years)		
18-35	130	29.89
36-59	239	54.94
60 & Above	66	15.17
Marital status		
Single	9	2.07
Married	416	95.63
Widow	10	2.30
Occupation		
Government /Private Employed	13	2.99
Peasant (Agriculture and Livestock Farmers)	432	97.01
Education status		
No Formal education	199	45.75
Primary School education	213	48.97
Secondary School Education and above	23	5.29
House Hold size		
1-10	284	65.29
11-39	142	32.64
40 & Above	9	2.07
House hold daily expenditure (Tshs.)		
1000- 10000	336	77.24
11000- 49000	93	21.38
50000 & Above	6	1.38

4.2 Livestock anthrax vaccination coverage among Livestock farmers who participated in the study at Momba District Council, Tanzania,2024

4.2.1 Farmers response about vaccination of their animals against various disease

Among 435 Livestock farmers of Momba District Council who participated in the study, for a year 2023, 358(82.3%) have vaccinated their Livestock against Anthrax while 77(17.7%) of them didn't vaccinate their animals against anthrax (Figure 2)

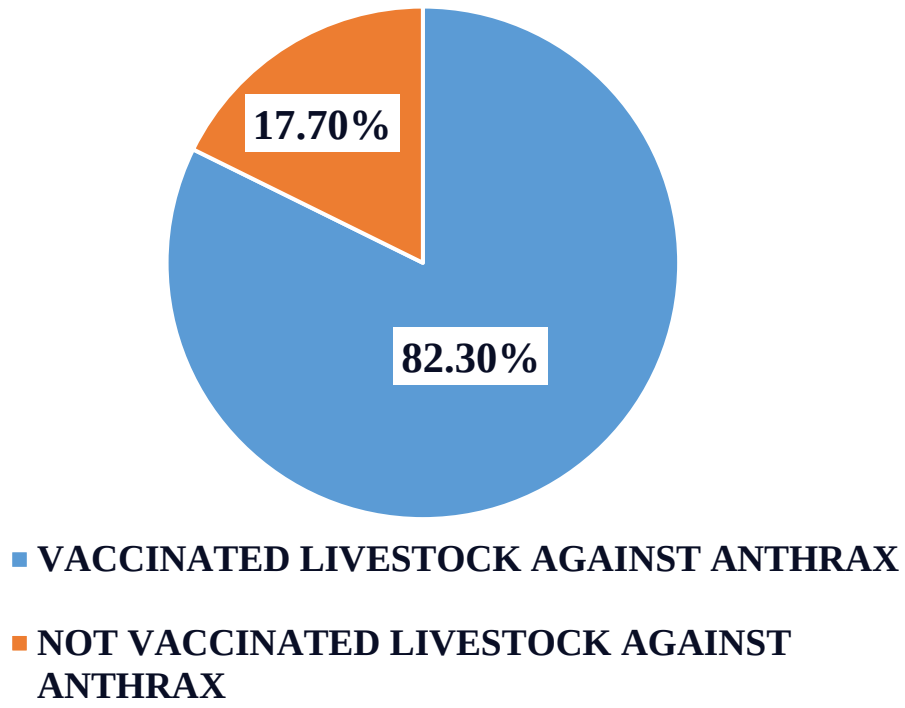


Figure 1: Livestock farmers' response about vaccination of their animals against anthrax in Momba District Council, Tanzania,2024

4.2.2 Livestock Anthrax vaccination coverage among Livestock farmers participated in the study in Momba District Council, 2024

4.2.2.1 The overall Livestock anthrax vaccination coverage among Livestock farmers participated in the study at Momba DC, Tanzania

The overall livestock anthrax vaccination coverage was 32.8% which is below 70% recommended by World Organization for Animal Health (WOAH)

4.2.2.2 Distribution of Livestock anthrax vaccination coverage by species in Momba District Council, Tanzania, 2024

From 435 livestock farmers from Momba DC who participated in the study, a total of 11698/30,968 (37.8%) cattle, 2125/9534 (22.3%) goats, and 712/3862 (18.4% sheep), respectively, where goats and sheep had low anthrax vaccination coverage compared to cattle. The vaccination coverage for all species was below 70% recommended by the World Organization for Animal Health to provide herd immunity and as a strategy toward disease elimination (Table 2).

Table 2: Anthrax vaccination coverage distribution by species in Momba DC for a year 2023

Animal Specie	Total number	Vaccinated	Vaccination Coverage(%)	Coverage Status
Cattle	30,968	11,698	37.8	Below 70%
Goat	9,534	2,125	22.3	Below 70%
Sheep	3,862	712	18.4	Below 70%
Overall	**44,365**	**14,535**	**32.8**	**Below 70%**

4.3 Factors associated with low livestock anthrax vaccination coverage among livestock farmers who participated in the Study in Momba DC, Tanzania,2024.

Bivariate analysis; Educational status, household size, lack of information about livestock vaccination schedule to farmers, seasonal migration of livestock in search of pasture and water, nature of the disease (anthrax) unlike other diseases with high morbidity and mortality like contagious bovine pleural pneumonia (CBPP) and contagious cranial pleural pneumonia (CCPP), and perception that vaccine does not offer protection against diseases were factors with a p value of less than 0.2, hence were considered as potential predictors of low anthrax vaccination coverage among livestock farmers of Momba DC, Tanzania. These factors were then taken to multivariate analysis.

Table 3: Bivariate modified Poisson regression of factors associated with Low Livestock Anthrax vaccination coverage among Livestock farmers in Momba District Council, Tanzania 2024

Variable	Total(n=435)	Low LAVC(n=280)	Crude PR(95% CL)	p value
Educational status				
No formal education	199	151(75.9)	**Reference**	
Primary School education	213	119 (55.9)	0.74 (0.58-0.94)	**0.013**
Secondary/University Education	23	10 (43.5)	0.74 (0.38-1.45)	0.383
Sex				
Male	404	265(65.6)	1.356 (0.81-2.28)	0.367
Female	31	15 (48.4)	**Reference**	
Household Size				
1-10	287	166(57.8)	0.75 (0.66-0.86)	**<0.001**
11-39	140	108 (77.1)	1.33 (1.05-1.70)	**0.020**
40 & Above	8	6(75.0)	**Reference**	
Lack of information about livestock vaccination schedule to farmers				
Yes	291	214(73.5)	1.61 (1.22-2.11)	**<0.001**
No	144	66(33.1)	**Reference**	

Variable	Total(n=435)	Low LAVC(n=280)	Crude PR(95% CL)	p value
Seasonal migration of Livestock in search of Pasture and Water				
Yes	235	124(52.8)	0.68 (0.53-0.86)	**<0.001**
No	200	156(78.0)	**Reference**	
High anthrax vaccination cost per animal				
Yes	202	202 (68.0)	0.89 (0.37-2.18)	0.814
No	138	78(56.5)	**Reference**	
Nature of the disease unlike CBPP and CCPP with higher mortality rate				
Yes	175	93 (53.1)	0.74 (0.63-0.87)	**<0.001**
No	260	187(71.9)	**Reference**	
Concern about vaccine side effects to vaccinated animals				
Yes	220	146(66.5)	1.2 (0.58-2.89)	0.533
No	215	134 (62.3)	**Reference**	
Vaccine does not offer protection against Diseases				
Yes	111	53 (47.7)	0.68 (0.55-0.84)	**<0.001**
No	324	227 (70.1)	**Reference**	
Farmers inability to differentiate Livestock vaccine and Treatment/Prophylaxis				
Yes	296	171 (59.9)	1.05 (0.87-1.26)	0.640
No	139	105 (75.54)	**Reference**	
Farmers are not engaged on Livestock vaccination program arrangements at District Level				
Yes	360	249 (88.7)	1.099 (0.86-1.4)	0.450
No	75	31 (11.3)	**Reference**	

From the multivariable Modified Poisson regression model with robust factors, livestock farmers who lack information about the livestock vaccination schedule are 41% more likely to have low anthrax vaccination coverage [PR 1.41 (95% CI, 1.18-1.68), p value <0.001]. Livestock farmers with primary education are 26% less likely to have low anthrax vaccination coverage compared to those with no formal education [PR 0.74 (95% CL, 0.67-0.94) p value 0.012], livestock farmers from households with 1-10 members had 18% significantly lower odds of low vaccination coverage compared to those from larger households [PR 0.82 (95% CI, 0.72-0.94) p value 0.041], and livestock farmers who migrate seasonally with their livestock in search of pasture and water are 27% less likely to have low livestock anthrax vaccination coverage than those who do not migrate [PR 0.73 (95% CI, 0.64-0.84) p value <0.001].

Also, the study found that 47.7% of livestock farmers who believed the anthrax vaccine does not offer protection against diseases had low vaccination coverage. This perception was significantly associated with lower vaccination rates, as indicated by an adjusted prevalence ratio (aPR) of 0.82 (95% CI: 0.67–0.99, p = 0.041). (Table 4).

Table 4: Multivariate modified Poisson regression of factors associated with low livestock Anthrax vaccination coverage among livestock farmers in Momba District Council, Tanzania 2024

Variable	Total(n= 435)	Low anthrax vaccination coverage(n=280)	Adjusted PR(95% CL)	p value
Educational status				
No formal education	199	151(75.9)	**Reference**	
Primary School education	213	119 (55.9)	0.74 (0.67-0.94)	**0.012**
Secondary/University education	23	10 (43.5)	0.82 (0.42-1.61)	
Household Size				
1-10	287	166(57.8)	0.82 (0.72-0.94)	**0.041**
11-39	140	108 (77.1)	1.23 (0.95-1.59)	
40 & Above	8	6(75.0)	**Reference**	
Lack of information about Vaccination Schedule to Farmers				
Yes	291	214(73.5)	1.41(1.18-1.68)	**<0.001**
No	144	66(33.1)	**Reference**	
Seasonal migration of Livestock in search of Pasture and Water				
Yes	235	124(52.8)	0.734 (0.64-0.84)	**<0.001**
No	200	156(78.0)	**Reference**	
Nature of the disease unlike CBPP and CCPP with higher mortality rate				
Yes	175	93 (53.1)	0.87 (0.74-1.0)	0.064
No	260	187(71.9)	**Reference**	
Vaccine does not offer protection against Diseases				
Yes	111	53 (47.7)	0.82 (0.67-0.99)	**0.041**
No	324	227 (70.1)	**Reference**	

Note; when POR>1 from these study means that" Livestock farmers are likely to have low Livestock anthrax vaccination coverage while when POR< 1 Means "Livestock farmers are less likely to have low livestock anthrax vaccination coverage (or They are more likely to vaccinate their Livestock)

CHAPTER FIVE

5.0 DISCUSSION

In this study that aimed at determining the Livestock anthrax vaccination coverage and its associated factors among Livestock farmers of Momba DC, we found that vaccination was markedly low 32.8% below 70% recommended by WOAH to offer the herd immunity, Several factors were found significantly associated with low livestock anthrax vaccination coverage after data analysis using Modified Poisson regression model with robust in the STATA software including education level, household size, Lack of information about livestock vaccination schedule to livestock farmers, seasonal migration of livestock of livestock in search of pasture and water and farmers perception that vaccines does not offer protection against diseases.

5.1 Socio-demographic Characteristics

The socio-demographic profile of the livestock farmers in Momba DC provides essential context for understanding the challenges and opportunities in enhancing livestock health interventions. The median age of study participants was 41 years. This finding aligns with findings from similar studies in other regions of Tanzania, which report that middle-aged individuals dominate livestock farming, providing a mature workforce capable of implementing health interventions effectively (25).

We found that among livestock farmers of Momba DC who participated in the study, male dominance (92.87%) among the farmers is consistent with the gender dynamics observed in agricultural and livestock activities across sub-Saharan Africa, where men typically control livestock ownership and decision-making (38,39)

Education levels among the farmers are relatively low, with nearly half having no formal education (45.75%) and 48.97% having only primary education. This low education level is a significant barrier to adopting modern livestock management practices and comprehending the importance of vaccination to most of the livestock farmers. Similar findings were found in

Southwest Ethiopia, where veterinary vaccine use increased with the increase in the level of education among livestock farmers (34).

The study found that larger household sizes were significantly associated with low livestock anthrax vaccination coverage, reflecting the extended family structures common in rural Tanzania and underscore the potential economic pressure on these households, affecting their ability to invest in livestock health (35). Possibly this is due to the fact that with a large household, the priority is set to sustain family life and not animal health services, including anthrax vaccination.

Moreover, the study found that 47.7% of livestock farmers who believed the anthrax vaccine does not offer protection against diseases had low livestock anthrax vaccination coverage. Similar findings have been reported by the study in India, where livestock farmers with a negative attitude toward vaccination and fear of the vaccine side effects on their animals had low livestock vaccination coverage (36) . This result suggests that farmers who doubt the vaccine's effectiveness are less likely to vaccinate their livestock, highlighting the impact of vaccine perception on vaccination behaviors.

5.2 Livestock anthrax vaccination coverage

The study revealed a low overall anthrax vaccination coverage of 32.8%, which is below the 70% threshold recommended by the World Organization for Animal Health (WOAH) for herd immunity. This low coverage is further categorized by species, showing even lower rates for goats (22.3%) and sheep (18.4%), compared to cattle (37.8%). Similar studies in Ethiopia and Kenya have also reported low vaccination coverage, attributing it to logistical challenges, lack of awareness, and insufficient veterinary services (37).

The disparity in vaccination rates among different livestock species may be linked to the perceived economic value of the animals and the prioritization of cattle over smaller ruminants, as noted in other African contexts (38). This prioritization suggests the need for tailored awareness programs emphasizing the importance of vaccinating all livestock species.

5.3 Factors associated with low livestock anthrax vaccination coverage among livestock farmers in Momba District Council

Several factors were identified as significant predictors of low anthrax vaccination coverage among livestock farmers including;

Farmers lacking information about livestock vaccination schedules were 41% more likely to have low livestock anthrax vaccination coverage in Momba DC. Similar finding with studies in Botswana and India, where inadequate dissemination of vaccination information was a critical barrier to livestock vaccination uptake by livestock farmers (40,41,42). This finding highlights the need for publicizing dates and times of livestock vaccination in each village of the district so that livestock farmers become more informed about the vaccination schedule of their livestock.

Education also played a crucial role, with primary-educated farmers being 26% less likely to have low vaccination coverage compared to those with no formal education. Similar findings have been obtained by the research in Ethiopia and Kenya, which found that education enhances the understanding and acceptance of vaccination programs, and livestock farmers have to be given education through trainings, seminars, and demonstrations at village level (38,42). This finding indicates the genuine importance of education on the increase of livestock vaccine uptake among livestock farmers.

Seasonal migration of livestock emerged as a protective factor, with migrating farmers 27% less likely to have low livestock anthrax vaccination coverage. These may be due to the fact that livestock farmers who migrate animals across their district or region are required by the Animal Diseases Act No. 17 of 2003 and its regulation (Livestock Vaccines and Vaccination Regulation of 2020) to have their animals vaccinated against various diseases, including anthrax, in anthrax-endemic areas (17,33).

5.4 Study limitation and its mitigation

In this study we faced some limitation especially during data collection Momba District Council which are listed below mentioning the limitation and its mitigation

i. **Geographical dispersion of Livestock farmers of Momba DC**

Livestock farmers were widely scattered, making it challenging to reach them and this affected the ability to adhere to the sampling frame.

This Limitation was mitigated by using motorcycles for transportation to access each farmer in his/her household, which helped but did not entirely eliminate the difficulty in reaching all targeted participants in the district.

ii. **Availability of livestock farmers in the study area during data collection time**

Many livestock farmers of Momba DC were also engaged in crop farming, making them unavailable during standard data collection times, this led to potential issues in recruiting the required sample size within the planned timeline.

To mitigate this limitation data collection was rescheduled to evening sessions when farmers were more likely to be at home, reducing the risk of selection bias.

5.5 Conclusion

The study identified a significantly low livestock anthrax vaccination coverage (32.8%) among livestock farmers in Momba District Council, which is well below the 70% threshold recommended by the World Organization for Animal Health (WOAH) for achieving herd immunity. Key factors associated with this low livestock anthrax vaccination coverage include lack of formal education, larger household sizes, inadequate dissemination of vaccination schedules, and seasonal livestock migration. The study highlights the need to address these factors through targeted interventions, which would increase vaccination uptake and help mitigate the risk of anthrax outbreaks, thereby protecting both livestock and public health.

5.6 Recommendations

Based on the study's findings, the following recommendations are proposed to enhance livestock anthrax vaccination coverage in the Momba district Council.

First, District authorities should implement educational programs focusing on the importance of livestock vaccination, especially targeting farmers with limited formal education. These could include regular training sessions, seminars, and public awareness campaigns in local communities.

Second, District council Authorities responsible for animal health and production should improve communication channels to publicize vaccination schedules effectively. Using community leaders and local radio announcements to inform livestock farmers about the dates and times for vaccinations could increase coverage.

Third, Special awareness campaigns should be launched to encourage the vaccination of goats and sheep, emphasizing their role in anthrax transmission and outbreak risk, equal to that of cattle.

Forth, District authority should provide support to migrant livestock farmers given that seasonal migration was linked to better vaccination coverage, creating incentives for vaccinating animals before migration could be beneficial. This could involve establishing checkpoints where vaccination status is verified before seasonal movement.

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APPENDICES

Appendix I: Anthrax Study Data Collection Tool

INFORMED CONSENT

Greetings, am ……..., working on research with the objective of determine the coverage of livestock vaccination against anthrax and the associated factors among livestock farmers in Momba District Council, Tanzania. findings from this study will be useful toward setting the appropriate intervention strategies to enhance livestock Anthrax vaccination coverage among livestock farmers protecting both Livestock and human health. Be assured that during this interview, no identifying information will be collected from you except your age, household size, educational level, marital status and household daily expenditure.

Are you willing to participate in this study?

- ○ Yes
- ○ No

SOCIAL- ECONOMIC AND DEMOGRAPHIC FACTORS

INFORMATIONS FROM THE RESPONDENT (PARTICIPANTS)

Respondent ID; ……

Ward……...

Data collection Area Geopoints

latitude (x.y °) ……

longitude (x.y °) ……...

altitude (m) ……...

accuracy (m) ……...

Sex

- Male
- Female

What is your Age……

Marital status (Please Select One)

- Married
- Single
- Divorced
- Single

Educational qualification

- No formal education
- Primary school education
- Secondary school education & Above

Occupation

- Government Employee & Private Employee
- Peasant

Number of Members in the family…….

What is your household daily expenditure per day?.....

INFORMATION ABOUT ANIMALS

1. **How many animals do you keep?**

   Number of Cattle owned ……...

   Number of Goat owned …….

   Number of Sheep owned ……...

INFORMATION ABOUT LIVESTOCK VACCINATION

2. Do you vaccinate your animals against diseases?
    - Yes
    - No
3. **Against which diseases do yours vaccinate your animals? (To every disease option respond Yes if you vaccinate it or No if you don't vaccinate it to your Livestock)**

    Anthrax
    - Yes
    - No

    CBPP
    - Yes
    - No

    CCPP
    - Yes
    - No

    Black quarter (BQ)
    - Yes
    - No

    Rabies
    - Yes
    - No
4. **Are you aware on the presence of Livestock anthrax vaccine?**
    - Yes
    - No
5. **How did you become aware of anthrax vaccination for livestock?**

    Through Animal Health Officer
    - Yes
    - No

During Livestock Vaccination Campaign

- Yes
- No

Through mass media (Radio, TV, Social Media)

- Yes
- No

Community meetings

- Yes
- No

6. **Have you vaccinated your animals against Anthrax?**
   - Yes
   - No
7. **How many animals in your herd are vaccinated against anthrax?**

   Number of cattle vaccinated …….

   Number of goat vaccinated …….

   Number of Sheep vaccinated……...

   Show your vaccination card/certificate…….

FACTORS ASSOCIATED WITH LOW LIVESTOCK ANTHRAX VACCINATION COVERAGE AMONG LIVESTOCK FARMERS

8. **What are the barriers of vaccinating your domestic animals against anthrax?**

   Lack of access to animal health officers at village level
   - Yes
   - No

   High Anthrax vaccination cost per animal
   - Yes
   - No

Nature of disease itself (Anthrax does not kill many animals at a time unlike CBPP and CCPP)

- Yes
- No

Lack of information on livestock vaccination schedules in the District

- Yes
- No

Concerns about anthrax vaccine side effects to animals

- Yes
- No

Vaccines does not offer protection against disease

- Yes
- No

Seasonal migration of Livestock to other areas in search of Livestock Pasture and water

- Yes
- No

Farmers inability to differentiate between treatment, Prophylaxis and Vaccine/ Vaccination

- Yes
- No

Livestock farmers are not engaged during vaccination program planning in the district

- Yes
- No

Others……..

Specify

- Yes
- No

9. **What is the cost of Anthrax vaccination per animal?**

10. **Is that cost affordable for you to vaccinate animals?**
    - Yes
    - No

11. **Suggest the Affordable vaccination Price …….**

12. **Is there anything more about protecting our Domestic animals against anthrax?.....**

Appendix II: Approval for ethical clearance

UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR – RESEARCH, PUBLICATIONS AND INNOVATION

Ref. No.DA.282/298/01.C/2123 Date: 02/04/2024

MUHAS-REC-04-2024-2122
HELMAN VELEGIRIO NYIGO
MUHAS

RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: LIVESTOCK ANTHRAX VACCINATION COVERAE AND ITS ASSOCIATED FACTORS AMONG LIVESTOCK FARMERS IN MOMBA DISTRICT, TANZANIA

Reference is made to the above heading.

I am pleased to inform you that the Chairman has on behalf of the University Senate, approved ethical clearance of the above-mentioned study, on recommendations of the Senate Research and Publications Committee meeting accordance with MUHAS research policy and Tanzania regulations governing human and animal subjects research.

APPROVAL DATE: 02/04/2024
EXPIRATION DATE OF APPROVAL: 02/04/2025

STUDY DESCRIPTION:
Purpose:

The purpose of this Cross0sectional study is to determine the livestock vaccination Coverage against anthrax and the associated factors among livestock farmers in Momba District Council, Tanzania.

The approved protocol and procedures for this study is attached and stamped with this letter, and can be found in the link provided: https://irb.muhas.ac.tz/storage/Certificates/Certificate%20-%2014554.pdf and in the MUHAS archives.

The PI is required to:

1. Submit bi-annual progress reports and final report upon completion of the study.
2. Report to the IRB any unanticipated problem involving risks to subjects or others including adverse events where applicable.
3. Apply for renewal of approval of ethical clearance one (1) month prior its expiration if the study is not completed at the end of this ethical approval. You may not continue with any research activity beyond the expiration date without the approval of the IRB. Failure to receive approval for continuation before the expiration date will result in automatic termination of the approval for this study on the expiration date.
4. Obtain IRB amendment (s) approval for any changes to any aspect of this study before they can be implemented.
5. Data security is ultimately the responsibility of the investigator.
6. Apply for and obtain Data Transfer Agreement (DTA) from NIMR if data will be transferred to a foreign country.
7. Apply for and obtain Material Transfer Agreement (MTA) from NIMR, if research materials (samples) will be shipped to a foreign country.
8. Apply for and obtain permission to publish the results from National Institute for Medical Research. The application should be before submitting to a publisher and not concurrently through the email publications@nimr.or.tz.
9. Any researcher, who contravenes or fail to comply with these conditions, shall be guilty of an offence and shall be liable on conviction to a fine as per NIMR Act No. 23 of 1979, PART III section 10 (2)
10. The PI is required to ensure that the findings of the study are disseminated to relevant stake holders.
11. PI is required to be versed with necessary laws and regulatory policies that govern research in Tanzania. Some guidance is available on our website https://drp.muhas.ac.tz/.

DIRECTOR Research, Publications & Innovations Box 65001

Dr. Nahya Salim Masoud,
CHAIRPERSON, MUHAS RESEARCH AND ETHICS COMMITTEE

Appendix III: Data Collection Approval Letter at Songwe Region



JAMHURI YA MUUNGANO WA TANZANIA
OFISI YA RAIS
TAWALA ZA MIKOA NA SERIKALI ZA MITAA

MKOA WA SONGWE
AnuaniyaSimu: "REGCOM"
Simuyamdomo: 025 – 2580306/5
025 – 2957397
Fax No. 025 – 2580306
Barua pepe: ras.songwe@tamisemi.go.tz
Tovuti:- www. songwe.go.tz
Unapojibu tafadhali taja:-

OFISI YA MKUU WA MKOA
S.L.P 23
SONGWE
2 NSELEWA MKOANI RD
54202 MLOWO - MBOZI

Kumb.Na. EA.127/153/01/21

18/04/2024.

Mkurugenzi Mtendaji,
Halmashauri ya Wilaya,
MOMBA.

Yah: KIBALI CHA KUFANYA UTAFITI UNAOHUSU CHANJO YA UGONJWA WA KIMETA

Tafadhali husika na somo tajwa hapo juu.

2. Ofisi ya Mkuu wa Mkoa imepokea barua kutoka OR-TAMISEMI yenye Kumb. Na. AB.307/323/01 ya tarehe 16 Aprili, 2024 yenye mada tajwa hapo juu.

3. Barua hiyo imeeleza kuwa, Dkt. Helman Velegirio Nyigo ni Mwanafunzi wa Shahada ya Uzamili kutoka Chuo Kikuu cha Afya na Sayansi Shirikishi cha Muhimbili – MUHAS, ambae amepanga kufanya utafiti unaohusu chanjo ya ugonjwa wa Kimeta Mkoani Songwe. ***Livestock Anthrax Vaccination Coverage and Associated Factors Among Livestock Farmers in Momba District in Tanzania.***

4. Utafiti huu ni sehemu ya ukamilishaji wa mafunzo ya Shahada ya Uzamili na umepata kibali cha kufanya tafiti Na. HD/MUH/T.834/2022 cha tarehe 05/04/2024 kutoka Chuo Kikuu cha Afya na Sayansi Shirikishi cha Muhimbili – MUHAS kwa kuzingatia mwongozo wa Serikali wenye Kumb. Na. MPEC/R/10/1 wa tarehe 4/07/1980 uliotoa idhini kwa Chuo kutoa vibali vya kufanya tafiti kwa niaba ya Tume ya Sayansi na Teknolojia nchini (COSTECH).

5. Muda wa kufanya utafiti huu ni kuanzia tarehe 16 Aprili, 2024 hadi tarehe 17 Mei, 2024. Takwimu zitakazo kusanywa kutokana na utafiti huu ni kwa ajali ya matumizi ya ndani tu na iwapo zitatakiwa kuchapishwa na kusambazwa kibali kutoka Mamlaka husika kitapaswa kuombwa.

6. Hivyo kwa barua hii, unaombwa kumpa ushirikiano utakaohitajika kwa ajili ya kukamilisha utafiti huu kama ulivyokusudiwa.

7. Nakutakia utekelezaji mwema.

W. P. Myuyu
KATIBU TAWALA MKOA.

Nakala: Mhe. Mkuu wa Mkoa (**Aione kwenye jalada**)
Katibu Tawala Wilaya,
MOMBA (Kwa taarifa)

Appendix IV: Data Collection Permission Letter in Momba DC

JAMHURI YA MUUNGANO WA TANZANIA
OFISI YA RAIS
TAWALA ZA MIKOA NA SERIKALI ZA MITAA
HALMASHAURI YA WILAYA MOMBA

Unapojibu tafadhali taja:-
Kumb. Na. MODC/V10/06/53

24/04/2024

WATENDAJI WA KATA,
S.L.P 273,
MOMBA.

Yah: KIBALI CHA KUFANYA UTAFITI UNAOHUSU CHANJO YA UGONJWA WA KIMETA

Tafadhali husika na somo tajwa hapo juu,

2. Ofisi ya Mkurugenzi Mtendaji Halmashauri ya Wilaya ya Momba imepokea barua kutoka kwa Katibu Tawala Mkoa wa Songwe yenye **Kumb.Na.EA.127/153/01/21** ya tarehe 18/04/2024 yenye mada tajwa hapo juu.

3. Barua hiyo imeeleza kuwa, Dkt. Helman Velegirio Nyigo ni Mwanafunzi wa Shahada ya Uzamili kutoka Chuo Kikuu cha Afya na Sayansi Shirikishi cha Muhimbili – MUHAS, ambaye amepanga kufanya utafiti unaohusu Ugonjwa wa Kimeta Wilayani Momba. Mada yake ya Utafiti ni ***"Livestock Anthrax Vaccination Coverage and Associated Factors Among Livestock Farmers in Momba District"***

4. Utafiti huu ni sehemu ya ukamilishaji wa mafunzo ya Shahada ya Uzamili na umepata kibali cha kufanya tafiti Na.HD/MUH/T.834/2022 cha tarehe 05/04/2024 kutoka Chuo Kikuu cha Afya na Sayansi Shiriki cha Muhimbili – MUHAS kwa kuzingatia mwongozo wa Serikali wenye Kumb.Na.MPEC/R/10/1 wa tarehe 04/07/1980 uliotoa idhini kwa Chuo kutoa vibali vya kufanya tafiti kwa niaba ya Tume ya Sayansi na Teknolojia nchini (COSTECH).

5. Muda wa kufanya utafiti huu ni kuanzia tarehe 29/04/2024 hadi tarehe 30/05/2024. Takwimu zitakazo kusanywa kutokana na utafiti huu ni kwa ajili ya matumizi ya ndani tu na iwapo zitatakiwa kuchapishwa na kusambazwa kibali kutoka Mamlaka husika kitapaswa kuombwa.

6. Hivyo kwa barua hii, unaombwa kumpa ushirikiano utakaohitajika kwa ajili ya kukamilisha utafiti huu kama ulivyokusudiwa.

Appendix V: Digital Receipt

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Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

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Assignment title:	Dissertation for Ethical
Submission title:	Livestock anthrax vaccination coverage and its associated fa...
File name:	DISSERTATION_REPORT_DR_NYIGO-Final-report.docx
File size:	815.9K
Page count:	53
Word count:	9,069
Character count:	54,031
Submission date:	27-Jun-2024 09:35PM (UTC+0300)
Submission ID:	2251265211



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Appendix VI: Plagiarism report

Livestock anthrax vaccination coverage and its associated factors among livestock farmers of Momba district council,Tanzania

ORIGINALITY REPORT

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