KNOWLEDGE, ATTITUDE, AND PRACTICES REGARDING EMERGENCE, SPREAD AND MANAGEMENT OF ANTIMICROBIAL RESISTANCE IN MEAT PRODUCTS' VALUE CHAIN IN EDO STATE

BY

Gift Oritseshamiaye AKORI (Miss)
AGR2000060

NOVEMBER, 2025

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A PROJECT REPORT SUBMITTED TO THE DEPARTMENT OF ANIMAL SCIENCE, FACULTY OF AGRICULTURE, IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF BACHELOR OF AGRICULTURE (B. AGRIC) DEGREE IN ANIMAL SCIENCE

NOVEMBER, 2025

CERTIFICATION

This is to certify that this project work was carried out by Miss Gift Oritseshamiaye AKORI with Matriculation Number AGR2000060 of the Department of Animal Science, Faculty of Agriculture, University of Benin-City, Nigeria.

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MR. EFEZINO S. ABEL **DATE**

PROJECT SUPERVISOR

_____ _____

DR. N.C. AKAEZE **DATE**

AG. HEAD OF DEPARTMENT

DEDICATION

This work is dedicated to God for His graciousness all through the course of my programme in the University of Benin, Benin City. I also dedicate the project to my loving parents, Mr. and Mrs. Akori and to my dear siblings for their sponsorship and support over the years.

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ABSTRACT

Antimicrobial Resistance (AMR) is a critical global public health crisis, significantly driven by antimicrobial misuse in livestock production, with the meat value chain serving as a primary route for resistance transmission to humans. This study employed a descriptive design involving a self-administered questionnaire to evaluate the knowledge, attitudes, and practices (KAP) regarding the emergence, spread and management of AMR in meat products' value chain in Edo State, Nigeria. A total of 100 participants were used, including livestock farmers, meat sellers/distributors, meat processors, suya vendors, veterinary doctors and meat consumers, drawn from the three Senatorial Districts of Edo State using a stratified random sampling technique. Data collected were coded and analyzed using the IBM SPSS (version 27, 2025). Descriptive statistics were used to summarize respondents' characteristics and key study variables. Inferential analyses were employed, incorporating chi-square testing to explore associations between categorical variables. Results revealed a 61% awareness of AMR but poor understanding of resistance mechanisms, with 16% unable to name any antimicrobial drug. A critical attitude-practice gap was evident. While respondents strongly supported prescription-only antibiotic use (mean=4.45), 80% reported self-prescribing antibiotics for livestock, and only 19.8% consulted veterinarians. Risky practices were widespread, including prophylactic antibiotic use (45.5%) and growth promotion (6.7%). Statistical analysis confirmed that higher education levels and positive attitudes were the strongest predictors of good practice. In conclusion, despite moderate awareness, substantial knowledge gaps, contradictory attitudes, and high-risk practices prevail, intensified by limited veterinary access and low regulatory awareness (77% unaware of laws). The study recommends targeted, multilingual education campaigns, strengthened veterinary services and regulatory enforcement, and the creation of economic incentives to bridge the knowledge-practice gap and promote antimicrobial stewardship across the value chain.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the study

Antimicrobial resistance (AMR) represents a major global health threat in the 21st century, hindering the treatment and prevention of infections caused by bacteria, viruses, fungi, and parasites (WHO, 2021). Often termed the "silent pandemic," AMR occurs when bacteria, viruses, fungi, and parasites change over time and no longer respond to medicines, making infections harder to treat and increasing the risk of disease spread, severe illness, and death (WHO, 2021). The beginning of this crisis is complex, but the misuse and overuse of antimicrobials in human medicine, agriculture, and livestock production are recognized as primary drivers.

To meet the demand of a growing global population, the agricultural sector, particularly livestock production, has increasingly relied on antimicrobials. These drugs are used not only to treat sick animals but also, for prophylaxis (disease prevention) and growth promotion. This practice creates a potent selective pressure, encouraging the emergence and increase of resistant bacteria in animals (Tiseo et al., 2020). These resistant pathogens do not remain confined to farms they enter the broader environment through waste and most alarmingly for the consumer, into the food chain via meat products (Founou, Founou, & Essack, 2021). From the abattoir to the market stall, every step in the meat value chain involving farmers, transporters, butchers, processors, and

retailers becomes a potential point for the transmission and cross-contamination of resistant microbes, posing a direct threat to public health.

In Nigeria, since livestock production has begun to increase rapidly, it faces a serious threat from uncontrolled antimicrobial use. People have easy access to these drugs, including those considered very important for human medicine (Oyeleye, Ajibo, Azor, & Ogunniran, 2024). Edo State, a significant hub of agricultural activity in Southern Nigeria, is no exception. Its vibrant markets are central to the local economy and diet, with meat products being a primary source of protein for a large portion of the population. However, the practices that govern the handling, safety, and antibiotic use within this value chain are often informal and poorly regulated (Jesumirhewe C et al., 2025).

1.2 Statement of problem

Antimicrobial Resistance is a critical global public health crisis, significantly driven by antimicrobial misuse in livestock production (WHO, 2021). Recent global analyses reveal that AMR already contributes significantly to morbidity and mortality and if unchecked, could cause up to 10 million deaths annually by 2050 (Naghavi et al., 2024). The meat value chain serves as a primary route for the emergence and spread of resistant bacteria, creating transmission pathways to humans through food consumption and environmental contamination (Musuka et al., 2025)

In Edo State, Nigeria, this global threat requires local investigation. The knowledge, attitudes, and practices (KAP) of meat value chain stakeholders including farmers, abattoir workers, and

retailers directly influence antimicrobial usage and hygiene standards, yet remain unquantified (Adekanye et al., 2020). Therefore, this study proposes a systematic assessment of KAP regarding AMR among meat value chain stakeholders in Edo State.

1.3 Research Justification

The ability to treat common infections is rapidly fading away by the global rise of drug resistant bacteria, threatening substantial death, illness, and economic loss worldwide. This critical public health crisis is closely linked to our food system, as livestock production serves as a major reservoir where the overuse of antibiotics selects for resistant pathogens that can transfer to consumers through meat, a relationship framed by the One Health approach. Unregulated antibiotic use in animals and the confirmed presence of multidrug resistant organisms in retail meat, specifically highlighted in Edo State markets, shows that the risk of consumer exposure is tangible and immediate. However, lab results alone cannot fix this, effective solutions require us to understand the human factor the knowledge, attitudes, and practices (KAP) of everyone from farmers to consumers that cause the misuse of antimicrobials and poor hygiene. Therefore, conducting a comprehensive KAP assessment in Edo State is essential to fill this evidence gap, allowing us to pinpoint the behavioral and socioeconomic drivers of misuse and design targeted, real world interventions, such as training and awareness campaigns, to reduce this local threat and inform broader national strategies.

1.4 Research Questions

1. What is the level of knowledge of antimicrobial resistance, its emergence, spread and management among stakeholders in the meat products value chain in Edo State?
2. What are the attitudes of stakeholders towards antimicrobial emergence, spread and management of resistance in the meat products value chain in Edo State?
3. What are the prevailing practices by stakeholders in the meat products value chain in Edo State, regarding the emergence, spread and management of AMR?

1.5 Research Hypothesis

H_0 (Null Hypothesis): There is no statistically significant relationship between knowledge, attitude, and practice regarding AMR and the emergence, spread, and management of antimicrobial-resistant organisms in the meat products value chain in Edo State.

H_1 (Alternative Hypothesis): There is a statistically significant relationship between knowledge, attitude, and practice regarding AMR and the emergence, spread, and management of antimicrobial-resistant organisms in the meat products value chain in Edo State.

1.6 Aim and objectives of this study

1.6.1 Aim of study

The aim of this study is to evaluate the knowledge, attitudes, and practices regarding antimicrobial resistance and its emergence, spread, and management among stakeholders in the meat products value chain in Edo State, Nigeria.

1.6.2 Objectives of the study

The Objectives of this study are:

1. To assess level of understanding of AMR, including its drivers and outcomes, among cattle farmers, veterinary experts, workers in abattoirs, meat processors, retailers and meat consumers in Edo State, Nigeria.
2. To determine the attitude of stakeholders towards AMR as a threat to public and animal health and their role in the meat products value chain in Edo State preventing its emergence and spread.
3. To document prevailing practices by stakeholders that could influence the emergence, spread, and management of AMR along the meat products value chain in Edo.

1.7 Scope of the study

The study is strictly confined to the meat products value chain within Edo State, Nigeria, focusing geographically on this region. It aims to assess the KAP of all stakeholders in the meat products value chain regarding AMR. The research will cover the factors contributing to the emergence and spread of AMR in commonly consumed meat products and document existing management practices and challenges regarding AMR.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter describes and analyzes previous research on the Assessment of Knowledge, attitude and practice regarding AMR and emergence, spread and management in the meat products value chain in Edo State. The purpose is to suggest some theoretical framework to be explained further in the chapter.

2.2 Overview of AMR

AMR is a slow-motion pandemic, eroding our ability to treat common infections and threatening modern medicine (Sultana et al., 2024). When bacteria, viruses and other pathogens evolve to withstand drugs, the results are longer illnesses, higher mortality and risks to procedures like

surgery and chemotherapy. AMR is already a leading global cause of death, with projections suggesting it could claim 10 million lives annually by 2050, creating a massive economic burden (Naghavi et al., 2024; Murray et al., 2022).

This crisis is fueled by the misuse of antimicrobials across human health, animal agriculture and the environment. Over prescription for viral infections, unregulated sales and the use of antibiotics as growth promoters in livestock create relentless selective pressure, allowing resistant strains to multiply and spread (WHO, 2023; Ma et al., 2021). Resistant pathogens circulate freely between humans, animals and the environment, making AMR an ideal "One Health" challenge where actions in one sector affect all others (OECD, 2023; Velázquez-Meza et al., 2022). The burden is often highest in regions with weaker health systems, where studies have documented resistant bacteria entering communities through everyday routes like the food chain (Igbinosa et al., 2023).

Combating AMR requires integrated, practical solutions. Key strategies include antimicrobial stewardship in hospitals and farms to ensure prudent drug use, robust infection prevention through hygiene and vaccination, and community education to change behaviors. Success hinges on local, culturally sensitive approaches that make these strategies accessible and affordable, protecting the efficacy of these vital medicines for future generations (Velázquez-Meza et al., 2022; Ma et al., 2021).

2.3 Antimicrobial use in livestock and its impact: Causes and Drivers of AMR.

The structure of modern intensive agriculture represents a primary driver of antimicrobial resistance (Kelbrick, Hesse, & O'Brien, 2023). The crowded conditions on industrial farms create ideal environments for disease spread, making the prophylactic use of antibiotics a rational economic decision for individual farmers fearing devastating losses. However, this short-term solution creates a catastrophic global externality by accelerating AMR, a problem further compounded by the historical legacy of using antibiotics for growth promotion which established a culture of dependency (Tiseo et al., 2020). This situation is exacerbated by significant structural gaps; in many regions, limited access to veterinary professionals forces farmers to rely on untrained advice and readily available over-the-counter drugs, leading to misuse. Perverse financial incentives that link revenue to sales volume further promote overuse rather than prevention (Odoi & van der Westhuizen, 2022; Caudell et al., 2020). Ultimately, for farmers operating in a context of immense uncertainty, antimicrobials provide a tangible sense of control against immediate financial risks, making the distant, global benefit of reducing use a less compelling motive than the pressing need to safeguard their livelihood (Rware et al., 2024). Changing these deeply ingrained practices requires addressing not just information gaps but also the underlying economic and cultural norms that sustain them (Caekebeke et al., 2020).

2.3.1 The Causes

1.The overuse and misuse of antimicrobials in agriculture represents the primary driver of antimicrobial resistance, operating through several key practices. The historical and ongoing use

of antibiotics for growth promotion, where low, sub-therapeutic doses are added to animal feed to accelerate growth, a practice that persists in many regions despite being banned in others (WOAH, 2024). Furthermore, in the crowded conditions of intensive farming, antibiotics are used prophylactically as a blanket disease prevention measure in healthy animals, exposing vast bacterial populations to drugs and fostering resistance (Lynn Kavanagh, 2023). This is compounded by metaphylaxis, the treatment of an entire herd when only a few animals are sick, which unnecessarily expands this exposure (Maples et al., 2022). Even legitimate therapeutic use for treating infections is problematic when compromised by incorrect dosing, poor drug selection, or unfinished courses, all of which can encourage resistant strains to survive (Islam et al., 2024). Underpinning these issues is the critical problem of inadequate veterinary oversight in many parts of the world, where a lack of professional guidance leads to unregulated and inappropriate antibiotic use, creating a structural failure in the responsible management of these vital medicines (Nuvey et al., 2022).

2. Environmental Contamination: A significant portion (75-90%) of antimicrobials administered to livestock are excreted unmetabolized in their feces and urine. This contaminated manure, often used as fertilizer, introduces antibiotics and resistant bacteria/genes into soil and water systems (Agga et al., 2024). Poor quality feed or water sources can introduce new pathogens and also serve as a medium for the spread of resistant bacteria within a farm. Insufficient hygiene practices and biosecurity measures on farms allow resistant bacteria to spread easily among animals and between farms.

2.4 The meat value chain: structure and risk points

The meat production chain, while essential for global food supply, acts as a significant pathway for antimicrobial resistance (AMR). The "farm-to-fork" process illustrates how resistant bacteria and genes can flow continuously from origin to consumer. The primary site of resistance emergence is the farm, where antimicrobial use for treatment, prevention, and historically for growth promotion creates powerful selective pressure, allowing resistant strains to develop in animals and contaminate the environment through manure (Heuer et al., 2022; Van Boeckel et al., 2020).

This initial contamination is amplified at subsequent stages. During transportation and slaughter, stress and poor hygiene can increase bacterial shedding and cause cross-contamination between animals and onto carcasses (Pires et al., 2021). Further processing, distribution, and finally, consumer handling in the kitchen present repeated opportunities for resistant bacteria to spread and persist, especially through cross-contamination and inadequate cooking. The interconnectedness of these stages means a problem at the farm level cascades throughout the entire system, with global trade spreading these risks across borders and environmental reservoirs like wastewater creating a continuous cycle of re-exposure (Nadimpalli et al., 2022; Landers et al., 2021; Bengtsson-Palme & Larsson, 2020).

2.5 Knowledge, Attitudes and Practices (KAP) toward Antimicrobial Resistance (AMR)

In livestock systems, antimicrobials are used for therapy, metaphylaxis and where regulation is weak, prophylaxis or growth promotion. These uses create selection pressure, producing resistant bacteria that can pass to humans through direct contact, contaminated meat or the environment (Ramírez-Castillo et al., 2023). Understanding the knowledge, attitudes and practices (KAP) of livestock producers, agro-vendors, para-veterinarians and slaughter/market workers is therefore essential to design effective, locally feasible interventions. In Edo State, microbiological surveys already detect resistant organisms in animals and retail meat, making KAP informed action urgent (Beshiru et al., 2024; Jesumirhewe et al., 2022; Jesumirhewe, Badmus, & Onyenwe, 2020).

2.5.1 Knowledge: gaps and strengths among livestock actors

KAP research across low- and middle-income countries shows a common pattern: many livestock keepers and value-chain actors can identify common drug names and know that medicines treat disease but lack detailed understanding of correct indications, species-specific dosing, withdrawal periods and how misuse selects for resistance (Caudell et al., 2020). In sub-Saharan Africa, reviews highlight frequent knowledge shortfalls among farmers and agro-vendors, and limited awareness that residues and resistant bacteria in animal products pose human-health risks (Odey, 2024).

2.5.2 Attitudes: economic logic and trust networks that shape use

Attitudes in livestock systems are shaped by immediate economic imperatives. Farmers often treat antimicrobials as inexpensive insurance against production losses, prioritizing rapid return to marketability over abstract future risks like AMR (Caudell et al., 2020). In many communities, feed sellers, para-veterinarians and peers are trusted advisers; formal veterinary services may be distant, costly or limited, so pragmatic decision-making favours empirical, rapid intervention (Odey, 2024). Such attitudes help explain why prophylactic group treatments, routine metaphylaxis and early sale/slaughter before withdrawal periods persist despite awareness campaigns.

2.5.3. Practices: common risky behaviours driving AMR in Edo State

1. Informal antibiotic purchase. Farmers frequently obtain antimicrobials from agro-shops or informal vendors without prescription; vendors often dispense improvised dosing advice and sell partial packs (Caudell et al., 2020; Odey, 2024).
2. Self-medication and mass prophylaxis. Whole herd or whole flock treatments after a single case, or routine prophylactic dosing during stress events, are common and amplify selection pressure (Caudell et al., 2020).
3. Non observance of withdrawal periods. Selling or slaughtering animals before withdrawal times exposes consumers to residues and potentially resistant bacteria

reflected in the recovery of resistant organisms from retail beef (Jesumirhewe et al., 2020).

2.6 Evidence that AMR exists in Edo State livestock systems

Local studies provide direct evidence of AMR across the livestock-to-market continuum in Edo State. Jesumirhewe et al. (2022) genetically characterized Enterobacteriaceae isolated from bovine feces and slaughter environments in Edo State and reported multiple resistance genes and multidrug resistance among isolates. A retail meat study in Ovia North and South local government areas found antibiotic-resistant organisms in beef sold at local markets (Jesumirhewe, Badmus & Onyenwe, 2020). More recently, Beshiru et al. (2024) documented a high prevalence of livestock-associated methicillin-resistant Staphylococcus aureus (LA-MRSA) among animal samples from Edo State, many isolates showing multidrug resistance and virulence genes. Together, these data demonstrate that resistant organisms are present on farms, in slaughter environments and in retail meat consistent with known behavioural drivers of AMR in livestock systems (Elbehiry & Marzouk, 2025).

2.7 The One Health Approach to Antimicrobial Resistance (AMR)

The effectiveness of modern medicine is under threat as a growing number of pathogens evolve to resist antimicrobial treatments.This complicates the treatment of once-simple infections in humans and animals, directly threatening public health and food security (Mahendra Pal et al., 2024). The complexity of AMR is heightened by its disregard for boundaries, spreading silently

across human, animal, and environmental domains. This interconnectedness is why the One Health approach, which recognizes the interdependency of human, animal, and environmental health, is considered the most promising strategy for sustainably addressing AMR (OECD, 2023). The risks are particularly magnified in low- and middle-income countries like Nigeria, where factors such as limited regulation and widespread over-the-counter antibiotic access intensify the problem (Omoleke & Akinyele, 2024).

A One Health approach breaks down sectoral silos by promoting coordinated action. This includes clinicians and veterinarians reducing unnecessary antibiotic prescriptions, while also addressing the human behaviors that drive resistance, such as farmers using antibiotics as insurance against livestock disease (Hardefeldt & Thursky, 2024). Successful interventions demonstrate the power of collaboration, such as training drug sellers, launching education campaigns, and strengthening food safety inspections (FAO, 2024). For such efforts to be sustainable, the approach must extend beyond regulations to include practical, economically viable alternatives for stakeholders. Ultimately, by embracing this interconnected strategy, nations can work to prevent a future where common infections become untreatable and agricultural livelihoods are compromised (Hughes et al., 2024).

2.8 Policies and Regulations for Antimicrobial Resistance (AMR) Management

Tackling the profound challenge of antimicrobial resistance (AMR) requires robust, enforceable policies that govern antimicrobial use across all sectors. The World Health Organization's Global

Action Plan (Ya et al., 2024) provides the foundational framework, urging countries to develop their own National Action Plans (NAPs), a call heeded by Nigeria with its initial 2017-2022 plan and a forthcoming updated version (One Health Trust, 2024). Effective regulation rests on three core pillars: first, the implementation of well-funded and locally adapted NAPs overcome fragmentation (Fuller et al., 2022); second, controlling access to antimicrobials by restricting over-the-counter sales and enforcing standards in agriculture, as guided by the FAO and WOAH (FAO, 2021; WOAH, 2021); and third, establishing integrated surveillance systems, such as WHO's GLASS, to provide the data necessary for accountability and adaptive policymaking (Kusuma et al., 2025).

However, policies must contend with the socioeconomic drivers of misuse, such as farmers relying on antibiotics as a cheap insurance for livestock and the prevalence of non-prescription sales by veterinary providers (Ogwuche et al., 2021). Therefore, successful regulation must blend enforcement with practical incentives, including subsidized vaccines and improved veterinary services, to make stewardship a viable choice (Odey et al., 2024). Ultimately, strong governance and political will are decisive, as without committed local leadership and coordinated One Health action, even the most comprehensive AMR strategies risk remaining as unimplemented "paper plans."

CHAPTER THREE

3.0 METHODOLOGY

3.1 Introduction

This chapter presents the research framework utilized to explore the livestock and meat products value chain operations within selected local government areas in Edo State, Nigeria. It discusses the research approach, target Population, sampling procedures, data gathering techniques and analytical methods used in this research.

3.2 Study Area

This research was conducted in Edo state across the three Senatorial Districts of the state and among stakeholders in the meat products' value chain, including livestock farmers, distributor (wholesale and retail), meat processors, veterinary doctors and consumers. Edo State possesses a significant livestock sector, primarily driven by poultry, piggery and ruminant production. While traditional backyard farming is common, commercial production of eggs, chicken and pork is growing rapidly. The sector benefits from the state's strategic location and market access. However, its potential is constrained by high feed costs, diseases outbreak and persistent farmer herder conflicts. Addressing these challenges is crucial for unlocking its full economic and nutritional contribution.

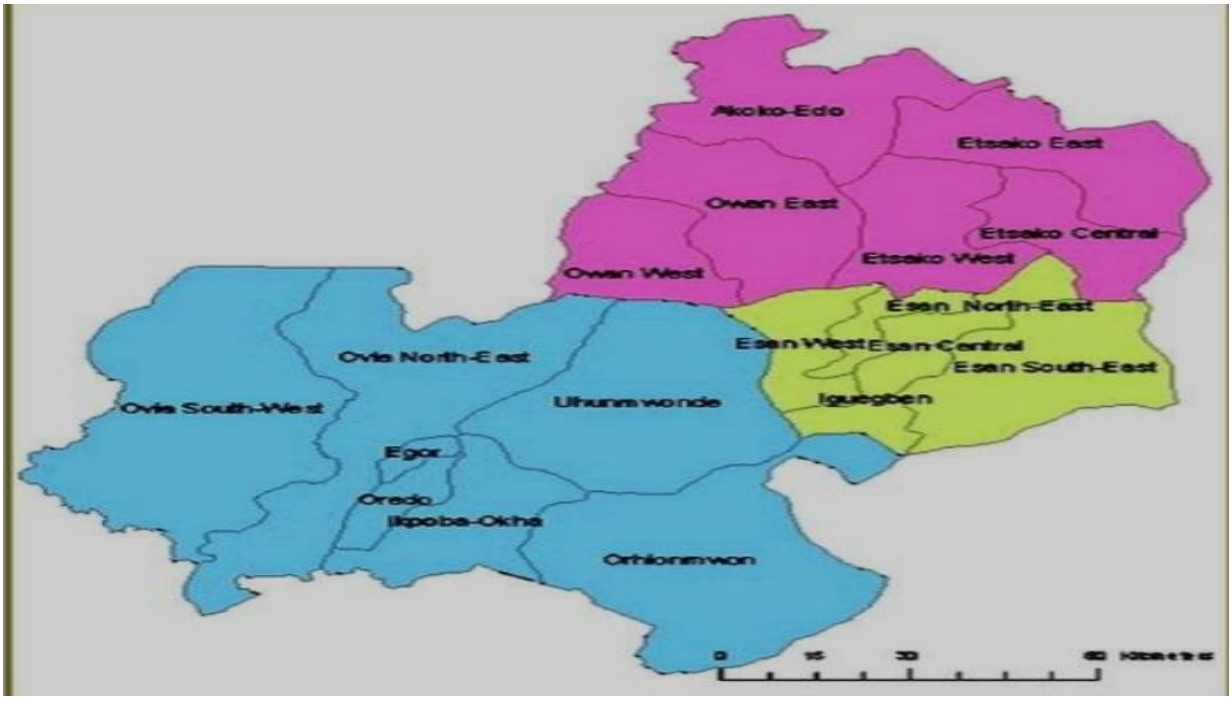

Figure 1: Map of Edo state showing the Local Government Areas (Source: www.nigerianmuem.com)

3.2 Study Population and Sampling

For the purpose of this research, 100 respondents were administered the questionnaire. A minimum of 10 persons to represent each of the stakeholders in the meat products value chain. The study employed a stratified random sampling method to secure a balanced representation of various stakeholders groups distributed across the state. This approach is well suited for this type of investigation because it ensures comprehensive coverage of different value chain actors and preserve statistical validity. By guaranteeing that all relevant subgroups are adequately

represented, the method is ideal for the value chain research where insights from diverse stakeholders are fundamental.

3.3 Data collection method and source of data

A structured questionnaire was administered to respondents from each stakeholder group. The questionnaire will assess the knowledge, attitudes, and practices related to AMR. Focus group discussions will also be conducted to gain deeper insights into respondents' perceptions and behaviors. The use of primary data ensures that the study captures context-specific realities directly from stakeholders, thereby enhancing the authenticity, accuracy, and relevance of the findings.

3.4 Research Instrument

The main research instrument used will be a structured questionnaire (Appendix 1), divided into four sections:

Section A: Socioeconomic characteristics of respondents.

Section B: Knowledge of antimicrobial resistance

Section C: Attitude to management and control of antimicrobial resistance

Section D: practice/behaviour towards antibiotic usage/management and control of antimicrobial resistance in meat products value chain.

3.5 Method of Data collection

Questionnaires were distributed across five local government areas in Edo State. This distribution method enhanced participation rates and provided opportunities for each participant to clarify each question when necessary, ensuring an effective and thorough collection.

3.6 Data Analysis

Data collected will be coded and analyzed using the Statistical Package for the Social Sciences (SPSS) IBM SPSS Statistics version 27 (2025). The analysis will involve descriptive statistics such as frequencies, percentages, means, and standard deviations to summarize respondents' characteristics and key study variables. Inferential analyses were employed, incorporating chi-square testing to explore associations between categorical variables and regression modeling to assess how various elements influence livestock and beef value chain functions and sustainability. The results will be presented in tables, charts, and graphs to ensure clarity and effective interpretation.

3.7 Ethical consideration

The respondents' consent was sought before data were obtained from them. Necessary information needed by the respondents with respect to the aims of the study were provided to ensure participation of each respondents was voluntary and that they were free not to participate. All private information linked to respondents were not included in the summarized data, ensuring confidentiality.

CHAPTER FOUR

4.0 RESULTS

4.1 Introduction

This chapter presents the results from the KAP survey conducted among stakeholders in the meat products value chain in Edo State, Nigeria. The study assessed participants' understanding of AMR, their attitudes toward its emergence, spread and management, and their practices regarding antimicrobial use. The results are presented in descriptive and inferential statistics, organized according to the research objectives and hypotheses outlined in earlier chapters.

4.1.1 Socio-economic Characteristics of Respondents

Table 1: Socio-economic Characteristics of Respondents

Variable		Frequency (n)	Percent (%)
Gender	Male	64	64.0
	Female	36	36.0
	Total	100	100.0
Age	18-24	18	18.0
	25-34	13	13.0
	35-44	46	46.0
	45-54	17	17.0
	55-64	5	5.00
	65-74	1	1.00
	Total	100	100.0
Marital Status	Single	34	34.0
	Married	62	62.0
	Divorced	1	1.0
	Widowed	2	2.0

Variable		Frequency (n)	Percent (%)
	Separated	1	1.0
	Total	100	100.0
Religion	Christianity	83	83.0
	Islam	11	11.0
	African Traditional Religion	6	6.0
	Total	100	100.0
Educational Level	PhD Studies	2	2.0
	Postgraduate studies	7	7.0
	Undergraduate studies	28	28.0
	Certificate/Polytechnic	21	21.0
	Secondary school	31	31.0
	Primary School	8	8.0
	Some schooling but did not finish primary	2	2.0
	Did not go to School	1	1.0
	Total	100	100.0
Occupation	Livestock Farmer	27	27.0
	Veterinarian	16	16.0
	Others	57	57.0
	Total	100	100.0
Monthly Income(₦)	Did not specify	3	3.0
	Less than 50,000	15	15.0
	50,001-100,000	24	24.0
	100,001-200,000	43	43.0
	200,001-300,000	15	15.0
	Total	100	100.0
Work experience	Less than 1 year	7	7.0
	1 to 2 years	13	13.0
	2 to 5 years	23	23.0
	5 to 10 years	25	25.0
	10 to 15 years	22	22.0
	Over 15 years	10	10.0
	Total	100	100.0
Source of credit	Self	75	75.0
	Family	14	14.0
	Cooperative	6	6.0

Variable		Frequency (n)	Percent (%)
	Banks	3	3.0
	Money lenders	2	2.0
	Total	100	100.0
Source of land	Personal	33	33.0
	Family	18	18.0
	Rent	48	48.0
	Government	1	1.0
	Total	100	100.0
Vet association	Yes	16	16.0
	No	84	84.0
	Total	100	100.0

Table 1 presents the socio-economic characteristics of the respondents. The majority of respondents were male (64%), while female respondents constituted 36% of the sample.

In terms of age distribution, participants were mostly between 35–44 years (46%) and 45–54 years (17%). Younger respondents aged 18–24 years accounted for 18%, those aged 25–34 years represented 13%, while respondents aged 55–64 years constituted 5%, and those aged 65–74 years made up 1% of the sample. This age distribution indicates a mature workforce with substantial life and professional experience in the meat products value chain.

Regarding marital status, the majority of respondents were married (62%), 34% were single, 2% were widowed, 1% were divorced, and 1% were separated. In terms of religious affiliation, Christianity was predominant (83%), while 11% identified as Muslims, and 6% practiced African Traditional Religion. This religious distribution reflects the demographic composition of Edo State, which has a Christian majority.

The respondents' educational background varied considerably: 31% had completed secondary school, 8% had completed primary school, 21% had certification or went to polytechnic, 28% had undergraduate studies, and 6% had postgraduate education. A small fraction had PhD studies (2%), 2% had some schooling but did not finish primary, ause1% had no formal education. This educational diversity suggests varying levels of literacy and capacity to understand technical information about antimicrobial resistance.

Considering occupation, 27% were livestock farmers, 16% were veterinarians, and 57% were engaged in other occupations such as meat vendors, butchers, processors, and meat sellers. In terms of monthly income, only 3% did not disclose their earnings. Among those who did, the largest group (43%) earned ₦100,001-200,000, followed by 24% earning ₦50,001-100,000, 15% earning less than ₦50,000, and 15% earning ₦200,001-300,000.

For work experience, 25% had 5–10 years of experience, 23% had 2–5 years, 22% had 10-15 years, 13% had 1–2 years, 10% had over 15 years, and 7% had less than 1 year of experience.

Regarding source of credit, the majority (75%) were self-financed, 14% obtained credit from family, 6% from cooperatives, 3% from banks, and 2% from money lenders. This demonstrates high reliance on personal resources and informal credit sources.

For land acquisition, 48% rented their land, 33% used personal land, 18% used family land, and 1% obtained land from the government. This demonstrates that land rental is the most common arrangement, with limited government involvement in land allocation for agricultural purposes.

Lastly, in terms of veterinary association membership, only 16% of respondents were members, while 84% were not affiliated with any veterinary association. This low membership rate suggests limited professional networking and potentially reduced access to continuing education and updated information on veterinary practices, including antimicrobial stewardship.

Overall, the data suggest that the respondents are predominantly middle-aged, married, educated males with moderate to substantial work experience and varying income levels. Most are self-reliant in financing their activities and primarily rent land or use personal property. The low rate of veterinary association membership and reliance on informal credit sources highlight areas where interventions could strengthen capacity for responsible antimicrobial use.

4.1.2 Knowledge of Antimicrobial Resistance

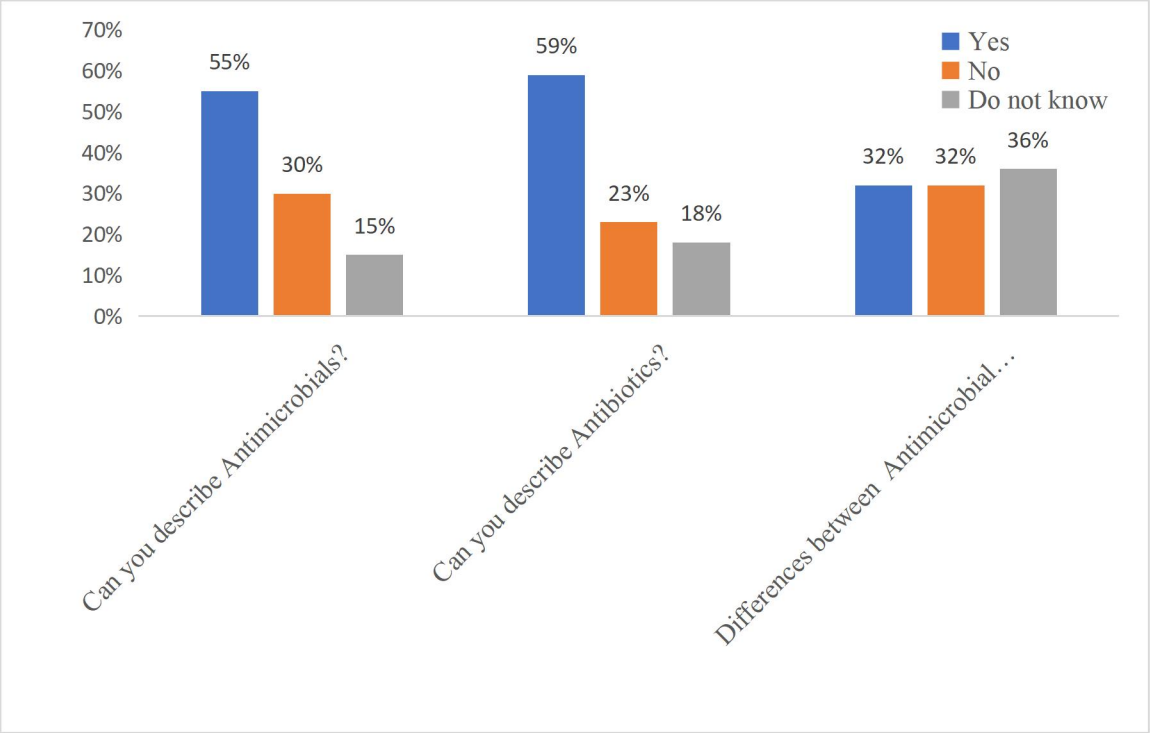

Figure 1: knowledge of Antimicrobial Resistance

The results in Figure 1 show the respondents' knowledge of antimicrobials, antibiotics, and the differences between the two:

55% of respondents stated they could describe antimicrobials, while 30% could not, and 15% said they did not know.

59% reported they could describe antibiotics, 23% could not, and 18% said they did not know.

When asked about the differences between antimicrobials and antibiotics, 32% answered yes, *32% answered no, and *36% said they did not know.

These results indicate that although more than half of the respondents understand antimicrobials and antibiotics individually, a large proportion lack clarity regarding the differences between the two. The high percentage (36%) who “do not know” the difference suggests a notable gap in conceptual understanding of antimicrobial resistance (AMR).

4.1.2.1 Knowledge Score

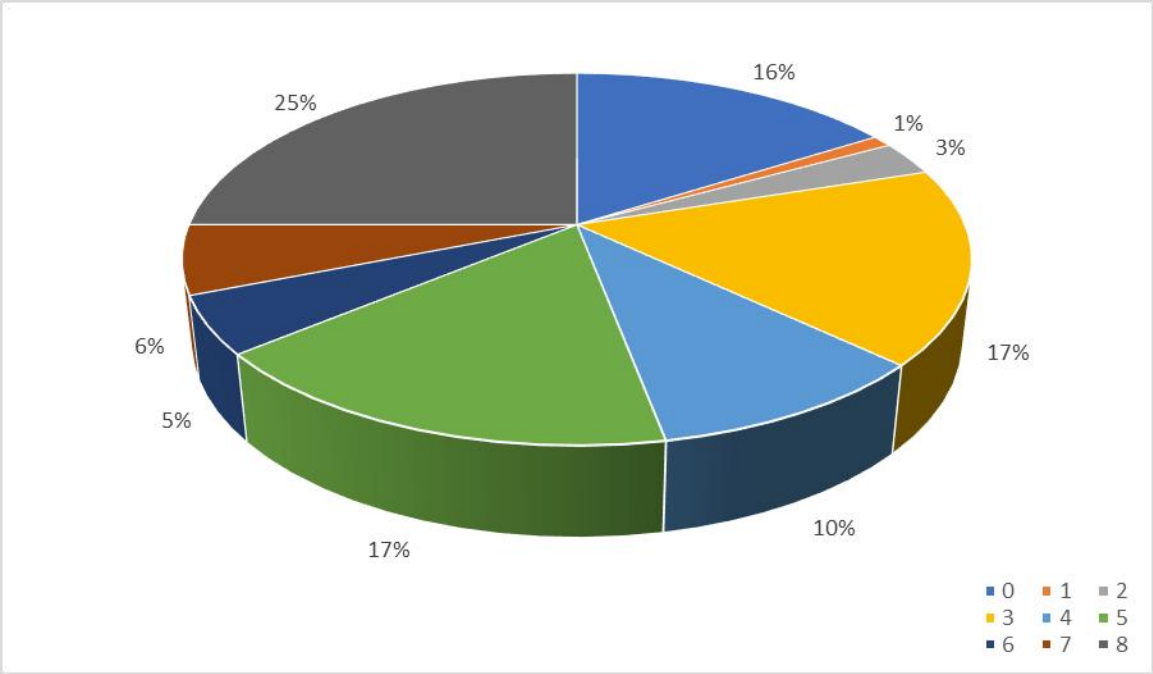

Figure 2: Knowledge Score on Antimicrobial Drugs

Figure 2 shows the overall knowledge scores of respondents based on the number of antimicrobial drugs they could name. The knowledge assessment revealed a concerning deficit. 16% of respondents could not name any antimicrobial drug, scoring zero. While 31% demonstrated high knowledge (scoring 7–8), the majority scored a minimum, indicating predominantly low to moderate knowledge. This substantial knowledge gap underscores the critical need for enhanced education on antimicrobial drugs and AMR concepts within the value chain.

Table 2: Classes of Antibiotics and examples listed by respondents

S/N	Class of antibiotics	Examples listed	Total	%
1	Penicillins	Amoxicillin, Penicillin, Ampicillin, Ampiclox, Augmentin, Amoxil	78	37.90
2	Tetracyclines	Tetracycline, Doxycycline	30	14.63
3	Aminoglycosides	Gentamicin, Streptomycin, Neomycin, Kanamycin	36	17.56
4	Macrolides	Azithromycin, Erythromycin, Clarithromycin, Tulathromycin	22	10.73
5	Cephalosporins	Cephalosporin, Ceftriaxone, Cephalexin, Cefuroxime, Cefquinome	14	6.83
6	Nitroimidazole	Metronidazole	9	4.39
7	Fluoroquinolones	Ciprofloxacin, Levofloxacin	7	3.4
8	Amphenicols	Chloramphenicol, Florfenicol	7	3.41
9	Lincosamides	Clindamycin	3	1.46
10	Glycopeptides	Vancomycin	3	1.46
11	Sulfonamides	Trimethoprim	3	1.46
12	Polymyxins	Colistin	2	0.98
13	Carbapenems	Meropenem, Imipenem	2	0.98
14	Oxazolidinones	Linezolid	1	0.49
	Total		205	100.00

Table 2 presents the classes of antibiotics and specific examples that respondents were able to name. Penicillins were the most commonly identified class, accounting for 37.90% of all responses, with examples including Amoxicillin, Penicillin, Ampicillin, Ampiclox, Augmentin, and Amoxil. This high recognition rate likely reflects the widespread use and availability of penicillins in both human and veterinary medicine in Nigeria.

Aminoglycosides ranked second at 17.56%, with respondents naming Gentamicin, Streptomycin, Neomycin, and Kanamycin. Tetracyclines followed at 14.63%, with Tetracycline and Doxycycline being the examples provided. Macrolides accounted for 10.73% of responses, including Azithromycin, Erythromycin, Clarithromycin, and Tulathromycin.

Less commonly identified classes included Cephalosporins (6.83%), Nitroimidazole (4.39%), Fluoroquinolones (3.40%), and Amphenicols (3.41%). The remaining classes—Lincosamides, Glycopeptides, Sulfonamides, Polymyxins, Carbapenems, and Oxazolidinones—were each mentioned by 3 or fewer respondents, collectively accounting for less than 8% of total responses.

This distribution suggests that respondents have stronger familiarity with commonly used, readily available, and perhaps older classes of antibiotics (penicillins, tetracyclines, aminoglycosides), while knowledge of newer or more specialized antimicrobial classes remains limited. The predominance of penicillin-related responses may also indicate frequent exposure to these drugs in local pharmacies, veterinary clinics, and agricultural settings.

4.1.2.2 Use of Antimicrobials/Antibiotics in both humans and farm animals

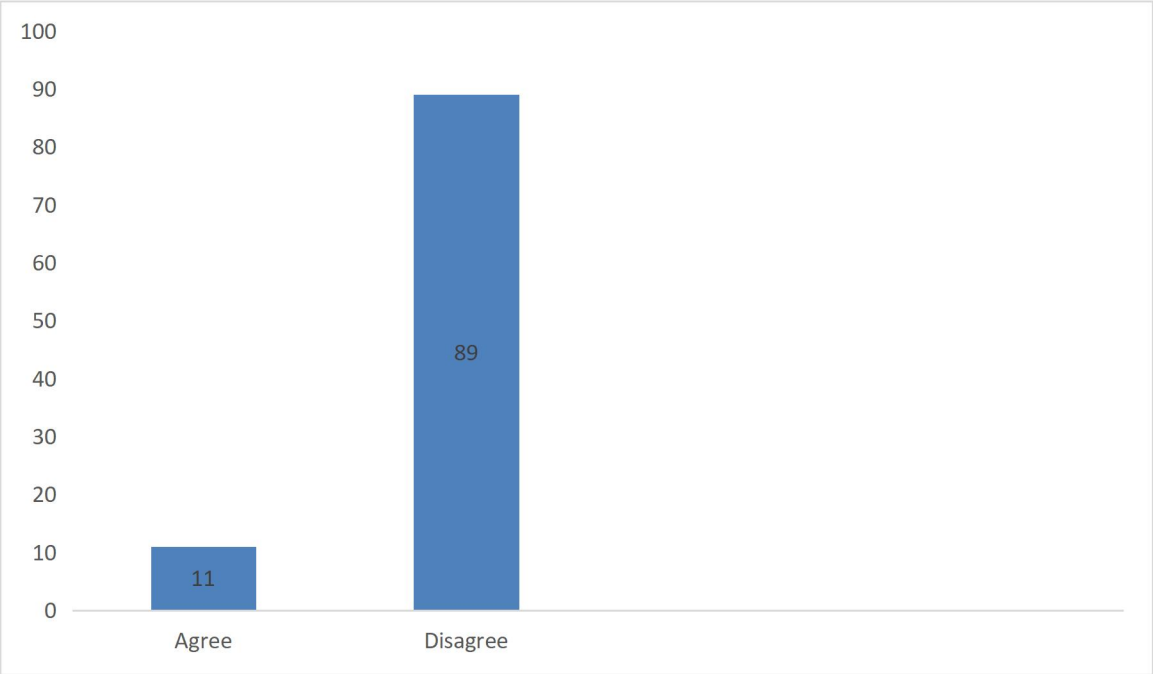

Figure 3: Respondents' Perception regarding the use of Antimicrobials in both humans and farm animals

Results show 89% correctly recognized that not all antimicrobials used in humans apply to animals and vice versa, indicating good awareness of species-specific use. However, 11% believed otherwise, suggesting misconceptions that could lead to inappropriate cross-species drug administration and potentially contribute to AMR.

4.1.2.3 Awareness of AMR

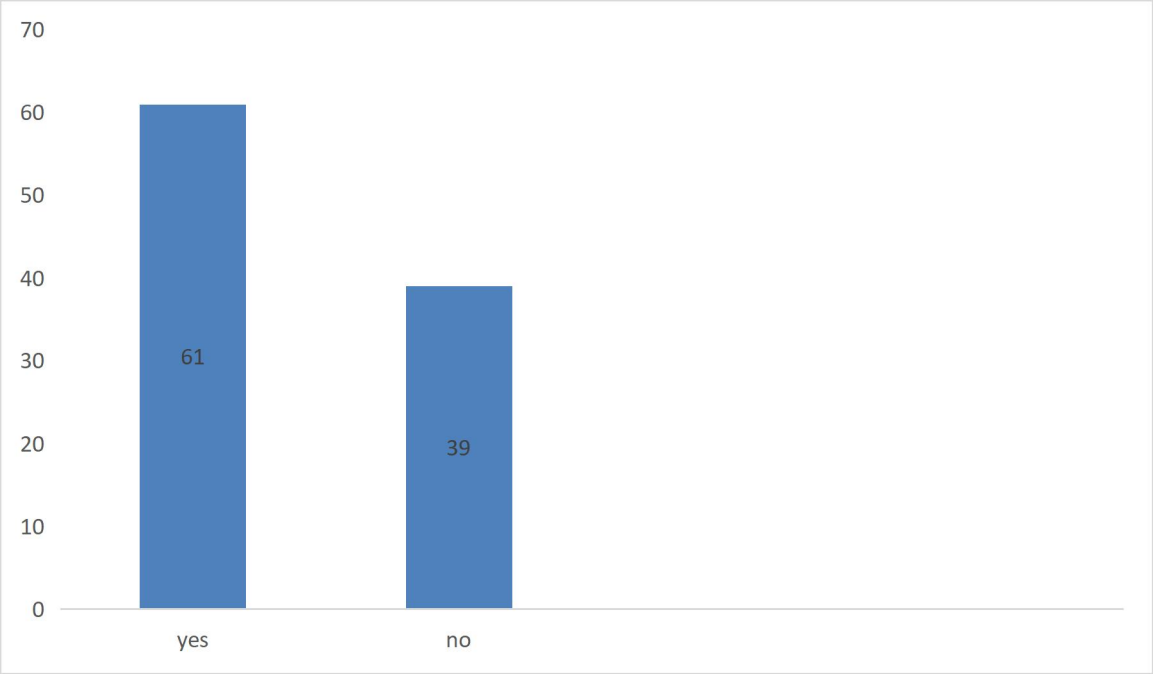

Figure 4: Respondents' knowledge level towards awareness of AMR

Results show 61% of respondents had heard of antimicrobial resistance, while only 39% had not, demonstrating very high awareness. This may reflect effective public health campaigns, veterinary training, and media coverage, suggesting AMR is widely recognized as a critical challenge in Edo State's meat value chain.

4.1.2.4 Knowledge of Antimicrobial Resistance

Table 3: Respondents' Knowledge of Antimicrobial Resistance

Variable		Frequency (n)	Percent (%)
Source from which you heard of AMR	Television	11	7.6
	Radio	13	9.0
	Print	16	11.0
	Friends	12	8.3
	Colleagues	6	4.1
	Seminar	35	24.1
	Social media	16	11.0
	Training program	32	22.1
	Others	4	2.8
	Total	145	100.0
What best describes AMR	It is dangerous but I cannot explain it	26	19.0
	Infection can't be treated because medicine is not effective	55	40.2
	When bacteria develop resistance to antimicrobial/antibiotic	45	32.8
	Not sure	11	8.0
	Total	137	100.0
Which is true regarding AMR	AMR is when infection can't be treated because medicine loses their potency	65	26.1
	AMR is when bacteria develop resistance to antimicrobials	61	24.5
	AMR is due to overuse of antimicrobials/antibiotics	57	22.9
	AMR occurs when microorganism changes response to the use of antimicrobials	41	16.5
	AMR trait can be transferred from one organism to another	25	10.0
	Total	249	100.0
Which is true about AMR as a health issue	It affects animal, plant and humans	63	27.1
	It occurs in humans only	29	12.4

Variable		Frequency (n)	Percent (%)
	It is detected in food animals by the amount of antimicrobial residue in meat sample	41	17.6
	It is a global threat	57	24.4
	It can be eradicated	43	18.5
	Total	233	100.0
Which of these practices contribute to the emergence and spread of AMR	Use of antimicrobials in humans when it is not necessary	67	27.1
	Overuse of antimicrobials in animals	67	27.1
	Discontinuing the antimicrobial use once the animal/human shows improvement	52	21.5
	Practicing appropriate use of antimicrobials in animals	16	6.1
	Practicing appropriate use of antimicrobials in humans	15	6.1
	Using fertilizer/water containing animal feces with antimicrobial residue	30	12.1
	Total	247	100.0
Which of these practices control/prevent the emergence and spread of AMR	Good vaccination program	70	23.6
	Good husbandry practices	63	21.3
	Use of antimicrobials as growth promoters	51	17.3
	Good farm hygiene	56	18.9
	Prudent use of antimicrobials	55	18.6
	None of the above	1	0.3
	Total	296	100.0

Sources of AMR Information: Respondents obtained AMR information primarily from seminars (24.1%) and training programs (22.1%), followed by print media and social media (11.0% each), radio (9.0%), friends (8.3%), and television (7.6%). Colleagues accounted for only 4.1%, while

other sources made up 2.8%. This highlights the importance of formal educational settings, supplemented by traditional and digital media platforms, in health information dissemination. The relatively low contribution of colleagues suggests limited peer-to-peer knowledge transfer within the value chain.

Understanding of AMR: Results show 40.2% correctly identified AMR as infections that cannot be treated because medicine is not effective, while 32.8% understood it as bacteria developing resistance to antimicrobials. Additionally, 19.0% recognized it as dangerous but couldn't explain it, and 8.0% were unsure. Overall, 73.0% demonstrated basic conceptual understanding of AMR, though nearly one-fifth acknowledged the threat without comprehending the mechanism, and comprehension remained incomplete for a significant minority.

Knowledge of AMR Mechanisms: Findings reveal that 26.1% understood AMR as infections that can't be treated because medicine loses potency, 24.5% correctly identified it as bacteria developing resistance to antimicrobials, and 22.9% associated it with overuse of antimicrobials. Additionally, 16.5% recognized that microorganisms change their response to antimicrobials, while 10.0% acknowledged that resistance traits can be transferred from one organism to another. This indicates varied understanding across different dimensions of AMR, with knowledge gaps particularly evident regarding molecular mechanisms like horizontal gene transfer, which requires more targeted technical training.

Recognition of AMR as a Health Issue: Results show 27.1% correctly identified AMR as affecting animals, plants, and humans, reflecting understanding of the One Health approach. Additionally, 24.4% recognized it as a global threat, while 18.5% believed it could be eradicated. However, concerning misconceptions persist: 17.6% thought AMR is detected in food animals solely by measuring antimicrobial residue in meat samples, and 12.4% believed it occurs only in humans. These misunderstandings could lead to complacency in implementing comprehensive control measures and underscore the need for clearer education on AMR's multifaceted nature.

Practices Contributing to AMR: Respondents identified unnecessary antimicrobial use in humans (27.1%) and overuse in animals (27.1%) as the primary contributors to AMR emergence and spread. Discontinuing treatment once animals or humans show improvement was recognized by 21.5%, while using fertilizer or water containing animal feces with antimicrobial residue accounted for 12.1%. Notably, very few respondents (6.5% for animals, 6.1% for humans) incorrectly associated appropriate antimicrobial use with AMR emergence, suggesting generally good awareness that proper use is protective rather than contributory. This understanding forms a solid foundation for promoting antimicrobial stewardship practices.

Practices for AMR Control and Prevention: Findings indicate that respondents identified good vaccination programs (23.6%), good husbandry practices (21.3%), good farm hygiene (18.9%), and prudent use of antimicrobials (18.6%) as key preventive measures. However, 17.3% incorrectly believed that using antimicrobials as growth promoters could control or prevent AMR,

revealing a significant knowledge gap. This misunderstanding is particularly concerning as growth promoter use is a recognized driver of AMR. Overall, respondents demonstrate understanding that AMR is a health challenge and possess practical knowledge of several preventive measures aligned with One Health principles. However, the misconception about growth promoters and the challenge of translating knowledge into consistent practice remain barriers requiring supportive policies, accessible veterinary services, and economic incentives for farmers.

4.1.3 Effects of Antimicrobials/Antibiotics on the Family

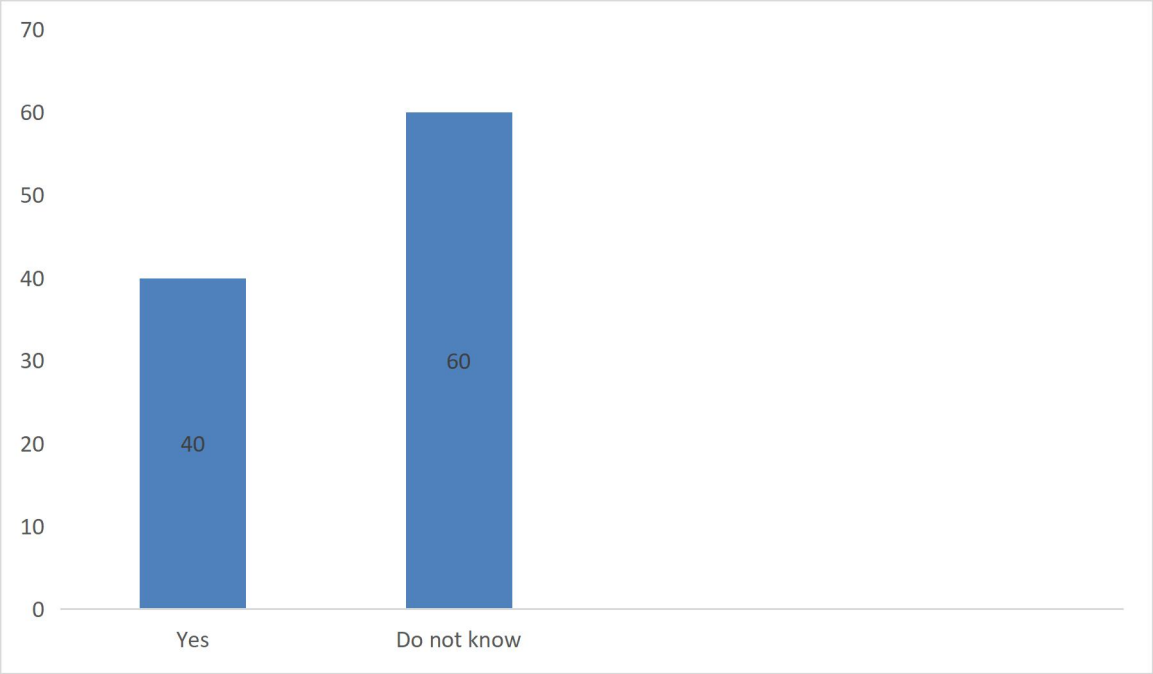

Figure 5: Respondents' Knowledge regarding the effect of Antimicrobial usage on the family

The results in Figure 5 show that 40 respondents indicated that they understood how antimicrobial or antibiotic use could affect their families, while 60 respondents stated that they did not know.

These findings suggest that although a portion of respondents are aware of the potential household effects of antimicrobial use—such as treatment failure, resistant infections, and increased health risks—a majority (60%) lack this understanding. This highlights a significant knowledge gap and the need for enhanced community-centered AMR education.

4.1.4 Emergence from meat and meat products

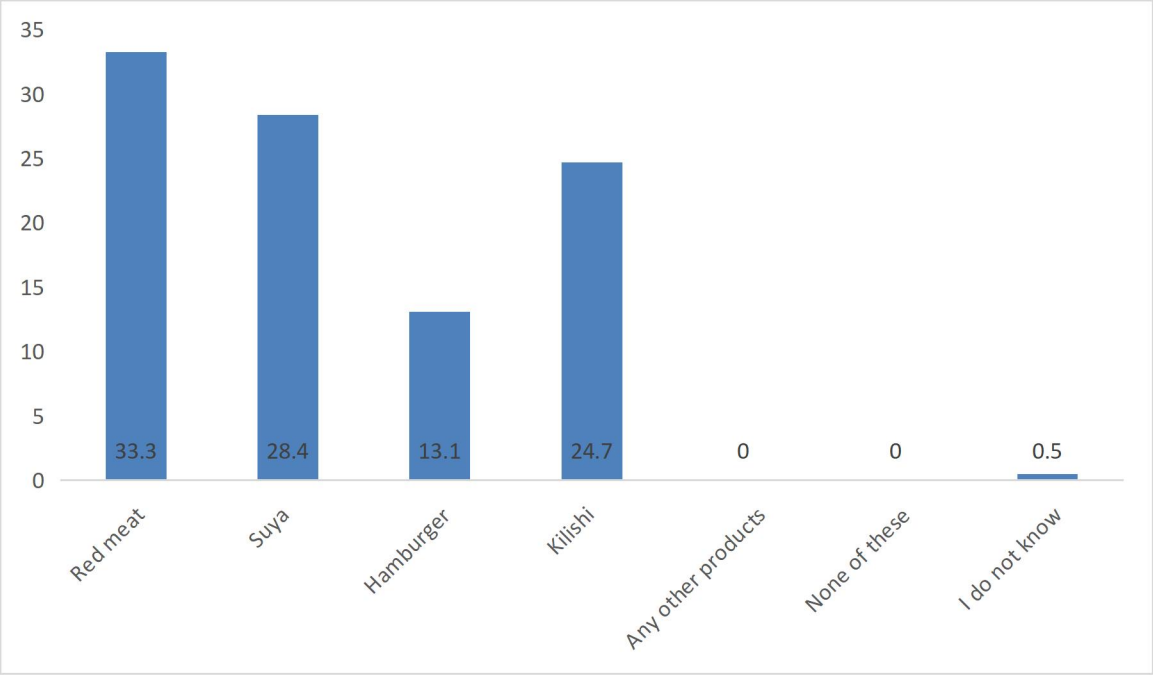

Figure 6: Respondents' knowledge regarding the emergence

Figure 6 shows respondents' views on which meat and meat products could contribute to the emergence of AMR. These results indicate that respondents most frequently identified red meat and suya as possible contributors to AMR, followed by kilishi and hamburger. The very low "none" and "don't know" responses suggest that most participants recognize that meat—

especially processed or street-vended products—can play a role in AMR emergence. This reflects a relatively strong awareness of food-related AMR risks.

4.2 Attitudes to Management and AMR

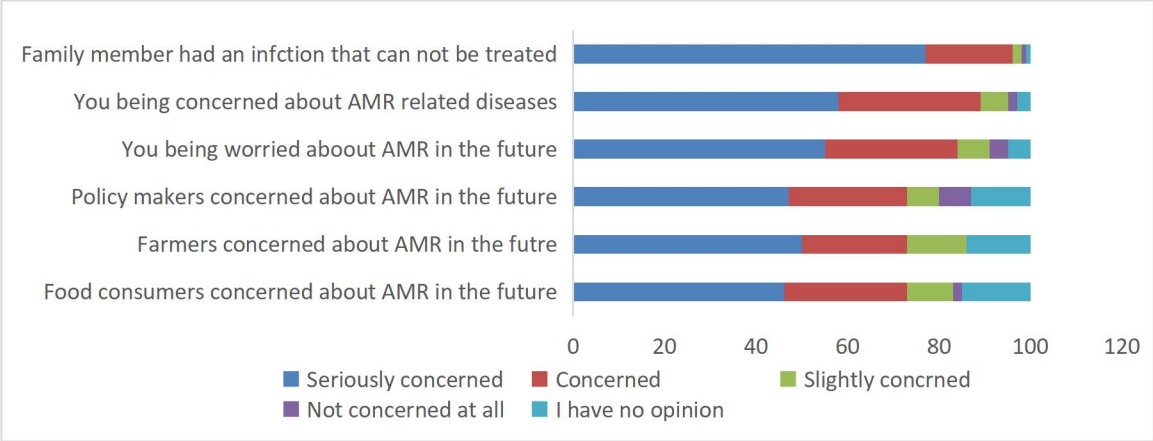

Figure 7: Level of Concern about AMR among Respondents

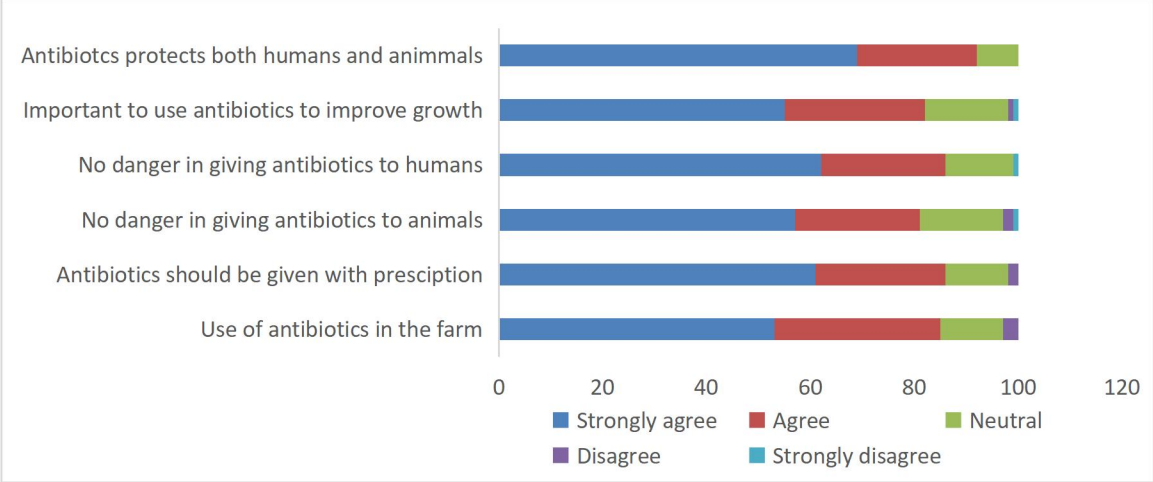

Figure 8: Opinions about Antimicrobial Use among Respondents

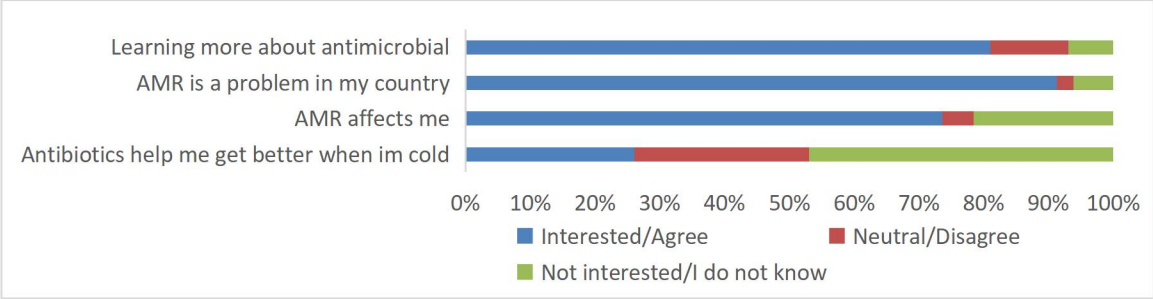

Figure 9: General Attitude toward AMR

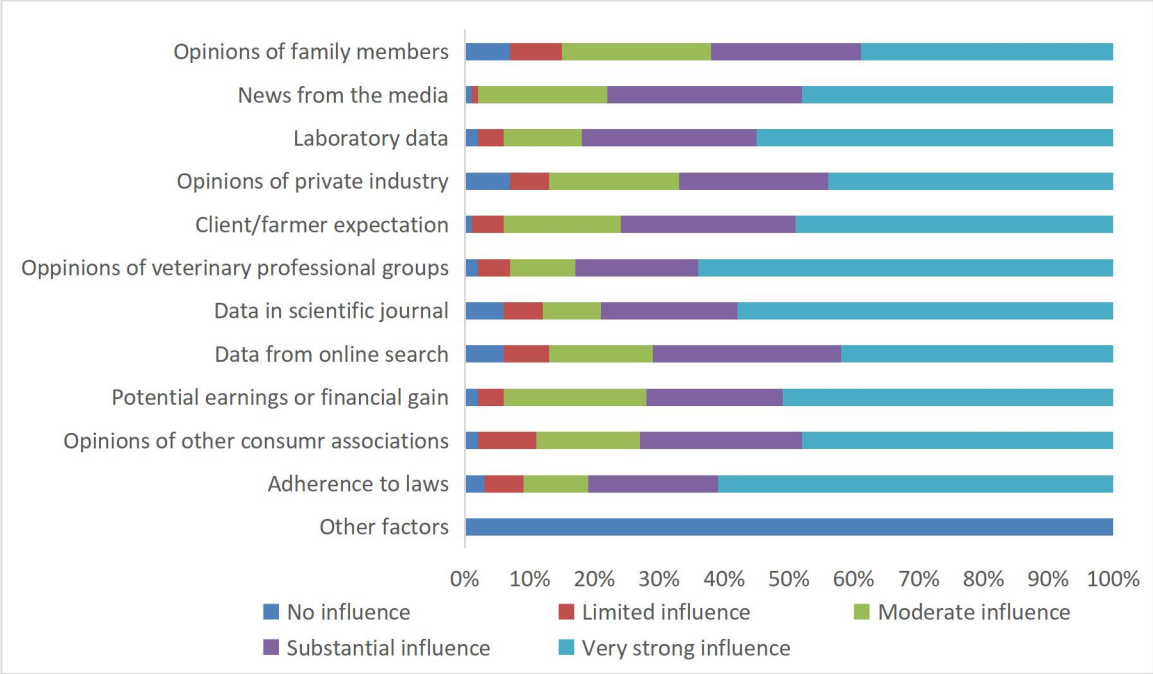

Figure 10: Factors affecting respondents' decision towards AMR

Table 4: Respondents' Level of Concern about AMR

S/N	Statement	Mean	Decision
1	Family member infection cannot be treated	4.70	Positive attitude
2	Self-infection from AMR related diseases	4.40	Positive attitude
3	Concern about AMR issues in the future	4.25	Positive attitude
4	Policy makers concerned about AMR issues	3.87	Positive attitude
5	Farmers concerned about AMR issues	3.95	Positive attitude
6	Consumers concerned about AMR issues	3.87	Positive attitude
Mean cutoff = 3			**Positive attitude**

Table 5: Respondents' Opinions about Antibiotics/ Antimicrobial Use

S/N	Statement	Mean	Decision
1	Antibiotics protect humans and animals	4.61	Positive attitude
2	Use antimicrobials to improve animal growth	4.34	Positive attitude
3	No danger giving antibiotics to humans	4.46	Positive attitude
4	No danger giving antibiotics to animals	4.34	Positive attitude
5	Antibiotics should be given with prescription	4.45	Positive attitude
6	Important to use antibiotics in the farm	4.35	Positive attitude
Mean cutoff = 3			**Positive attitude**

Table 6: Factors that affects respondents' decisions on practices to mitigate AMR

S/N	Statement	Mean	Decision
1	Opinions of family members	3.79	Positive attitude
2	News from media	4.23	Positive attitude
3	Laboratory data	4.29	Positive attitude
4	Opinions of private industry	3.91	Positive attitude
5	Clients /Farmer expectation	4.18	Positive attitude
6	Opinions of veterinary professional groups	4.38	Positive attitude
7	Data in scientific journals	4.19	Positive attitude
8	Data from online search engines	3.94	Positive attitude
9	Potential earnings or financial gain	4.15	Positive attitude
10	Opinions of other consumer association and civil	4.08	Positive attitude
11	society	4.30	Positive attitude
12	Adherence to laws and legislation	1.00	Negative attitude
	Other factors		
Mean cutoff = 3			**Positive attitude**

Table 7: Influencing Factors & General Attitude

S/N	Statement	Mean	Decision
1	Interest in learning more about AMR	2.74	Positive attitude
2	AMR is a problem in your country	2.48	Positive attitude
3	AMR is an issue that could affect me	2.51	Positive attitude
4	Antibiotics makes me better when I'm cold	1.79	Negative attitude
Mean cutoff = 2			**Positive attitude**

Note: The mean cutoff values were used to determine the decisions of each response any mean value greater than the mean cutoff value is termed positive and values lower than the mean cutoff are negative.

Personal Concern About AMR: Respondents expressed very high concern for immediate family threats (mean=4.70) and personal infection (mean=4.40). Concern for future risks was slightly lower (mean=4.25), likely due to psychological distance. All scores confirmed AMR is viewed as a serious personal and familial issue.

Perceptions of Concern Among Different Stakeholders: Respondents perceived moderate concern from policymakers (mean=3.87), farmers (mean=3.95), and consumers (mean=3.87). Scores were lower than personal concern, suggesting perceived inadequate urgency from these groups. Farmers received the highest perceived score, possibly due to direct economic impacts.

Beliefs About Antimicrobial Use: Respondents strongly agreed on antimicrobials' protective value (mean=4.61) and the need for prescriptions (mean=4.45). A contradiction emerged with agreement on using antibiotics for animal growth promotion (mean=4.34). This indicates a significant knowledge gap that could lead to misuse.

Factors Influencing Safe Practices: Veterinary advice (mean=4.38), laws (mean=4.30), and scientific data (mean=4.29) were the strongest influences on safe practices. Financial gain (mean=4.15) and online sources (mean=3.94) had a moderate influence, revealing potential vulnerabilities. The pattern shows a primary reliance on professional, evidence-based guidance.

Interest in Learning More About Antimicrobials: Respondents showed a moderate, positive interest in further AMR education (mean=2.74). This presents both an opportunity and a

challenge for educational initiatives. The modest score may indicate feelings of being informed, competing priorities, or lack of access.

Perceptions About AMR as a Personal Issue: There is strong agreement that AMR is a national (mean=2.48) and personal threat (mean=2.51). However, a key misconception persists that antibiotics help treat colds (mean=1.79). This highlights a critical knowledge gap requiring targeted education on appropriate use.

4.3 Practice/Behavior Towards Antibiotic Usage and Management of Antimicrobial Resistance in the Meat Products Value Chain

4.3.1 Food Sourcing and Purchasing Decisions

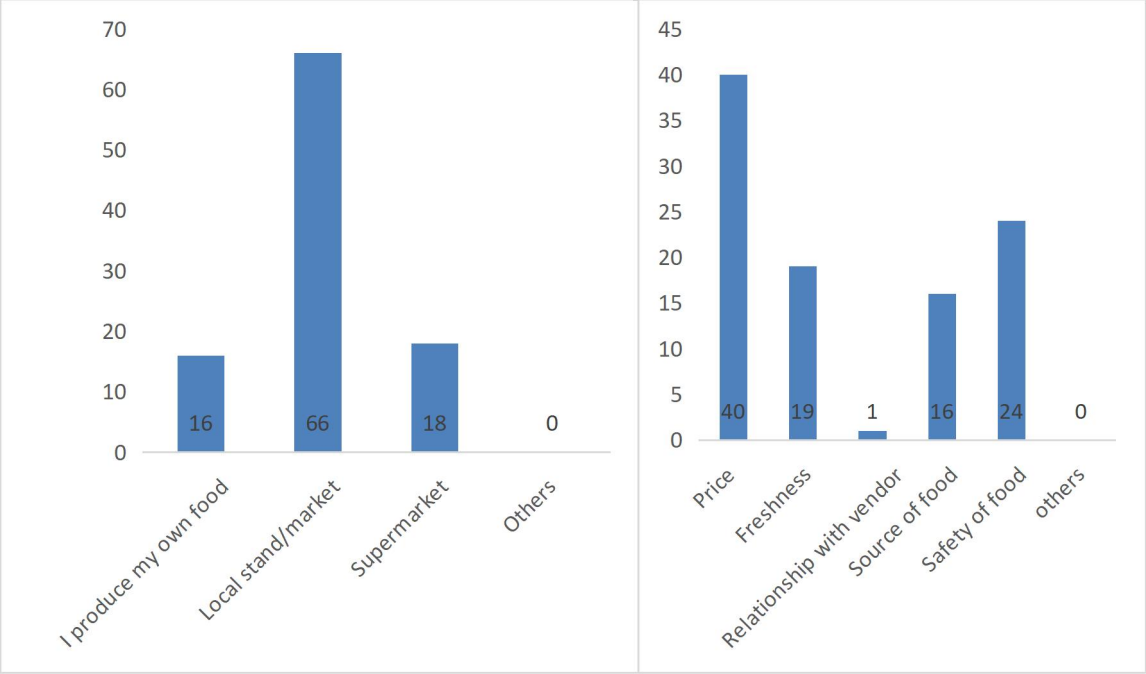

Figure 11: Source of Food of Respondents **Figure 12: Purchasing decision of respondents**

Where Respondents Get Their Food: Results show 66% obtain food from local stand/markets, 18% from supermarkets, 16% produce their own, and 0% from other sources. The predominant reliance on local markets, which often lack veterinary oversight and food safety controls, potentially exposes consumers to products with uncertain antibiotic use histories.

Factors Influencing Food Purchasing Decisions: Findings reveal 40 respondents prioritize freshness, 24 consider safety of food, 19 value price, 16 consider source of food, and 1 values relationship with vendor. No respondents cited other factors. This emphasis on sensory attributes over safety concerns suggests consumers overlook invisible risks like antimicrobial-resistant bacteria and drug residues in meat products.

4.3.2 Level of Concern About Risks Associated with AMR

Table 8: Respondents' Level of Concern About Risks Associated with AMR

Variables	Very Concerned	Fairly Concerned	Not very Concerned	Not at all Concerned	I do not know	Mean	Std. Deviation	Decision
AMR from people taking too many antimicrobials	72	12	7	9	0	4.47	0.969	Seriously Concerned
AMR developed by contact with bacteria in soil/river/seawater	59	23	9	8	1	4.31	1.002	Seriously Concerned
AMR from pets given too many antimicrobials	57	25	15	2	1	4.35	0.880	Seriously Concerned
AMR from contaminants in solid waste and wastewater	60	29	7	2	2	4.43	0.868	Seriously Concerned
AMR from antibiotics used to boost animal growth	64	22	8	2	4	4.40	1.005	Seriously Concerned
AMR from food	72	23	3	1	1	4.64	0.689	Seriously Concerned
AMR from imported food	69	25	4	1	1	4.60	0.711	Seriously Concerned

Cutoff mean=3. Any mean value higher than the cutoff value shows serious concern while those lower show a negligible level of concern.

Table 8 shows respondents expressed the highest concern for AMR originating from food (mean=4.64) and imported food (mean=4.60), viewing consumption as a key exposure pathway.

Serious concern was also shown for human antimicrobial overuse (mean=4.47), environmental contaminants (mean=4.43), and antibiotic use in animals (mean=4.40). All scores substantially exceeded the cutoff of 3.0, with low standard deviations indicating consistent, high agreement. This holistic recognition of multiple transmission pathways demonstrates a sophisticated understanding and suggests readiness for integrated One Health interventions.

4.3.3 Food Preparation Activities that Could Protect Against the Spread of AMR

Table 9: Food Preparation Activities That Could Protect Against the Spread of Antimicrobial Resistance

	Variable	Frequency (n)	Percent (%)
Which of these food preparation activities could protect against the spread of AMR	Preparing food on different chopping boards	82	14.8
	Cooking food thoroughly	96	23.4
	Heating leftovers before eating	71	12.8
	Storing food at 5°C or below	54	9.8
	Following storage instructions on food labels	69	5.9
	Washing hands before preparing food	95	17.7
	Washing/Peeling fruits and vegetables	86	15.6
	None of these	0	0.0
	I do not know	0	0.0
	Total	553	100.0
Under which circumstance do you make use of antibiotics	When animal is sick	92	26.8
	To prevent transmission of disease to healthy animals	76	22.2
	Promotion of growth	23	6.7
	When animals are newly introduced to the farm	50	14.6

	Prevention of weight loss due to transportation stress	30	8.7
	When instructed by a veterinarian	68	19.8
	Others	4	1.2
	Total	**343**	**100.0**

Food Preparation Practices: Thorough cooking and handwashing were the most recognized protective measures. Recognition was notably lower for proper cold storage and following label instructions, indicating a gap in advanced food safety knowledge. However, all respondents identified at least one practice, showing universal awareness of the link between food handling and AMR.

Circumstances for Antibiotic Use in Animals: The most common circumstance was administering antibiotics when animals are sick. However, a significantly lower proportion wait for veterinary instruction, revealing a major lack of professional oversight. Substantial prophylactic use for disease prevention and stress further highlights a pattern of use often detached from formal veterinary guidance.

Overall Implications: Basic food hygiene awareness exists alongside critical gaps in both advanced food safety and proper antibiotic stewardship in animals. A significant disconnect is evident between valuing veterinary prescriptions in theory and rarely seeking them in practice. Addressing this knowledge-practice gap requires improved education, better access to veterinary services, and stronger regulations.

4.3.4 Awareness of Federal and State Laws Regulating the Use of Antibiotics in Nigeria

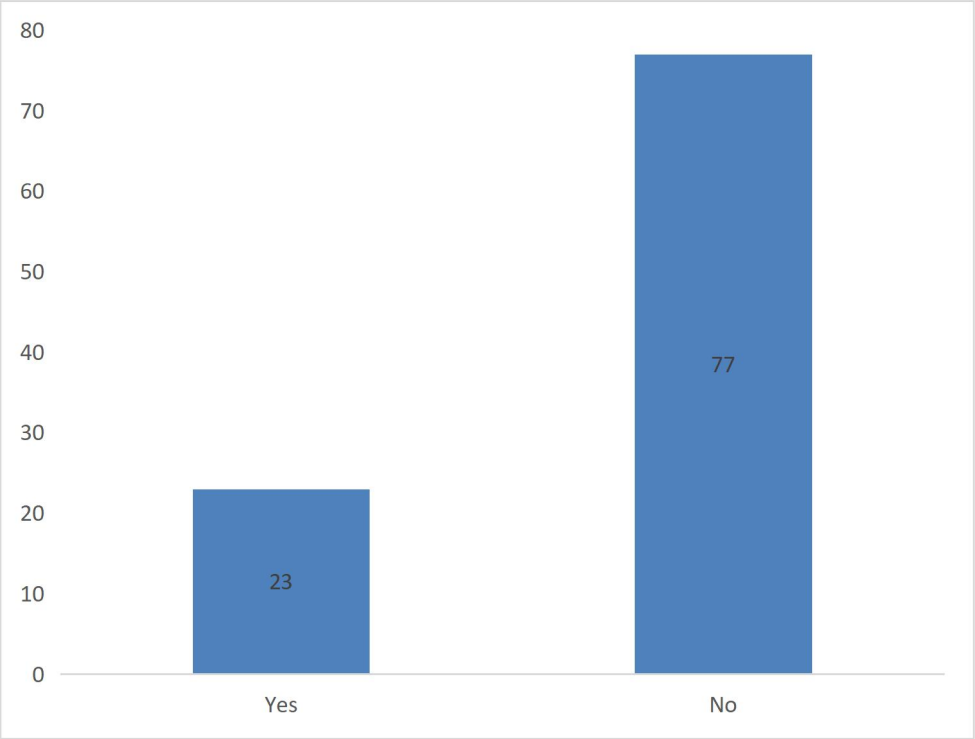

Figure 13: Awareness of Any Federal and State Laws Regulating the Use of Antibiotics in Nigeria

Results show only 23% of respondents were aware of federal and state antibiotic regulations, while 77% were unaware, indicating low overall awareness. This significant gap between policy and stakeholders undermines antimicrobial stewardship efforts, requiring intensified advocacy, simplified communication, strengthened enforcement, and stakeholder engagement.

4.4 Hypothesis Testing

Table 10: Relationship Between Knowledge of Antimicrobial Resistance and Socio-Demographic Characteristics of Stakeholders

Variable		High Knowledge n (%)	Low Knowledge n (%)	χ^2	p-value	Decision
Age (years)	18-24	10 (55.6%)	8 (44.4%)	52.94	<0.001	Significant
	25-34	5 (38.5%)	8 (61.5%)			
	35-44	38 (82.6%)	8 (17.4%)			
	45-54	12 (70.6%)	5 (29.4%)			
	55-64	2 (40.0%)	3 (60.0%)			
	65-74	0 (0.0%)	1 (100.0%)			
Gender	Male	45 (70.3%)	19 (29.7%)	4.35	0.037	Significant
	Female	18 (50.0%)	18 (50.0%)			
Marital Status	Single	19 (55.9%)	15 (44.1%)	8.45	0.076	Not Significant
	Married	42 (67.7%)	20 (32.3%)			
	Divorced	1 (100.0%)	0 (0.0%)			
	Widowed	1 (50.0%)	1 (50.0%)			
	Separated	0 (0.0%)	1 (100.0%)			
Educational Level	Did not go to School	0 (0.0%)	1(100%)			
	Some schooling but did not finish primary school	2 (100.0%)	0 (0.0%)			
	Primary School	7 (87.5%)	1 (12.5%)			
	Secondary School	25 (80.6%)	6 (19.4%)	154.6	<0.001	Highly significant
	Polytechnic	14 (66.7%)	7 (33.3%)			
	Undergraduate studies	12 (42.9%)	16 (57.1%)			

Variable		High Knowledge n (%)	Low Knowledge n (%)	χ^2	p-value	Decision
	Post Graduate Studies	4 (57.1%)	3 (42.9%)			
	PhD Studies	2 (100.0%)	0 (0.0%)			
Occupation	Livestock Farmer	16 (59.3%)	11 (40.7%)	33.5	<0.001	Highly Significant
	Veterinarian	13 (81.3%)	3 (18.8%)			
	Others	34 (59.6%)	23 (40.4%)			
Monthly Income (₦)	Did not specify	1 (33.3%)	2 (66.7%)	12.56	0.014	Significant
	Less than 50,000	7 (46.7%)	8 (53.3%)			
	50,001-100,000	12 (50.0%)	12 (50.0%)			
	100,001-200,000	31 (72.1%)	12 (27.9%)			
	200,001-300,000	12 (80.0%)	3 (20.0%)			
Work Experience (years)	Less than 1 year	3 (42.9%)	4 (57.1%)	13.98	0.016	Significant
	1-2 years	5 (38.5%)	8 (61.5%)			
	2-5 years	15 (65.2%)	8 (34.8%)			
	5-10 years	20 (80.0%)	5 (20.0%)			
	10-15 years	16 (72.7%)	6 (27.3%)			
	Over 15 years	8 (80.0%)	2 (20.0%)			
Veterinary Association Membership	Yes	13 (81.3%)	3 (18.8%)	4.89	0.027	Significant
	No	50 (59.5%)	34 (40.5%)			

Table 11: Relationship Between Attitudes Toward Antimicrobial Use and Socio-Demographic Characteristics

Variable		Positive Attitude n (%)	Negative Attitude n (%)	χ^2	p-value	Decision
Age (years)	18-24	16 (88.9%)	2 (11.1%)	13.04	0.023	Significant
	25-34	8 (61.5%)	5 (38.5%)			
	35-44	45 (97.8%)	1 (2.2%)			
	45-54	17 (100.0%)	0 (0.0%)			
	55-64	5 (100.0%)	0 (0.0%)			
	65-74	1 (100.0%)	0 (0.0%)			
Gender	Male	59 (92.2%)	5 (7.8%)	0.43	0.510	Not Significant
	Female	31 (86.1%)	5 (13.9%)			
Marital Status	Single	29 (85.3%)	5 (14.7%)	6.21	0.184	Not Significant
	Married	59 (95.2%)	3 (4.8%)			
	Divorced	1 (100.0%)	0 (0.0%)			
	Widowed	2 (100.0%)	0 (0.0%)			
	Separated	1 (100.0%)	0 (0.0%)			
Educational Level	Did not go to school	1 (100.0%)	0 (0.0%)	53.82	<0.001	Highly Significant
	Some schooling but did not finish primary school	2 (100.0%)	0 (0.0%)			
	Primary school	8 (100.0%)	0 (0.0%)			
	Secondary School	30 (96.8%)	1 (3.2%)			
	Certificate/Polytechnic	20 (95.2%)	1 (4.8%)			
	Undergraduate studies	22 (78.6%)	6 (21.4%)			
	Post Graduate Studies	6 (85.7%)	1 (14.3%)			
	PhD studies	1 (50.0%)	1 (50.0%)			
Occupation	Livestock Farmer	25 (92.6%)	2 (7.4%)	11.33	0.003	Significant

Variable		Positive Attitude n (%)	Negative Attitude n (%)	χ^2	p-value	Decision
	Veterinarian	15 (93.8%)	1 (6.3%)			
	Others	50 (87.7%)	7 (12.3%)			
Monthly Income (₦)	Did not specify	2 (66.7%)	1 (33.3%)	8.92	0.063	Not Significant
	Less than 50,000	12 (80.0%)	3 (20.0%)			
	50,001-100,000	21 (87.5%)	3 (12.5%)			
	100,001-200,000	41 (95.3%)	2 (4.7%)			
	200,001-300,000	14 (93.3%)	1 (6.7%)			
Work Experience (years)	Less than 1 year	5 (71.4%)	2 (28.6%)	16.74	0.005	Significant
	1-2 years	9 (69.2%)	4 (30.8%)			
	2-5 years	21 (91.3%)	2 (8.7%)			
	5-10 years	25 (100.0%)	0 (0.0%)			
	10-15 years	20 (90.9%)	2 (9.1%)			
	Over 15 years	10 (100.0%)	0 (0.0%)			
Veterinary Association Membership	Yes	15 (93.8%)	1 (6.3%)	0.53	0.465	Not Significant
	No	75 (89.3%)	9 (10.7%)			

Table 12: Relationship Between Practices Regarding Antimicrobial Use and Socio-Demographic Characteristics

Variable		Good Practice n (%)	Poor Practice n (%)	χ^2	p-value	Decision
Age (years)	18-24	11 (61.1%)	7 (38.9%)	18.45	0.002	Significant
	25-34	6 (46.2%)	7 (53.8%)			
	35-44	35 (76.1%)	11 (23.9%)			
	45-54	14 (82.4%)	3 (17.6%)			
	55-64	4 (80.0%)	1 (20.0%)			
	65-74	1 (100.0%)	0 (0.0%)			
Gender	Male	48 (75.0%)	16 (25.0%)	3.92	0.048	Significant
	Female	21 (58.3%)	15 (41.7%)			
Marital Status	Single	20 (58.8%)	14 (41.2%)	7.88	0.096	Not Significant
	Married	47 (75.8%)	15 (24.2%)			
	Divorced	1 (100.0%)	0 (0.0%)			
	Widowed	1 (50.0%)	1 (50.0%)			
	Separated	0 (0.0%)	1 (100.0%)			
Educational Level	Did not go to School	1 (100.0%)	0 (0.0%)	16.89	0.018	Significant
	Some schooling but did not finish primary school	2 (100.0%)	0 (0.0%)			
	Primary School	7 (87.5%)	1 (12.5%)			
	Secondary School	24 (77.4%)	7 (22.6%)			
	Certificate/Polytechnic	16 (76.2%)	5 (23.8%)			
	Undergraduate studies	15 (53.6%)	13 (46.4%)			
	Post Graduate Studies	4 (57.1%)	3 (42.9%)			
	PhD studies	0 (0.0%)	2 (100.0%)			
Occupation	Livestock Farmer	17 (63.0%)	10 (37.0%)	4.21	0.122	Not Significant
	Veterinarian	14 (87.5%)	2 (12.5%)			

Variable		Good Practice n (%)	Poor Practice n (%)	χ^2	p-value	Decision
	Others	38 (66.7%)	19 (33.3%)			
Monthly Income (₦)	Did not specify	1 (33.3%)	2 (66.7%)	10.34	0.035	Significant
	Less than 50,000	8 (53.3%)	7 (46.7%)			
	50,001-100,000	15 (62.5%)	9 (37.5%)			
	100,001-200,000	33 (76.7%)	10 (23.3%)			
	200,001-300,000	12 (80.0%)	3 (20.0%)			
Work Experience (years)	Less than 1 year	3 (42.9%)	4 (57.1%)	12.67	0.027	Significant
	1-2 years	6 (46.2%)	7 (53.8%)			
	2-5 years	16 (69.6%)	7 (30.4%)			
	5-10 years	20 (80.0%)	5 (20.0%)			
	10-15 years	17 (77.3%)	5 (22.7%)			
	Over 15 years	7 (70.0%)	3 (30.0%)			
Veterinary Association Membership	Yes	14 (87.5%)	2 (12.5%)	4.56	0.033	Significant
	No	55 (65.5%)	29 (34.5%)			
Awareness of Regulations	Yes	22 (84.6%)	4 (15.4%)	6.78	0.009	Significant
	No	47 (63.5%)	27 (36.5%)			

Table 13: Relationship Between Knowledge, Attitude, and Practice Regarding Antimicrobial Resistance

Variables		Good Practice n (%)	Poor Practice n (%)	χ^2	p-value	Decision
Knowledge Level	High Knowledge	53 (84.1%)	10 (15.9%)	24.56	0.000	Significant
	Low Knowledge	16 (43.2%)	21 (56.8%)			
Attitude	Positive Attitude	67 (74.4%)	23 (25.6%)	9.87	0.002	Significant
	Negative Attitude	2 (20.0%)	8 (80.0%)			
Knowledge and Attitude Combined	High Knowledge + Positive Attitude	51 (87.9%)	7 (12.1%)	31.45	0.000	Significant
	High Knowledge + Negative Attitude	2 (40.0%)	3 (60.0%)			
	Low Knowledge + Positive Attitude	16 (50.0%)	16 (50.0%)			
	Low Knowledge + Negative Attitude	0 (0.0%)	5 (100.0%)			

Table 14: Relationship Between Awareness of AMR and Practice

Variables		Good Practice n (%)	Poor Practice n (%)	χ^2	p-value	Decision
Heard of AMR	Yes	50 (82.0%)	11 (18.0%)	18.92	0.000	Significant
	No	19 (48.7%)	20 (51.3%)			
Can Describe Effect on Family	Yes	56 (75.7%)	18 (24.3%)	8.45	0.004	Significant
	No	13 (50.0%)	13 (50.0%)			
Source of Food	Own Production	7 (87.5%)	1 (12.5%)	9.67	0.022	Significant
	Local Stand Market	44 (64.7%)	24 (35.3%)			
	Supermarket	17 (81.0%)	4 (19.0%)			
	Others	1 (33.3%)	2 (66.7%)			

Interpretation of Results:

Table 10: Knowledge and Socio-Demographic Characteristics. Significant predictors of AMR knowledge included age (χ^2=52.94, p<0.001), with highest knowledge in the 35–44 group (82.6%), gender (χ^2=4.35, p=0.037), favouring males (70.3%), education (χ^2=154.6, p<0.001), occupation (χ^2=33.5, p<0.001), with veterinarians scoring highest (81.3%), monthly income (χ^2=12.56, p=0.014), work experience (χ^2=13.98, p=0.016), and veterinary association membership (χ^2=4.89, p=0.027). Marital status was not significant (χ^2=8.45, p=0.076).

Table 11: Attitude and Socio-Demographic Characteristics. The analysis of attitudes toward antimicrobial use identified several significant socio-demographic associations. Age (χ^2=13.04, p=0.023) and work experience (χ^2=16.74, p=0.005) were significant, with the 5–10 year and >15

year experience groups showing 100% positive attitudes. Educational level (χ^2=53.82, p<0.001) and occupation (χ^2=11.33, p=0.003) were also significant. Gender (χ^2=0.43, p=0.510), marital status (χ^2=6.21, p=0.184), monthly income (χ^2=8.92, p=0.063), and veterinary association membership (χ^2=0.53, p=0.465) were not significant.

Table 12: Practice and Socio-Demographic Characteristics Several variables showed significant associations with antimicrobial use practices. Age (χ^2=18.45, p=0.002), gender (χ^2=3.92, p=0.048), educational level (χ^2=16.89, p=0.018), monthly income (χ^2=10.34, p=0.035), work experience (χ^2=12.67, p=0.027), veterinary association membership (χ^2=4.56, p=0.033), and awareness of regulations (χ^2=6.78, p=0.009) all demonstrated significant relationships with practices. Marital status (p=0.096) and occupation (p=0.122) were not significantly associated with practices.

Table 13: Relationship Between Knowledge, Attitude, and Practice Highly significant relationships were found between knowledge and practice (χ^2=24.56, p<0.001), with 84.1% of those with high knowledge demonstrating good practices compared to only 43.2% of those with low knowledge. Attitude was also significantly related to practice (χ^2=9.87, p=0.002), with 74.4% of those with positive attitudes showing good practices versus only 20.0% of those with negative attitudes. The combined effect of knowledge and attitude showed the strongest association with practice (χ^2=31.45, p<0.001), with 87.9% of respondents having both high knowledge and positive attitudes demonstrating good practices.

Table 14: Awareness and Practice Awareness of AMR showed a significant relationship with practices (χ^2=18.92, p<0.001), with 82.0% of those who had heard of AMR demonstrating good practices compared to 48.7% of those who had not. Ability to describe effects on family (χ^2=8.45, p=0.004) and source of food (χ^2=9.67, p=0.022) were also significantly associated with practices, indicating that personal awareness of AMR consequences and food sourcing patterns influence antimicrobial-related behaviors.

CHAPTER FIVE

5.0 DISCUSSION

5.1 Socio-Economic Characteristics of Respondents

The socio-economic profile indicates that 64% of participants were male while 36% were female, demonstrating male predominance in Edo State's livestock. This gender imbalance mirrors wider agricultural value chain trends throughout Nigeria, where males predominantly control commercial livestock enterprises while females mainly participate in small-scale backyard poultry operations (Fuller et al., 2022; Caudell et al., 2020). Nevertheless, female participation differs based on livestock enterprise categories, cultural contexts, and resource availability, as evidenced by considerable female involvement in specific segments across Africa (Hughes et al., 2024; Caudell et al., 2020).

The majority of participants belonged to middle-aged groups of 35-44 years (46%) and 45-54 years (17%). This age structure reflects an experienced workforce with considerable life exposure, although the representation of younger participants (31% aged 18-34 years) shows some youth involvement in livestock enterprises. Youth are deterred from agriculture due to its negative association with poverty and manual labor. Simultaneously, limited access to land and financing creates significant structural barriers to entering the livestock value chain (Igbinosa et al., 2023).

Marital status revealed 62% married, 34% single, 2% widowed, 1% divorced, and 1% separated, indicating diverse household configurations with the majority bearing family obligations that may encourage continuous participation in livestock operations for livelihood stability. Religious identification showed 83% Christians, 11% Muslims, and 6% following African Traditional Religion, mirroring Edo State's population structure and potentially shaping work attitudes and community collaboration (Islam et al., 2024).

Educational achievement varied substantially, with 31% possessing certificate/polytechnic credentials, 28% finishing primary education, 21% finishing secondary education, 8% possessing undergraduate qualifications, and 2% holding postgraduate education. A minor segment held PhD studies (1%), 7% had partial primary education, and 2% lacked formal schooling. Varied education levels significantly impact AMR understanding, with higher education consistently linked to better knowledge and more responsible practices. (χ^2=21.21, p=0.007) (Elbehiry & Marzouk, 2025).

Professionally, 27% were livestock producers, 16% veterinarians, and 57% involved in alternative professions including meat retailers, butchers, processors, and market vendors. This profile emphasizes varied participants beyond primary producers, each possessing unique knowledge requirements and AMR management possibilities. The veterinarian representation (16%) suggests reasonable professional inclusion in the sample, though veterinary association

participation remained minimal at merely 16%, indicating potential deficiencies in professional networking and stewardship assistance mechanisms (Founou et al., 2021).

The study found most respondents earned moderate incomes, with 43% in the ₦100,001–200,000 monthly bracket. Income level was significantly correlated with both better AMR knowledge and more responsible practices. Lower income drives reliance on cheaper, unregulated antimicrobials, limiting access to veterinary care and quality resources (Beshiru et al., 2024; Jesumirhewe et al., 2022).

Work experience revealed 25% with 5-10 years, 10% with beyond 15 years, and 7% with under 1 year, demonstrating considerable practical expertise throughout the sample. Nevertheless, experience might maintain obsolete behaviors absent ongoing education (Food and Agriculture Organization, 2024, 2021).

Credit sources showed substantial dependence on personal resources (75%), with 14% securing credit from relatives, 6% from cooperatives, 3% from financial institutions, and 2% from private lenders, demonstrating severely restricted formal financial accessibility. This limits investment in enhanced animal health administration, with producers depending on informal credit more inclined to acquire less expensive, unregulated antimicrobials (Heuer et al., 2022).

Land procurement revealed 48% leasing their property, 33% utilizing personal property, 18% utilizing family property, and merely 1% acquiring property from government sources. The

predominance of rented land signals a shift toward commercialization, where securing land tenure is crucial for enabling the long-term investments in biosecurity that reduce antimicrobial use (Hardefeldt & Thursky, 2024; Caekebeke et al., 2020).

Merely 16% participated in veterinary organizations, while 84% lacked professional connection, indicating severely restricted networking and diminished contact with antimicrobial stewardship recommendations (Berman et al., 2023; Aslam et al., 2021).

5.2 Knowledge of Antimicrobial Resistance

Participants exhibited reasonable understanding across three measures: 55% accurately described antimicrobials, 59% understood antibiotics, and 32% recognized the relationship between them. This reveals a critical gap where practical familiarity with drug names does not translate to conceptual understanding of AMR, which is essential for stewardship.

The 55% accurately characterizing antimicrobials demonstrates considerable consciousness, though almost half the population lack precision on this essential concept. The 59% accurately characterizing antibiotics indicates moderate recognition through extensive application in human and veterinary medicine. Antibiotics are widely accessible in veterinary outlets and consistently addressed in extension initiatives, rendering them more identifiable than wider antimicrobial classifications (Alhasan et al., 2024).

Concerning the connection between antibiotics and antimicrobials, 32% accurately identified antibiotics as an antimicrobial subdivision. This demonstrates a low conceptual precision, having 68% remain unclear about differences. This uncertainty holds practical consequences, potentially causing unsuitable drug choices or inability to identify non-antibiotic antimicrobials as contributing to resistance.

5.2.1 Knowledge Score

Knowledge scores varied widely: 16% scored 0, while 31% achieved the maximum (7-8). A further 44% attained moderate scores (3-5). The concentration of scores in lower to moderate ranges highlights a difficulty in converting general AMR awareness into specific technical knowledge. This widespread understanding-practice gap is frequently observed in developing nations. Here, high AMR consciousness coexists with inadequate technical understanding and suboptimal behaviors. This is attributed to restricted access to formal education and economic pressures that prioritize immediate productivity over long-term stewardship (Hughes et al., 2024).

Recognition of antimicrobial classes varied significantly, with penicillins most identified (37.90%), followed by aminoglycosides (17.56%) and tetracyclines (14.63%). Recognition was lower for cephalosporins (6.83%), nitroimidazole (4.39%), and fluoroquinolones (3.40%). Specialized classes like carbapenems were seldom named (each under 1%), showing familiarity with older antibiotics but not newer ones.

In contrast, the 11% scoring 6-8 exhibited robust understanding, probably reflecting formal veterinary instruction or involvement in AMR initiatives. This subgroup constitutes potential advocates for knowledge dissemination within communities (Islam et al., 2024; Founou et al., 2021).

5.2.2 Use of Antimicrobials/Antibiotics in Humans and Animals

The observation that 89% accurately acknowledged that not all antimicrobials utilized in humans are similarly utilized in animals and reciprocally demonstrates adequate consciousness of species-particular antimicrobial regulation. Comprehending species-particular limitations is essential to preventing unsuitable cross-species medication utilization, which can produce treatment failures, toxicity, and expedited AMR progression (Caudell et al., 2020).

Nevertheless, the 11% incorrectly accepting antimicrobials are exchangeable between humans and animals constitutes a worrying minority whose behaviors may present substantial hazards. Such cross-species utilization is problematic because dosing and safety characteristics differ between species, certain antimicrobials are reserved solely for human utilization owing to their critical significance, and utilizing antimicrobials beyond authorized indications may contravene withdrawal period regulations and present food safety hazards (Jesumirhewe et al., 2022).

5.2.3 Awareness of Antimicrobial Resistance

The observation that 61% of participants had encountered antimicrobial resistance while 39% had not constitutes moderate consciousness among meat value chain participants in Edo State. This level demonstrates that AMR consciousness initiatives have accomplished some achievement but considerable deficiencies persist, with nearly two-fifths of participants still unfamiliar with this critical health danger.

While moderate consciousness is promising compared to complete unawareness, it remains inadequate of the near-universal identification required for comprehensive AMR management. The "consciousness-action deficiency" constitutes a major obstacle globally, with numerous individuals having encountered AMR but lacking comprehensive comprehension of its origins, outcomes, or prevention (Founou et al., 2021; Islam et al., 2024).

5.2.4 Detailed Knowledge of Antimicrobial Resistance

Seminars (24.1%) and training (22.1%) were primary AMR information sources, followed by print/social media (11.0% each), radio (9.0%), acquaintances (8.3%), television (7.6%), and colleagues (4.1%). This underscores formal education's importance but also a reliance on media. The low colleague contribution indicates limited peer-to-peer knowledge sharing within the sector. The notable role of social media (11.0%) reflects digital adoption in agriculture, offering

both a trusted channel for peer education and a risk for spreading misinformation (Berman et al., 2023; Aslam et al., 2021).

Comprehension of AMR revealed 40.2% accurately identified it as infections that cannot be managed because medicine is ineffective, while 32.8% comprehended it as bacteria establishing resistance to antimicrobials. Furthermore, 19.0% identified it as hazardous but couldn't clarify it, and 8.0% were uncertain. Combined, approximately 73% exhibited basic conceptual comprehension of AMR, though nearly one-fifth recognized the danger without grasping the process, and comprehension remained incomplete for a substantial minority.

Understanding of AMR mechanisms was varied: 26.1% saw it as unmanageable infections due to diminished medicine potency, 24.5% accurately identified it as bacterial resistance, and 22.9% linked it to excessive antimicrobial use. Furthermore, 16.5% knew microorganisms modify their response, while only 10.0% recognized the transmission of resistance traits between organisms. This reveals a significant comprehension gap regarding molecular mechanisms like horizontal gene transfer. Understanding this process is crucial as it explains the rapid spread of resistance, informing critical behaviors such as hygiene and waste management. (Elbehiry & Marzouk, 2025; Heuer et al., 2022).

Identification of AMR as a health concern showed 27.1% accurately understood its One Health scope (animals, plants, humans), and 24.4% recognized it as a global danger. However, significant misconceptions persisted: 18.5% believed AMR can be eliminated, 17.6% thought it

is detected only via antimicrobial residues in meat, and 12.4% believed it occurs only in humans. These misperceptions risk fostering complacency and highlight the need for clearer education on AMR's complex nature. (Igbinosa et al., 2023).

Respondents identified unnecessary antimicrobial use in humans and animals (27.1% each) as primary drivers of AMR, followed by stopping treatment early (21.5%) and environmental contamination (12.1%). Very few (6.5% for animals, 6.1% for humans) incorrectly linked proper antimicrobial use to AMR emergence. This indicates a solid foundational awareness that correct use is protective, providing a basis for advancing stewardship behaviors.

Respondents identified key preventive measures: appropriate vaccination (23.6%), husbandry (21.3%), farm hygiene (18.9%), and judicious antimicrobial use (18.6%). However, a significant knowledge gap was shown as 17.3% incorrectly believed using antimicrobials as growth enhancers could manage AMR. This misconception is especially dangerous as it actively drives resistance. While practical understanding of interventions exists, translating this into consistent behavior remains a key obstacle, requiring supportive policies and incentives (Food and Agriculture Organization, 2024; Hardefeldt & Thursky, 2024; Caekebeke et al., 2020).

5.3 Effects of Antimicrobials/Antibiotics on the Family

While 60% could not characterize how antimicrobial use affects their families, 40% could, indicating a significant portion perceive AMR's personal relevance. This personalization is

crucial, as perceived vulnerability drives behavior change, supported by the strong correlation (χ^2=8.45, p=0.004) between understanding household impacts and adopting responsible antimicrobial behaviors.(Beshiru et al., 2024; Jesumirhewe et al., 2022).

Participants who understood AMR's household impacts identified concrete risks like treatment failure, prolonged illness, and higher medical costs. This reflects a growing awareness that AMR is a tangible threat to family health and economic stability, not just an abstract concept.

Nevertheless, the 60% who could not characterize family impacts constitutes a substantial majority whose absence of perceived personal significance may restrict motivation to embrace more responsible antimicrobial behaviors. This psychological separation has been recorded as a major obstacle to AMR-related behavior modification globally (Alhasan et al., 2024).

Households are critical hubs for both the transmission and management of AMR from a One Health perspective. Resistant bacteria spread through routes like contaminated food, contact with animals, person-to-person contact, and improper waste disposal. (Fuller et al., 2022; Caudell et al., 2020).

5.4 Perception of Foods as Possible Sources of Antimicrobial Resistance

The data shows red meat (33.3%) and suya (28.4%) were most frequently identified as potential AMR sources, followed by kilishi (24.7%) and hamburger (13.1%). No respondents selected

"none of these" or "I do not know" (0% each), demonstrating near-universal awareness that these meat products can act as vehicles for antimicrobial resistance.

The prominence of red meat and traditional processed commodities like suya and kilishi in participants' perceptions is adequately supported by scientific evidence. Meat and meat commodities have been identified globally as significant vehicles for transmitting antimicrobial-resistant bacteria from food animals to humans. Contamination can manifest at multiple value chain locations including during slaughter and processing when resistant bacteria in animals' intestinal tracts contaminate carcasses, through unsuitable handling and storage permitting resistant bacteria proliferation, and via inadequate cooking failing to eliminate viable pathogens (Hughes et al., 2024).

Nigerian investigations have recorded worrying levels of antimicrobial-resistant bacteria in retail meat. Igbinosa et al. (2023) identified methicillin-resistant Staphylococcus aureus in 34% of retail poultry specimens from Edo State with elevated resistance rates to frequently utilized antibiotics, while Jesumirhewe et al. (2022, 2020) discovered multidrug-resistant Enterobacteriaceae in beef specimens from Edo State markets. These observations validate that meat marketed in Edo State markets does indeed transport resistant organisms, confirming participants' perceptions.

The particular concern about suya and kilishi mirrors practical observation of preparation and handling circumstances. Suya is characteristically prepared in informal environments with

restricted hygiene controls where vendors frequently handle raw and cooked meat without modifying gloves, meat may be exhibited at ambient temperatures for extended periods, and preparation surfaces may not be sufficiently cleaned between utilizations. These circumstances establish multiple possibilities for contamination and bacterial proliferation.

5.5 Attitudes to Management and Control of Antimicrobial Resistance

Personal concern about AMR was very high, with mean scores for family member infection (4.70), self-infection (4.40), and future concerns (4.25) all exceeding the 3.0 cutoff. In contrast, perceived concern among other stakeholders was moderate, with means for policymakers, producers, and consumers all at 3.87-3.95. This indicates a disparity between individuals' personal urgency and their perception of broader stakeholder engagement.

The significant gap between high personal concern (e.g., family infection mean=4.70) and lower perceived stakeholder concern (policymaker mean=3.87) likely stems from participants' direct experiences with animal health and treatment failures. The lower perceived institutional concern reflects views of inadequate government action and weak enforcement. This aligns with the finding that only 26% were aware of antimicrobial regulations, highlighting a perceived lack of institutional support.

Participants strongly agreed antimicrobials protect humans/animals (mean=4.61) and require prescriptions (mean=4.45), recognizing their safe, appropriate use (means 4.34-4.46). However,

the equally strong agreement with using them for animal growth promotion (mean=4.34) is a major concern. This indicates mixed comprehension, where an understanding of their protective value coexists with a significant knowledge gap that directly contradicts AMR prevention.

The robust support for prescription-only antimicrobial accessibility (mean=4.45) constitutes a significant favorable attitude aligning with international stewardship principles. Nevertheless, this declared attitude contrasts with the observation that merely 19.8% of participants actually awaited veterinary instruction before administering antibiotics to animals, indicating a substantial attitude-practice deficiency potentially mirroring social desirability bias or genuine support combined with practical circumvention when confronting obstacles to accessing professional veterinary assistance (Islam et al., 2024; Founou et al., 2021).

Veterinary professionals had the strongest influence on AMR mitigation decisions (mean=4.38), followed by laws (4.30) and laboratory data (4.29). Media news (4.23) and scientific journals (4.19) were also key influences. Financial gain (4.15) and online sources (3.94) held moderate influence, highlighting the valued role of expert guidance for stewardship (Berman et al., 2023; Aslam et al., 2021) alongside vulnerabilities to economic pressure and misinformation.

Interest in learning more about antimicrobials was moderate (mean=2.74), indicating generally favorable but not universal enthusiasm for further education. Participants robustly agreed AMR is a national problem (mean=2.48) and a personal concern (mean=2.51). However, a critical misconception was evident, with respondents incorrectly agreeing that antibiotics assist with

colds (mean=1.79). This misunderstanding about viral infections contributes directly to inappropriate antimicrobial use. Overall, while recognition of AMR's relevance exists, this specific knowledge gap presents a key target for educational interventions.

5.6 Food Sourcing, Purchasing Priorities and Implications for AMR Control

The data shows a strong dependence on informal markets for food sourcing, with 65% obtaining food from local stands or markets, compared to 18% from supermarkets and 16% producing their own.

In purchasing decisions, freshness is the dominant priority (40%), followed by the relationship with the vendor (24%) and price (19%). Food safety (14%) and the source of the food (1%) are much lower priorities. This emphasis on visible attributes like freshness over invisible risks like microbial safety indicates consumers may unintentionally select products carrying resistant bacteria or antimicrobial residues. These patterns highlight a critical gap where informal markets with limited oversight meet consumer priorities that do not emphasize safety, increasing potential AMR exposure (Elbehiry & Marzouk, 2025; Heuer et al., 2022).

5.7 Food Preparation Activities and Antibiotic Use Practices

Thorough cooking (23.4%) and handwashing before preparation (17.2%) were the most frequently identified protective food preparation behaviors against AMR. These were followed by washing/peeling produce (15.6%) and using separate chopping boards (14.8%). Heating

leftovers (12.8%) and following storage instructions (12.5%) received moderate recognition. However, storing food at proper temperatures was identified the least (9.8%). This pattern shows a strong focus on basic hygiene but reveals critical gaps in understanding cross-contamination prevention and, especially, temperature control, which is vital for limiting bacterial growth and resistance gene transfer.

While 26.8% of participants appropriately administered antibiotics only when animals were sick, only 19.8% reported waiting for veterinary instruction beforehand. This reveals a critical gap, suggesting over 80% may be self-prescribing despite expressed support for prescriptions. Prophylactic use was common, with 22.2% using antibiotics to prevent disease in healthy animals, 14.6% administering them to newly introduced animals, and 8.7% doing so to prevent transport-related weight loss. An additional 6.7% reported using antibiotics for growth promotion.

The combined rate of prophylactic antibiotic use (45.5%) far exceeds therapeutic use with veterinary guidance (19.8%), indicating widespread preventive administration without professional oversight. This gap is stark compared to the 26.8% who treat sick animals independently, revealing a major deficit in professional supervision. This likely stems from limited access to veterinary services, cost constraints, or reliance on personal experience.

5.8 Level of Concern About AMR Risks

Respondents exhibited serious concern across all AMR transmission routes, with all mean scores considerably exceeding the cutoff of 3.0. They were most seriously concerned about AMR from food (mean=4.64) and imported food (mean=4.60), identifying the direct exposure route through consumption. They similarly expressed very elevated concern about AMR from human antimicrobial excessive utilization (mean=4.47) and contaminants in solid waste and wastewater (mean=4.43).

Furthermore, participants revealed serious concern about AMR from antibiotics utilized to enhance animal growth (mean=4.40), pets administered excessive antimicrobials (mean=4.35), and contact with environmental bacteria in soil/river/seawater (mean=4.31). The comparatively minimal standard deviations (ranging from 0.689 to 1.005) demonstrated consistent agreement across participants.

This comprehensive identification of multiple AMR transmission routes—human utilization, animal utilization, food commodities, environmental contamination, and even pet antimicrobial utilization—exhibits sophisticated comprehension of AMR as a complex, multi-source danger. The particularly elevated concern about food and imported food aligns with participants' positions in the meat commodities value chain and mirrors consciousness of AMR as both an occupational and consumer hazard. This holistic concern configuration indicates readiness for One Health interventions that address AMR across human, animal, and environmental domains.

5.9 Awareness of Antimicrobial Use Regulations

The observation that merely 23% were conscious of federal and state laws regulating antibiotic utilization constitutes a critical policy execution deficiency. Despite Nigeria's National Action Plan on AMR and regulatory frameworks through NAFDAC and FMARD, these policies remain unknown to most value chain participants responsible for their execution. The substantial connection between regulatory consciousness and behaviors (χ^2=6.78, p=0.009) validates that those conscious of regulations were considerably more inclined to exhibit appropriate antimicrobial stewardship behaviors (Igbinosa et al., 2023).

This minimal consciousness (23%) aligns with observations from alternative Nigerian investigations recording inadequate consciousness of antimicrobial regulations among livestock producers and value chain participants, attributed to restricted dissemination efforts, complex regulatory language, weak enforcement, and inadequate stakeholder engagement (Food and Agriculture Organization, 2024; Hardefeldt & Thursky, 2024; Caekebeke et al., 2020).

The 77% who were unconscious constitutes a critical mass whose behaviors may not align with legal requirements, not owing to deliberate non-compliance but simply because they do not understand what the law necessitates. This undermines regulatory effectiveness and establishes an uneven playing field where compliant participants may confront competitive disadvantages.

Addressing this consciousness deficiency necessitates targeted communication strategies utilizing multiple channels including mass media campaigns in local languages, engagement through professional organizations and cooperatives, instruction of veterinary extension workers as policy communicators, simplified visual materials clarifying principal requirements, and consistent enforcement increasing policy visibility (Hughes et al., 2024).

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

This study assessed the knowledge, attitudes, and practices regarding antimicrobial resistance among stakeholders in the meat products value chain in Edo State, Nigeria. It found a 61% awareness of AMR exists, yet 37% scored very low on drug knowledge, revealing critical gaps. Contradictory attitudes persist, with strong support for prescriptions but high acceptance of growth promoters. Risky practices dominate, including an 80% self-prescription rate for livestock antibiotics. Stakeholders are typically experienced but operate informally, with 75% self-financed and 84% not in veterinary associations. Structural barriers like limited formal credit (3% bank access) and a 74% unawareness of regulations hinder progress. These factors create a major gap between awareness and safe behavior, amplified by gender disparities in knowledge (70.3% males vs 50% females).

While 61% of stakeholders were aware of AMR, knowledge is inconsistent. Core concepts are understood (68-79% correct on definitions, 89% know drugs aren't interchangeable between species). Most (74%) can describe AMR's family impact, showing personalized risk perception. However, critical gaps exist: only 10% understand genetic resistance transfer, and 18.5% incorrectly believe AMR can be eradicated. Practical knowledge is poor, with a mean score of

3.8/8 for naming drugs and 37% scoring 0-2. Information comes mainly from formal sessions (seminars 24.1%, training 22.1%), not peers (4.1%).

Attitude patterns revealed complex dynamics. Personal concern is high (mean for family=4.70, self=4.40, future concerns=4.25), yet belief in antibiotic misuse for colds persists (mean=1.79 against 2.0 cutoff). Positive attitudes include strong support for prescription-only access (mean 4.45) and trust in veterinary advice (mean=4.38). However, acceptance of growth promotion contradicts best practice (mean=4.34). A statistically significant link confirms attitudes drive behavior (χ^2=9.87, p=0.002), highlighting a critical gap between concern and appropriate belief.

Prevailing practices reveal systemic risks in Edo State's meat value chain. Most stakeholders (68%) source from informal markets, prioritizing freshness (61%) over verified safety (12%). Critically, antibiotic use in livestock is characterized by a high self-prescription rate of 80%, with only 19.8% seeking veterinary guidance. Substantial non-therapeutic use continues, including a combined 45.5% for disease prevention and persistent growth promotion (6.7%). These high-risk behaviors are exacerbated by a severe regulatory gap, with 74% of respondents unaware of antimicrobial use regulations.

Statistical hypothesis testing confirmed significant relationships between knowledge and practices (χ^2=24.56, p<0.001), with 84.1% of those with high knowledge demonstrating good practices versus 43.2% with low knowledge. Attitudes significantly influenced practices (χ^2=9.87, p=0.002), with 74.4% of those with positive attitudes showing good practices versus 20.0% with

negative attitudes. Most importantly, combined high knowledge and positive attitudes yielded the strongest association (χ^2=31.45, p<0.001), with 87.9% demonstrating good practices, validating the KAP framework.

Additional significant relationships emerged between practices and age (χ^2=18.45, p=0.002), gender (χ^2=3.92, p=0.048), educational level (χ^2=16.89, p=0.018), monthly income (χ^2=10.34, p=0.035), work experience (χ^2=12.67, p=0.027), veterinary association membership (χ^2=4.56, p=0.033), regulatory awareness (χ^2=6.78, p=0.009), AMR awareness (χ^2=18.92, p<0.001), ability to describe family effects (χ^2=8.45, p=0.004), and food sourcing patterns (χ^2=9.67, p=0.022).

These findings align with previous research from Nigeria and similar developing country contexts (Islam et al., 2024; Founou et al., 2021; Caudell et al., 2020; Amenu et al., 2020) but compare less favorably with patterns from high-income countries where stronger knowledge, attitudes, and practices reflect sustained investments in education, veterinary infrastructure, regulatory enforcement, and economic incentives for stewardship (Hardefeldt & Thursky, 2024; Caekebeke et al., 2020).

These findings align with research from similar contexts but lag behind high-income nations with stronger stewardship systems. While foundational awareness exists, translating this into consistent practice is hindered by critical barriers: significant knowledge gaps, a major attitude-behavior disconnect, and limited access to veterinary services and financing. Furthermore, weak regulatory awareness, informal market structures, and gender disparities compound the challenge.

Effective control therefore requires going beyond awareness to implement multi-faceted interventions. This includes strengthening veterinary access, enforcing regulations, creating economic incentives, and addressing structural inequalities across the value chain.

6.2 Recommendations

Based on study findings, the following recommendations are proposed to strengthen antimicrobial resistance control in Edo State's meat products value chain:

1. Strengthen knowledge through targeted, data-driven education. Given that 16% of respondents could not name any antimicrobial drug and 27% scored in the low-to-moderate knowledge range (0-3), with education level being the strongest predictor of knowledge (χ^2=154.6, $p<0.001$), it is imperative to launch multilingual AMR education campaigns. These must address specific gaps, such as the understanding of resistance mechanisms (known by only 10%) and the critical misconception that antibiotics treat colds. Academic and training institutions should integrate this content into curricula, while professional associations must expand stewardship networks to bridge the current 84% non-membership gap.
2. Cultivate positive attitudes and bridge the attitude-practice gap through personalized risk communication. Although attitudes were generally positive, a critical disconnect with practice was evident exemplified by 80% self-prescription rates despite strong agreement (mean=4.45) that antibiotics require prescriptions. Communication must be personalized

to highlight immediate family impacts (understood by only 40%) and correct dangerous misconceptions, such as the belief that antimicrobials can be used for growth promotion (mean=4.34). Professional associations should leverage their influence to promote ethical standards and transform awareness into behavioral change.

3. Support behavior change by creating enabling environments and strengthening systems. The high self-prescription and low veterinary consultation (19.8%) are facilitated by structural barriers, including limited access to formal credit (only 3% from banks) and low regulatory awareness (77% unaware of laws). Veterinary services must be strengthened by increasing the rural workforce and expanding extension support. Furthermore, regulatory enforcement must be enhanced and coupled with practical incentives to make stewardship a viable choice, addressing the economic realities of stakeholders who primarily rely on informal markets (66%).

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APPENDIX

DEPARTMENT OF ANIMAL SCIENCE
Faculty of Agriculture
University of Benin, Benin City, Edo State, Nigeria

QUESTIONNAIRE

Dear Sir/Madam,

I am an undergraduate student of the above named Department. I am carrying out a research on **THE KNOWLEDGE, ATTITUDE AND PRACTICE REGARDING ANTIMICROBIAL RESISTANCE AND ITS EMERGENCE, SPREAD AND MANAGEMENT IN MEAT PRODUCTS VALUE CHAIN IN EDO STATE.** I solicit your cooperation to kindly answer the questions below as correctly as possible so as to ensure reliable data collection for the study. The research is purely for academic purpose and your responses will be treated as such. Thanks for your anticipated cooperation.

Yours sincerely,

AKORI GIFT ORITSESHAMIAYE

SECTION A: SOCIOECONOMIC CHARACTERISTICS OF RESPONDENTS

Please circle where appropriate or fill the spaces provided with the adequate responses. Note that options with ( ) means a single response while those with [ ] means you can give multiple responses.

1. STATE:_____
2. LGA:_____
3. COMMUNITY: _____
4. Gender (A) Male (B) Female
5. Age (A) 18-24 (B) 25-34 (C) 35 – 44 (D) 45-55 (E) 55-64 (F) 65-74 (G) 75 and above
6. Marital Status (A) Single (B) Married (C) Divorced (D) Widowed (E) Separated
7. Religion (A) Christianity (B) Islam (C) African Traditional Religion (D) Others specify:_____

8. What is your highest education level attained?
   (A) Doctoral/PhD Studies (specialization: _____)
   (B) Post Graduate Studies (specialization: _____)
   (C) Undergraduate/Bachelor (specialization: _____)
   (D) Certificate/Polytechnic/Technical
   (E) Secondary School
   (F) Primary School
   (G) Some schooling but did not finish elementary/primary school
   (H) Did not go to school

9. What do you do for a living? (A) Livestock farmer (B) Veterinarian (C) Others, specify:_____

10. Monthly income: _____

11. How many years of work experience do you have?
   (A) Less than 1 year
   (B) 1 year to 2 years
   (C) 2 years to 5 years
   (D) 5 years to 10 years
   (E) 10 years to 15 years
   (F) Over 15 years

12. What are your sources of credit? (A) Self (B) Family members (C) Friends (D) Cooperative (E) Banks (F) Money lenders (G) Others, specify:_____

13. What are your sources of land ownership? (A) Personal (B) Family (C) Rent (D) Government (E) Community (F) Others, specify:_____

14. Are you a member of any veterinary association? (A) Yes (B) No

SECTION B: KNOWLEDGE OF ANTIMCROBIAL RESISTANCE

15. Can you describe what antimicrobials are? (A) Yes (B) No (C) Do not know

16. If yes, please describe: _____

17. Can you describe what antibiotics are? (A) Yes (B) No (C) Do not know

18. If yes, please describe: _____

19. Do you think there is a difference between antibiotics and antimicrobials? (A) Yes (B) No (C) Do not know

20. Please explain your response: _____

21. Please list up to 8 antimicrobials/antibiotics that you know (generic or brand name).
    (A) _____
    (B) _____
    (C) _____
    (D) _____
    (E) _____
    (F) _____
    (G) _____
    (H) _____

22. All antimicrobials/antibiotics used in humans are also used in animals, and all antimicrobials/antibiotics used in animals are also used in humans. (A) True (B) False (C) Other responses: _____

23. Have you heard of antimicrobial resistance or antibiotic resistance?
    (A) Yes
    (B) No **(Go to Attitude section)**
    (C) If yes, what do you know about it? _____

24. Where did you hear about antimicrobial/antibiotic resistance? (**Select all that apply**)
    (A) From television (**Please specify channel or program**: _____)
    (B) From radio (**Please specify station or program**: _____)
    (C) From print media – newspapers, magazines, etc.
    (D) From my friends
    (E) From my colleagues
    (F) From a seminar or workshop
    (G) Social media such as Facebook, Twitter or Instagram (**Please specify**: _____)
    (H) School or training program
    (I) Others (**Please specify**): _____

25. Select what best describes antimicrobial/antibiotic resistance in the list below. (**Select all that apply**)
    - Antimicrobial/antibiotic resistance is dangerous but I do not know how to describe it
    - When an infection cannot be treated because the medicine is ineffective
    - When bacteria develop resistance to one or more antimicrobial/antibiotic
    - I am not sure or I do not know

26. Which of the following is true regarding the nature of antimicrobial/antibiotic resistance? (**Select all that apply**)
    - Antimicrobial/antibiotic resistance is when infections cannot be treated because medicines lose their potency or effectiveness
    - Antimicrobial/antibiotic resistance is when bacteria develop resistance to antimicrobials such as antibiotics
    - Antimicrobial/antibiotic resistance emergence is accelerated with overuse and misuse of antimicrobials/antibiotics
    - Antimicrobial/antibiotic resistance occurs when microorganisms change in response to the use of antimicrobials/antibiotics
    - Antimicrobial/antibiotic resistance traits (genetic elements) can be transferred from one organism to another

27. Which of the following is true about antimicrobial/antibiotic resistance as a health issue? (**Select all that apply)**
    - It is a health issue concerning animals (terrestrial and aquatic), plants and humans
    - It occurs in human pathogens only
    - It is detected in food animals by determining the amount of antimicrobial/antibiotic residue in meat samples
    - It is a global health threat
    - It can be eradicated

28. Which of the following practices can contribute to the emergence and spread of antimicrobial/antibiotic resistance? (**Select all that apply**)
    (A) Use of antimicrobials/antibiotics in humans when it is not necessary
    (B) Overuse of antimicrobials/antibiotics in animals
    (C) Discontinuing antimicrobial/antibiotic use once the patient (animal or human) shows improvement
    (D) Practicing appropriate use of antimicrobials/antibiotics in animals
    (E) Practicing appropriate use of antimicrobials/antibiotics in humans
    (F) Using fertilizer or water containing animal feces with antimicrobial/antibiotic residues

29. Which of the following practices can help control/prevent the development of antimicrobial/antibiotic resistance? (**Select all that apply**)
    - Good vaccination programs
    - Good husbandry practices
    - Use of antimicrobials/antibiotics as growth promoters
    - Good Farm hygiene, sanitation, biosecurity
    - Prudent use of antimicrobials/antibiotics
    - None of the above

30. Please describe how using antimicrobials/antibiotics could affect you and your family.
    (A) _____
    (B) Do not know/No comment
31. Which, if any, of these foods do you consider to be sources of antimicrobial resistance? ***Please select all you think apply.*** [A] Red Meat [B] Suya [C] Hamburger [D] Kilishi [E] Any other products (please specify) [F] None of these [G] I do not know

SECTION C: ATTITUDE TO MANAGEMENT AND CONTROL OF ANTIMICROBIAL RESISTANCE

32. How would you rate your situation if one of your family members had an infection that cannot be treated with medicines?
    - Seriously concerned
    - Concerned
    - Slightly concerned
    - Not concerned at all
    - I have no opinion

- Are you concerned you will get an antimicrobial/antibiotic resistance related disease?
  (A) Seriously concerned
  (B) Concerned
  (C) Slightly concerned
  (D) Not concerned at all
  (E) I have no opinion

- Are you worried or concerned about antimicrobial/antibiotic resistance issues in the future?
  - Seriously concerned
  - Concerned
  - Slightly concerned
  - Not concerned at all
  - I have no opinion

- Do you think policy makers are worried or concerned about antimicrobial/antibiotic resistance issues in the future?
  - Seriously concerned
  - Concerned
  - Slightly concerned
  - Not concerned at all
  - I have no opinion

- Do you think farmers are worried or concerned about antimicrobial/antibiotic resistance issues in the future?
  (A) Seriously concerned
  (B) Concerned
  (C) Slightly concerned
  (D) Not concerned at all
  (E) I have no opinion

- Do you think food consumers in general are worried or concerned about antimicrobial/antibiotic resistance issues in the future?
  (A) Seriously concerned
  (B) Concerned
  (C) Slightly concerned
  (D) Not concerned at all
  (E) I have no opinion

- Please rate your opinion on the following statements whether you: 1, Strongly agree; 2, Agree; 3, are Neutral; 4, Disagree; or, 5, Strongly disagree:
  (A) Antimicrobials such as antibiotics protect both humans and animals from diseases
  (B) It is appropriate to use antimicrobials/antibiotics to improve growth of animals
  (C) There is no danger in giving antimicrobials/antibiotics to humans if properly used when required
  (D) There is no danger in giving antimicrobials/antibiotics to animals if properly used when required
  (E) Antimicrobials/antibiotics should be given with prescription
  (F) It is important to use antimicrobials/antibiotics in farms

- How would the following factors affect your decision when promoting safe practices to mitigate antimicrobial/antibiotic resistance?

	No influence	**Limited influence**	**Moderate influence**	**Substantial influence**	**Very strong influence**
Opinions of my family members					
News and reports from the media					
Laboratory data					
Opinions of the private industry					
Client/farmer expectations					
Opinions of veterinary professional groups					

	No influence	Limited influence	Moderate influence	Substantial influence	Very strong influence
Data in scientific journals					
Data from online search engines such as Google, Yahoo, Bing					
Potential earnings or financial gain					
Opinions of other consumer associations and civil society					
Adherence to laws and legislation					
Other factors (**Please identify**): _____					

- Please rate your interest in learning more about antimicrobials/antibiotics.
  - Interested (B) Neutral (C) Not interested
- Antibiotic resistance is a problem in your country and worldwide (Agree/Disagree/I do not know)
- Antibiotic resistance is an issue that could affect me or my family (Agree/Disagree/I do not know)
- When I get a cold, antibiotics help me to get better more quickly (Agree/Disagree/ I do not know)

SECTION D: PRACTICE/BEHAVIOR TOWARDS ANTIBIOTIC USAGE/ MANAGEMENT AND CONTROL OF ANTIMICROBIAL RESISTANCE IN MEAT PRODUCTS VALUE CHAIN

- Where do you get/buy the majority of your food? (A) I produce my own food (B) Local stand, market (C) Supermarket (D) Others (**Please specify**): _____
- What is the most important factor when you buy your food? (A) Price (B) Freshness (C) Relationship, trust with your local market vendor (D) Source of food (E) Safety of food (F) Others (**Please specify**): _____
- Antibiotic resistance (which is a type of antimicrobial resistance) is the resistance of bacteria to antibiotics that have previously been effective at treating certain illnesses, therefore, making them harder to treat.

- **Bearing this in mind, how concerned, if at all, are you about each of the following risks? [***1 = Very concerned, 2 = Fairly concerned, 3 = Not very concerned, 4 = Not at all concerned, 5 = I do not know*]

(A) Antimicrobial/Antibiotic resistance from people taking too many antibiotics. [ ]
(B) Antimicrobial resistance developed by contact with bacteria in soil, rivers, and seawater. [ ]
(C) Antimicrobial resistance from pets (for example, dogs, cats etc) being given too many antibiotics. [ ]
(D) Antimicrobial resistance from contaminants in solid waste and wastewater. [ ]
(E) Antimicrobial resistance from antibiotics is used to boost animal growth in intensive farming. [ ]
(F) Antimicrobial resistance from food. [ ]
(G) Antimicrobial resistance from foods imported to West African countries. [ ]

- **Which of these food preparation activities, if any, do you think could protect against the spread of antimicrobial resistance?** *Tick all that apply below.*

(A) Preparing different food types on different surfaces/chopping boards.
(B) Cooking food thoroughly.
(C) Heating leftovers until they are steaming hot before eating them.
(D) Storing food at 5ºC or below.
(E) Following storage instructions on food labels.
(F) Washing hands before starting to prepare or cook food.
(G) Washing or peeling fruit and vegetables.
(H) None of these.
(I) I do not know.

- Under which circumstances do you make use of antibiotics? *Tick all that apply*

[A] When animals are sick [B] Prevention of transmission of diseases to healthy animals [C] Promotion of growth [D] When animals are newly introduced to your farm [E] Prevention of weight losses due to transportation stress [F) When instructed by a veterinarian [G] Others, specify:_____
_____

- Are you aware of any federal and state laws regulating the use of antibiotics in Nigeria? (A) Yes (B) No

- If yes to No. 45 above, please specify:_____