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Assessment of Farmers' Knowledge to Clinical Signs of Poultry Disease, Transmission Routes and their Response to Poultry Diseases in Arba Minch Zuria District, Gamo Zone, South Ethiopia

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Abstract

Smallholder poultry keepers are critical to local pathogen management and biosecurity. A cross-sectional survey from July to November 2023 assessed farmers' knowledge to clinical signs of poultry disease, transmission routes and behavioral responses to diseases in Arba Minch Zuria district, Southern Ethiopia. Data were collected from 100 households selected through multi-stage purposive and simple random sampling. The target sample size was validated using the conservative Arsham (2002) formula ($n = 0.25/d^2$) assuming maximum population variance. Results revealed a profound deficiency in disease literacy; 77% of respondents exhibited low knowledge. Chi-square analysis demonstrated that production longevity did not advance literacy, as 83.3% of experienced farmers (>10 years) possessed poor knowledge scores ($\chi^2 = 10.94$, $p = 0.027$). Consequently, only 53% sought professional veterinary intervention, while 33% self-medicated with antibiotics and 14% used traditional remedies. This irrational drug usage risks might pose a risk of localized antimicrobial resistance. Extension frameworks must transition to targeted, practical training on basic knowledge to safeguard flock productivity and public health.

Key words: *Clinical signs; Knowledge; Poultry diseases; Poultry farmers; Response*

1. INTRODUCTION

1.1 Background

Smallholder poultry production provides vital economic, social, and cultural benefits across developing nations, serving as a primary cornerstone for household food security, income generation, and women's empowerment. Poultry also provides food and cash income, and are significant for their nutritional or economic value. Apart from this, it plays a significant role in human society through its contribution to the cultural and social life of rural people (Hailemichael, 2007).

Within Ethiopia's livestock subsector, village and backyard poultry systems are highly suited for resource-poor rural households due to minimal land requirements and low initial capital investment (FAO, 2019). The domestic poultry sector is broadly categorized into large-scale commercial, small-scale commercial, and village or backyard production systems based on structural parameters including breed selection, management technology, housing, and biosecurity protocols (Bush, 2006). Out of an estimated national poultry population of 60 million birds, the traditional backyard system remains dominant. Approximately 56% of Ethiopian households maintain traditional holdings characterized by small flock sizes ranging from 1 to 9 birds per household, with chicks and laying hens comprising the primary demographic shares (CSA, 2017).

Despite its significant socioeconomic contribution, the development of the poultry sector in Ethiopia is severely constrained by endemic disease outbreaks. Avian pathogens cause pervasive flock mortalities, with losses typically ranging from 20% to 50%, and scaling up to 80% during catastrophic viral epidemics (Tadelle & Ogle, 2001). Effectively mitigating these losses requires a structured understanding of human behavior at the farm tier, as a flock's biosecurity status is directly dependent on the actions of its keeper.

Theoretically, this interaction is best understood through the Knowledge, Attitudes, and Practices (KAP) framework, which posits that an individual's underlying technical knowledge shapes their operational attitudes and dictates their eventual management practices. In rural smallholder systems, a lack of scientifically grounded epidemiological knowledge often manifests as poor disease prevention choices. This behavioral vulnerability is further compounded by the emerging global threat of antimicrobial resistance (AMR), driven by unregulated, empirical self-medication and the irrational administration of veterinary drugs by farmers bypassing professional diagnostics (Mezene et al., 2020).

While scattered livestock health surveys have been conducted within Southern Ethiopia, a critical empirical gap remains regarding small scale poultry systems. Specifically, there is a profound shortage of localized, quantitative data evaluating how smallholders' underlying baseline knowledge regarding poultry health that directly drives their subsequent therapeutic selections and drug-handling habits. Consequently, the status of epidemiological literacy among poultry producers in the Gamo Zone remains poorly understood. To address this research gap, this study was designed to quantitatively evaluate farmers' knowledge levels regarding clinical signs of poultry disease, transmission routes and behavioral responses to poultry diseases in the Arba Minch Zuria district, providing baseline empirical evidence necessary to optimize local veterinary extension programming and biosecurity interventions.

2. MATERIALS AND METHODS

2.1. Description of Study Area

The study was conducted in the Arba Minch Zuria district, situated within the East African Rift Valley in the Gamo Zone of Southern Ethiopia. The district is geographically flanked by Lakes Abaya and Chamo, as well as the Nech Sar National Park. Topographically, the area features a diverse landscape comprising massifs, plains, steep slopes, and seasonal gorges fed by numerous streams and rivers. The climatic profile of the Arba Minch Zuria district and Gamo Zone is characterized by a bimodal rainfall pattern: a short rainy season spanning from January to April, and a long rainy season from June to September. The annual rainfall ranges between 800 mm and 1200 mm, with a mean annual temperature of 26.33°C. According to institutional census data from the Arba Minch Zuria District Livestock and Fisheries Resource Development Office, the domestic animal population consists of an estimated 101,628 cattle, 27,339 sheep, 42,662 goats, 3,204 equines, and 140,050 poultry birds (AZLFRDO, 2022).

2.2. Study Design and Target Population

A descriptive, cross-sectional survey was deployed from July 2023 to November 2023 to evaluate smallholder farmers' epidemiological knowledge and management responses regarding endemic poultry diseases. The target study population comprised rural smallholder poultry-producing households located across five selected kebeles (the smallest administrative units in Ethiopia) within the Arba Minch Zuria district.

2.3 Sampling Technique

A multi-stage sampling framework combining purposive and simple random sampling techniques was implemented. In the first stage, five specific kebeles namely Kola Shara, Shele Mela, Lante, Chano Chalba, and Zeyse Elgo were purposively selected based on their poultry production profiles, relative accessibility, and high concentration of smallholder production systems. In the second stage, a definitive sampling frame listing active poultry-keeping households was compiled in active collaboration with local Kebele Agricultural Extension Specialists. From these localized registers, individual households were selected using a simple random sampling protocol to eliminate selection bias.

2.4 Sample Size Determination

To achieve sufficient statistical power for this exploratory behavioral survey when baseline parameters are unknown, the target sample size was calculated using the mathematically conservative Arsham (2002) formulation for maximum population variance: $n=0.25/d^2$. Where: n = the required target sample size (number of households), 0.25 = the maximum variance threshold, representing the highest possible population heterogeneity assuming an unknown proportion ($p = 0.50$) and d = the acceptable margin of absolute precision or standard error, strictly set at the 5% alpha level ($d = 0.05$). Based on this formula, a final sample size of 100 households was determined.

2.5. Data Collection Methods

Data collection was executed using an interviewer-administered, semi-structured questionnaire specifically designed to evaluate the technical knowledge and disease response behaviors of smallholder poultry producers. To ensure data quality and minimize response variance, all face-to-face interviews were conducted directly by the primary researcher.

2.6. Data Management and Analysis

Field data were meticulously cleaned, coded, and entered into Microsoft Excel before being exported into SPSS for comprehensive statistical analysis. Descriptive statistics, including raw frequencies and horizontal percentages, were utilized to summarize demographic attributes and baseline responses. For inferential statistics, cross-tabulations coupled with Pearson's Chi-square (χ^2) tests of independence were performed to identify significant associations between key independent variables (flock size and production experience) and the overall knowledge tiers of the farmers. Statistical significance thresholds were strictly set at the 95% confidence level ($p < 0.05$).

2.7. Assessment of Farmers' Knowledge Levels

To evaluate the epidemiological awareness of poultry keepers regarding endemic avian pathogens, transmission vectors, and public health risks, a structured Knowledge Score Index (KSI) was adapted within a standard Knowledge, Attitudes, and Practices (KAP) framework (Govindaraj et al., 2016). The diagnostic index comprised 10 core objective items spanning clinical symptom recognition, horizontal transmission routes, vaccine utility, and zoonotic risk markers, as comprehensively itemized in Table 1.

A binary scoring matrix was implemented where each scientifically accurate response was awarded a score of 1, whereas incorrect answers and "I do not know" selections received a score of 0, yielding a total cumulative score range of 0 to 10 points. To categorize overall competency, final scores were stratified using a modified Bloom's cut-off specification: Low/Poor Knowledge (scores 0–4; <50 %), Moderate Knowledge (scores 5–7; 50% -74%), and High/Good Knowledge (scores 8–10; >75%) (Seid & Amogne, 2022).

Table 1. Core evaluation domains and objective items of the Knowledge Score Index (KSI)

No.	Core Evaluation Domain	Objective Assessment Item	Expected Scientific Response (Score = 1)
1	Symptom Recognition	Identification of visible clinical signs of common poultry illness (e.g., coughing, diarrhea, ruffled	Yes

		feathers).	
2	Symptom Recognition	Awareness of classic clinical manifestations associated with local epidemics like Newcastle Disease (e.g., twisting of neck, high mortality).	Yes
3	Transmission Routes	Knowledge regarding horizontal pathogen transmission via contaminated feed and drinking water surfaces.	Yes
4	Transmission Routes	Understanding that introducing newly purchased birds from public markets without quarantine presents an infection vector.	Yes
5	Transmission Routes	Awareness of disease transmission risks via wild birds and scavenging neighborhood flocks.	Yes
6	Preventative Measures	Knowledge regarding the utility and protective value of routine flock vaccinations.	Yes
7	Preventative Measures	Understanding that isolating sick birds (flock segregation) reduces household transmission rates.	Yes
8	Biosecurity & Hygiene	Recognition of the importance of regular poultry housing sanitation and equipment disinfection.	Yes
9	Zoonotic Risk	Awareness that certain avian pathogens have zoonotic potential and can cross over to infect humans.	Yes
10	Public Health Risk	Knowledge regarding the human health safety risks associated with slaughtering, handling, or eating sick birds.	Yes

2.8. Ethical Consideration

Prior to the commencement of field data collection, formal administrative clearance was obtained from the institutional oversight office at the Arba Minch Zuria District Agricultural Office. The objectives of the survey were clearly explained to each participant in their local language. Explicit verbal informed consent was obtained from all participating poultry keepers, and complete anonymity and data confidentiality were maintained throughout the study.

3. RESULTS AND DISCUSSION

3.1 Demographic Information

The socio-demographic composition of the sampled smallholder poultry producers in the Arba Minch Zuria district is structured in Tables 2, 3 and 4. Out of the 100 surveyed household heads, 57% were female and 43% were male. Age distribution trends revealed a predominantly young to middle-aged farming workforce: 49% of the respondents were under 30 years of age, 46% ranged between 30 and 45 years, and a marginal 5%

were older than 45 years. Regarding formal educational attainment, a profound literacy and training gap was observed: 32% of respondents could only read and write without formal schooling, 47% completed an elementary level education, 13% attained a high school education, and only 8% possessed a college degree or higher qualification.

Table 2. Gender distribution of respondents

Gender	No of respondents	Percentage (%)
Male	43	43%
Female	57	57%
Total	100	100%

Table 3. Age distribution of respondents

Age of the respondents	No of respondents	Percentage (%)
below 30 years	49	49%
30 up to 45 years	46	46%
45 up to 60 years	5	5%

Table 4. Literacy levels of respondents

Level of education	No of respondents	Percentage (%)
Read and write	32	32%
Elementary	47	47%
High school	13	13%
College and above	8	8%

To evaluate the distributional uniformity of the respondent demographics, a Chi-Square (χ^2) Goodness-of-Fit test was conducted at a 95% confidence interval (alpha = 0.05). The analysis revealed that the gender distribution of the respondents was statistically balanced ($\chi^2 = 1.96$, $p > 0.05$), indicating a statistically equitable representation of male and female stakeholders within the study sample. Conversely, highly significant unequal distributions were observed for both age ($\chi^2 = 36.27$, $p < 0.001$) and literacy levels ($\chi^2 = 38.64$, $p < 0.001$) (Table 5).

Table 5. Statistical analysis of demographic factors on SPSS using Chi-square test, at CI 95% and $p<0.05$

Category	Test Applied	Chi-Square (χ^2)	Significance (p-value)	Verdict
Gender	Goodness-of-Fit	1.96	$p > 0.05$	Not Significant (Balanced sample).
Age	Goodness-of-Fit	36.27	$p < 0.001$	Highly Significant (Unequal distribution)
Literacy	Goodness-of-Fit	38.64	$p < 0.001$	Highly Significant (Unequal distribution)

The prominent involvement of female respondents (57%) in this study strongly reflects the traditional socioeconomic role of backyard poultry husbandry across rural Sub-Saharan Africa, where small-scale poultry management serves as a critical entry point for women's economic autonomy and family dietary security. This baseline alignment matches findings across East Africa noting that small livestock remains a gender-differentiated domain heavily anchored by women.

Furthermore, the statistically significant, youthful profile of the producers (49% under 30 years of age) highlights a dynamic demographic shift. This young workforce represents an optimal target population that could easily be mobilized for technological upgrades, modern biosecurity interventions. However, as noted by Gelle et al. (2018), while younger producers are inherently more receptive to modern, tech-driven agricultural innovations, their technical efficiency is often severely truncated by a lack of institutional training and structured extension support. This structural limitation is highly evident in the study area, where the highly significant literacy skew ($p < 0.001$) underscores that 79% of the producers rely strictly on basic reading, writing, or elementary-level schooling which is not similar with the finding of a study by Achikule (2022) regarding broiler farmers in Kenya. Consequently, future capacity-building frameworks must design training materials that are highly visual, accessible, and tailored to the prevailing low-literacy context to effectively bridge the gap between youthful receptivity and technical execution.

3.2. Poultry Production Attributes: production experience, Sourcing, and flock typologies

Analysis of flock dynamics showed that 60% of the smallholders possessed more than 10 years of active production experience, whereas 35% had 5 to 10 years, and only 5% were novice keepers with less than 5 years of experience (Table 6).

Table 6. Poultry Production Attributes: production experience, Sourcing, and Flock Typologies (n=100)

Poultry keeping experience	No of respondents	Percentage (%)
Less than five year	5	5%
5 year – 10 years	35	35%
More than 10 years	60	60%
Source of the chickens		
Purchased from market	70	70%
Provided by NGO"s	10	10%
Provided by agriculture research center	-	-
Natural home hatching of eggs	20	20%
Type of poultry		
Layers	52	52 %
Broilers	18	18 %
Mixed	30	30 %
System of production		
Free range	44	44 %
Semi intensive	46	46 %
Intensive	10	10 %

The fact that 60% of respondents have over a decade of poultry-keeping experience matches regional livestock records, such as Mezene et al. (2020), highlighting that backyard poultry farming is a long-term, stable component of rural livelihoods in Southern Ethiopia. However, a major epidemiological vulnerability is exposed by their sourcing habits: 70% of producers source their birds directly from open, unregulated public markets. Open markets function as primary viral mixing hubs for highly contagious pathogens such as Newcastle Disease (ND) and Highly Pathogenic Avian Influenza (HPAI). Sourcing birds from these spaces without subsequent quarantine setups establishes an ongoing line of infection into naive household flocks (Silva et al., 2022).

Concurrently, the dominance of free-range (44%) and semi-intensive (46%) management styles means that birds are constantly scavenging in shared open spaces. This creates continuous horizontal transmission vectors via wild bird interactions, contaminated water surfaces, and direct contact with infected neighboring flocks. Meanwhile 20% of respondents still rely on natural home hatching using traditional broody hens, which is in agreement with study by Addisu et al. (2013) and Meseret (2010) in which most farmers have always using broody hens for incubation rather than depending on external source of provision.

3.3 Major Challenges Restricting Production Success

Smallholders faced multiple concurrent challenges within the district, with a substantial majority identifying the combination of environmental stress and disease outbreaks as their primary operational bottleneck (Table 7).

Table 7. Smallholder perceptions of primary production problems (n = 100)

Perceived primary challenge	No of respondents	Percentage (%)
Disease	23	23%
Predators	9	9%
Environmental stress and disease	66	66%
lack of service	2	2%

The field data reveals that 66% of local producers view disease outbreaks as a challenge that is severely worsened by environmental stress factors. This perception is highly accurate from a veterinary perspective. This finding is strongly supported by Sambo et al. (2015), who documented that backyard producers across similar agro-ecological zones identify cold rainy seasons and early morning dew conditions as prime risk factors that accelerate the onset of respiratory epidemics. Furthermore, Teklemariam (2017) and Aman et al. (2015) have similarly reported that the twin pressures of disease and predation represent the absolute greatest structural constraints limiting the successful introduction and survival of high-yielding exotic poultry breeds in Southern Ethiopia.

3.4 Quantification of Farmers' Knowledge Levels

The quantification of poultry keepers' epidemiological awareness using the categorical stratification adapted from the standard KAP framework, showed a profound deficit in comprehensive disease knowledge within the study area (Table 8). The vast majority of the interviewed farmers (77%, n = 77) exhibited a Low/Poor knowledge level regarding poultry disease identification, transmission pathways, and biosecurity implications. Meanwhile, 19% (n = 19) of the respondents demonstrated a Moderate knowledge level. Notably, only a marginal fraction of the surveyed population (4%, n = 4) achieved scores qualifying them for the High/Good knowledge category.

Table 8. Knowledge level of the respondents

Knowledge level of the respondents based on Knowledge Score Index	No of respondents	Percentage (%)
Low/Poor	77	77%
Moderate	19	19%
High/Good	4	4%

The striking predominance of low disease literacy (77%) among smallholder poultry producers in Arba Minch Zuria district underscores a critical vulnerability in village-level flock health management. This baseline deficiency suggests that the structural understanding of avian pathogens, clinical manifestations, and transmission dynamics is severely constrained among rural smallholders.

To fulfill the statistical requirements for frequency distributions, this distribution was subjected to a statistical inquiry using a Chi-square (χ^2) Goodness-of-Fit test at a stated 95% Confidence Interval (CI) and a maximum error range of alpha = 0.05. The analysis revealed that the concentration of farmers within the lower literacy tier is highly significant ($\chi^2 = 89.18$, df = 2, $p < 0.001$), mathematically proving that this knowledge deficiency is systematic and not a random sampling anomaly (Table 9).

Table 9. Frequency distribution and Chi-square inquiry of farmers' knowledge levels (n=100).

Knowledge Level Category (Based on KSI)	Observed Count (n)	Expected Count (n)	Percentage (%)	Chi-Square (χ^2)	Degrees of Freedom (df)	Asymp. Sig. (p-value)
Low/Poor (Score 0-4)	77	33.3	77%			
Moderate (Score 5-7)	19	33.3	19%	89.18	2	P<0.001
High/Good (Score 8-10)	4	33.3	4%			
Total	100	100	100%			

This pervasive lack of technical knowledge serves as the underlying behavioral driver for the problematic management practices documented in this study specifically, the high incidence of self-medication (33%) and the widespread lack of proactive biosecurity and preventative awareness (55%). When farmers lack the capacity to systematically recognize clinical signs or understand transmission vectors, their responses to disease challenges naturally become reactive and empirical rather than preventative and veterinary-guided.

This finding aligns with previous veterinary extension assessments conducted within similar smallholder contexts in Ethiopia. For instance, Haile et al. (2023) reported parallel knowledge deficits among livestock handlers in Southern Ethiopia, attributing the trends to minimal exposure to structured veterinary extension services and a lack of targeted training modules. Similarly, Habte et al. (2017) noted that a poor understanding of vaccine efficacy and disease transmission vectors directly undermines the success of community-wide village poultry interventions.

3.5 Association between Production Experience and Knowledge Level

To assess whether the duration of poultry keeping experience influenced the epidemiological literacy of the respondents, a cross-tabulation with a Pearson Chi-square (χ^2) test of independence was performed. The analysis revealed a statistically significant association between a farmer's

production experience and their structured poultry disease knowledge level (χ^2 = 10.94, df = 4, p = 0.027) (Table 10).
Among the smallholders (<5 years of experience), 100% (n = 5) exhibited lower/poor knowledge. For producers with 5–10 years of experience, 62.9% (n = 22) had poor knowledge, 25.7% (n = 9) had moderate knowledge, and 11.4% (n = 4) attained a high/good knowledge level. Interestingly, among the most experienced cohort (>10 years of experience), the vast majority (83.3%, n = 50) still fell within the lower/poor knowledge category, while only 16.7% (n = 10) demonstrated moderate knowledge, and 0% (n = 0) achieved a high/good knowledge rating.

Table 10. Association between production experience and Knowledge level

Production experience	Lower/poor knowledge (n, %)	Moderate knowledge (n, %)	High/good knowledge (n, %)	Total (n, %)	Chi-square(χ^2)	P-value
<5 Years	5 (100)	0 (0)	0 (0)	5	10.94	0.027
5-10 years	22 62.9)	9(25.7	4 11.4	35		
>10 years	50 (83.3)	10 (16.7)	0 (0)	60		

The statistical significance (p = 0.027) confirmed by the Chi-square test demonstrates that a farmer's timeline of engagement in poultry production does impact their baseline distribution across knowledge tiers. However, a deeper, critical analysis of the percentage distributions reveals a highly concerning epidemiological paradox that addresses the core of local extension challenges.

Intuitively, one would assume that decades of active farming would yield a highly accurate, advanced understanding of avian pathogens through experiential learning. Yet, our empirical data flips this assumption: 83.3% of poultry keepers with more than 10 years of experience still operate with a structurally poor or lower knowledge level regarding disease identification and transmission. Concurrently, the absolute zero percentage (0%) of high-knowledge individuals within this veteran group indicates that extended exposure to poultry production, in the absence of institutional training, fails to correct deep-seated misconceptions or improve technical capacity.

This trend strongly suggests that what is often classified as "experiential knowledge" among smallholders in the Arba Minch Zuria district is largely limited to basic observation of clinical signs without a corresponding understanding of sub-clinical dynamics, biosecurity vectors, or rational therapeutic interventions. These results are consistent with broader regional observations across Sub-Saharan Africa, where traditional or unguided backyard farming patterns pass down habits rather than scientific methodologies. For instance, Habte et al. (2017) noted that traditional village poultry habits pass down generationally as routine practices rather than scientific methodologies, remaining completely stagnant over cycles.

3.6 Farmer’s Behavioral Responses to Disease Occurrences

Smallholders' operational choices when encountering active flock disease events are detailed in Table 11. While 53% sought formal professional support from veterinarians, a highly concerning 33% bypass veterinary services entirely to purchase drugs directly from pharmacies and self-medicate their birds, while 14% rely exclusively on traditional remedies (Table 11).

Table 11. Primary behavioral action taken by smallholders during disease events (n = 100).

Action taken during disease occurrence	No of respondents	Percentage (%)
Seek veterinarians	53	53%
Purchase drugs from veterinary pharmacy and self-treat	33	33%
Treat with traditional remedies	14	14%

The field finding shows that 33% of smallholders practice independent antibiotic self-medication presents a severe threat to local animal health and public safety. However there is a highly statistically significant difference in the actions taken during a disease occurrence ($p < 0.001$). Respondents demonstrate a clear, significant preference for seeking professional veterinary intervention (53%), while traditional treatments are significantly underutilized (14%) compared to random chance.

Bypassing professional veterinary diagnostics to purchase and administer over-the-counter veterinary drugs indicates widespread, highly irrational medication usage across the district. Under conditions of low disease literacy, this behavior typically leads to incorrect dosing, improper treatment timelines, and the administration of inappropriate drug classes (such as treating viral infections like Newcastle disease with broadspectrum antibiotics). This unsafe behavioral pattern matches Mezene et al. (2020), who identified unregulated retail access to veterinary drugs as a primary driver of empirical self-medication in Southern Ethiopia. This practice poses a major risk for accelerating localized antimicrobial resistance (AMR) traits within the food chain, creating a critical One Health challenge that connects veterinary management directly to human public health.

3.7 Inferential Associations Driving Disease Response Behaviors

3.7.1. Influence of Production Experience on Choice of Intervention

Inferential evaluation of the relationship between production experience and disease intervention choices showed no statistically significant correlation ($\chi^2 = 4.2$, df = 4, p = 0.76) (Table 12).

Table 12. Chi-square cross-tabulation of production experience against outbreak response choices (n=100).

Production experience	Response to diseases			Total	p-value	χ2
	Traditional treatment	Buy veterinary drugs & self-treat	Seek veterinary service			
Less than 5 years	1	3	1	5	0.376	4.2
5 to 10 years	7	20	18	35		
Above 10years	6	20	34	60		
Total	14	33	53	100		

The lack of statistical significance (p = 0.376) confirms that a farmer's longevity in the poultry sector does not act as a defining driver for their therapeutic choices. Smallholders with over a decade of production experience are statistically just as likely to engage in empirical self-medication or deploy unstandardized traditional home remedies as novice producers. This baseline uniformity reinforces our earlier finding that production longevity does not equal clinical capability. Without targeted agricultural training, long-standing habits remain completely uncorrected, leading veteran farmers to rely on the same informal paths as beginners.

3.7.2. Influence of Flock size on responses to diseases

In contrast to production longevity, a highly significant statistical association was discovered between the scale of the poultry holding (number of birds owned) and the farmer's outbreak response choices ($\chi^2 = 23.3$, df = 6, p = 0.001) (Table13).

Table 13. Chi-square cross-tabulation of flock size against outbreak response choices (n=100).

No of chicks	Response to diseases: Traditional treatment	Buy veterinary drugs & self-treat	Seek veterinary service	Total	p-value	χ^2
1-10	12	25	18	55	0.001	23.3
11-20	1	8	25	34		
21-50	0	0	5	5		
Above 50	1	0	5	6		
Total	14	33	53	100		

The high statistical significance (p = 0.001) clearly demonstrates that flock scale serves as a powerful behavioral driver for smallholder veterinary choices. As individual flock holdings expand beyond the minimal backyard tier (>10 birds), there is a sharp behavioral shift away from informal remedies and self-medication toward seeking professional veterinary intervention.

This distinct behavioral pivot is directly driven by the increased economic stakes tied to larger production tiers. For a household maintaining a minimal holding of 1 to 10 birds, the financial impact of a disease event is small, leading them to rely on cheap traditional remedies or casual over-the-counter drug purchases. However, as the capital investment scales up into dozens or hundreds of birds, a single epidemic threatens the household with catastrophic economic loss. This heightened exposure to financial risk acts as a powerful motivator that forces producers to bypass informal channels and actively invest in professional diagnostics and veterinary services to protect their capital.

4. CONCLUSION AND RECOMMENDATION

4.1 Conclusion

This study evaluated the baseline epidemiological knowledge and behavioral response dynamics of smallholder poultry keepers in the Arba Minch Zuria district. The empirical findings reveal a critical and pervasive deficiency in disease literacy, with 77% of the surveyed producers exhibiting a low overall knowledge level regarding avian symptom recognition, transmission vectors, and biosecurity protocols.

Crucially, inferential analysis demonstrated that poultry-keeping longevity does not automatically yield technical competence ($\chi^2 = 10.94$, $p = 0.027$); a striking 83.3% of producers with over a decade of experience still operate with structurally poor disease knowledge. This deep knowledge vacuum serves as the primary driver for high-risk behavioral responses during active flock disease events, where 33% of smallholders completely bypass veterinary diagnostics to practice empirical drug administration and antibiotic self-medication.

In contrast, the scale of individual poultry holdings was identified as a powerful behavioral driver ($\chi2= 23.3$, $p = 0.001$), proving that increased financial investment and exposure to economic risk strongly incentivize smallholders to transition from informal remedies toward seeking professional veterinary services. Ultimately, the combination of low disease literacy, extensive open-market bird sourcing (70%), free-range scavenging systems, and unguided chemotherapy creates a dangerous regional pathway for the development and acceleration of localized antimicrobial resistance (AMR), threatening flock productivity and community public health.

4.2 Recommendation

Based on the evidence generated from this study, the following targeted interventions are recommended to upgrade the smallholder poultry sector:

- The District Agricultural Office should shift from generic livestock support toward practical, visual, and field-based training modules tailored to low-literacy contexts to improve baseline disease recognition and biosecurity protocols.
- Local agricultural authorities should set up veterinary oversight and basic screening booths at major regional market nodes to

minimize the introduction and horizontal mixing of highly contagious poultry diseases from open markets.

- Local regulatory bodies must strengthen oversight over rural pharmacies and drug vendors, strictly promoting professional diagnostic verification before veterinary drugs are sold over the counter.

Conflict of Interest

The author declares that there are no conflicts of interest regarding the publication of this manuscript.

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Data Availability

The quantitative datasets of this study are available from the corresponding author upon reasonable request.

5. REFERENCES

Achikule, A. Y., Joyce, G. M., & Paul, N. M. (2022). Farmers' perception on the welfare of broiler chickens in smallholder production systems in Kiambu County, Kenya. Advances in Agriculture, 2022, 1–7.

Addisu, H., Hailu, M., & Zewdu, W. (2013). Indigenous chicken production system and breeding practice in North Wollo, Amhara Region, Ethiopia. Poultry, Fisheries & Wildlife Sciences, 1(1), Article 108.

Aman, G., Fitsum, T., Mesfin, M., Addisu, J., & Bereket, Z. (2015). Assessment of village chicken production systems in Kambata Tambaro and Wolaita Zones, SNNPR, Ethiopia. Global Journal of Science, 15(1), 2249–4626.

Arbaminch Zuria District Livestock and Fishery Resource Office. (2021). Report from Arbaminch Zuria district livestock and fishery resource office (Unpublished institutional report). Gamo Zone, SNNPR.

Arsham, H. (2002). Descriptive sampling data analysis: Statistical thinking for managerial decision making. University of Baltimore. http://ubmail.ubalt.edu/harsham/Business-stat/opre504.htm#whyrssm

Bush, J. (2006). The threat of avian flu: Predicted impacts on rural livelihoods in Southern Nation, Nationalities and Peoples Region (SNNPR), Ethiopia. The Food Economy Group.

Central Statistical Agency. (2017). Central statistical authority, Federal Democratic Republic of Ethiopia: Statistical abstract. CSA.

Food and Agriculture Organization. (2019). Poultry development review. https://www.fao.org

Gelle, S. J., Mbugua, P. N., & Maina, J. G. (2018). Evaluation of management practices in layer chickens and their influence on welfare status in Kabete Sub-County, Kenya. Open Access Journal of Agricultural Research, 3(12), Article 16000214. https://doi.org/10.23880/oajar-16000214

Govindaraj, G., Nagalingam, M., Nethrayini, K. R., Shalini, R., Rajeswari Shome, R. S., Bambal, R. G., Lipi Sairiwal, L. S., & Rahman, H. (2016). Assessment of brucellosis knowledge, attitude and practice among veterinarians in India. Journal of Experimental Biology and Agricultural Sciences, 4(Spl-3-ADPCIAD), S83–S94.

Habte, T., Amare, A., Bettridge, J., Collins, M., Christley, R., & Wigley, P. (2017). Guide to chicken health and management in Ethiopia (ILRI Manual 25). International Livestock Research Institute.

Hailemichael, A. (2007). Village poultry in Ethiopia: Socio-technical analysis and learning with farmers [Doctoral dissertation, Wageningen University]. Wageningen University Repository.

Meseret, M. (2010). Characterization of village poultry production and marketing system in Gomma Wereda, Jimma Zone, Ethiopia [Master's thesis, Jimma University]. Jimma University Institutional Repository.

Mezene, W., Getahun, E. A., Balako, G., Dinka, A., & Gezahegn, M. (2020). Antibiotic use in poultry production in selected districts of East Showa Zone, Central Ethiopia: From antibiotic stewardship perspective. American-Eurasian Journal of Scientific Research, 15(3), 101–111.

Sambo, E., Judy, B., Tadelle, D., Alemayehu, A., Tadiose, H., Paul, W., & Robert, M. C. (2015). Participatory evaluation of chicken health and production constraints in Ethiopia. Preventive Veterinary Medicine, 118(1), 117–127. https://doi.org/10.1016/j.prevetmed.2014.10.014

Seid, M. A., & Amogne, W. (2022). Knowledge, attitude, and practice towards antimicrobial resistance among final-year undergraduate students in the health sciences at Addis Ababa University, Ethiopia. PLOS ONE, 17(10), Article e0275512. https://doi.org/10.1371/journal.pone.0275512

Silva, N., Chaka, H., Gaidashova, G., Belguise, A., & Wood, J. L. (2022). Detection of chicken respiratory pathogens in live markets of Addis Ababa, Ethiopia, and epidemiological implications. Veterinary Sciences, 9(9), Article 503. https://doi.org/10.3390/vetsci9090503

Tadelle, D., & Ogle, B. (2001). Village poultry production system in the Central Highlands of Ethiopia. Tropical Animal Health and Production, 33(6), 521–537.

Teklemariam, A. (2017). Perception of farmers on exotic chicken breeds and its management condition in Northwestern zone Tigray, Ethiopia. World Scientific News, 86(3), 168–179.