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Knowledge, Attitudes and Practices on Newcastle Disease Prevention in Poultry Among Small-Scale Poultry Farmers in Lusaka West, Zambia

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ABSTRACT

Introduction: Newcastle disease is a viral disease caused by virulent Newcastle disease virus (NDV) strains infecting avian species worldwide. Infected birds may show signs of loss of appetite, coughing, gasping, nasal discharge, watery eyes, and nervous signs such as paralysis and convulsions. The disease is spread primarily through direct contact between healthy birds and the bodily discharges of infected birds. The study assessed knowledge, attitudes, and practices on Newcastle disease prevention among small-scale poultry farmers in Lusaka West, Zambia.

Materials and methods: A quantitative descriptive cross-sectional study design, was used and the study was conducted in five areas of Lusaka West. Probability sampling method was utilised to select a sample size of 384 poultry farmers. Closed-ended structured questionnaires were used to collect data, which was analysed using descriptive analysis.

Results: The study showed that the respondents had a good level of knowledge (58.8%); positive attitudes (71.1%); and positive practices (73.2%) on Newcastle disease prevention.

Conclusion: The obtained results could be attributed to the levels of experience and fear of losing business profits due to bird mortalities and the level of experience most respondents had in poultry farming. This was observed by the significant association between knowledge and experience (*p-value* - 0.004). This calls for the promotion of awareness and knowledge on the importance of vaccination of birds as a means of prevention for Newcastle disease and enhancing Newcastle disease detection and control through rapid test kits and others.

Keywords: Newcastle Disease, Newcastle Disease Virus, Poultry, Knowledge, Attitudes, Practices, Small-Scale Poultry Farmers.

INTRODUCTION

Newcastle disease is a viral disease caused by virulent Newcastle disease virus (NDV) strains infecting avian species worldwide. Newcastle disease viruses are single-stranded paramyxoviruses that are negatively sensed, enveloped ribonucleic (RNA) viruses in the genus Avulavirus.[1] Since its discovery in 1926, there have been at least 11 genotypes of class II viruses that have been identified.[2] The first outbreaks of the Newcastle disease (ND) to be recognised occurred in 1926, in Java, Indonesia and in Newcastle-upon-Tyne, England, in 1927.[3] Earlier reports indicated a similar disease outbreak in Central Europe before this date. However, it is extremely difficult to assess the prevalence of NDV globally, because in some countries or areas, the disease is not reported at all or only if it occurs in commercial poultry, while its presence in village chickens or backyard flocks is ignored.[4]

The African poultry subsector has experienced chick losses caused by infectious diseases, among which ND accounts for 83%.[5] Thirty-one African countries covering the West, East, and Southern African regions reported ND to the African Union-Inter African Bureau for Animal Resources (AU-IBAR) in 2011. The disease affected a total of 1,031 epidemiological units involving 487,206 cases and 326,706, with a case fatality rate of 67.1% (AU-IBAR, 2019).[6]

In Zambia, Newcastle disease was first reported in native fowls in Mazabuka, Southern Province, in May 1952.[7] By 1957, ND had spread to major poultry-producing areas of the country, with the largest number of outbreaks previously recorded in Central, Southern and Copperbelt provinces.[8] Between the period 1989 and 2014, Eastern Zambia recorded an estimated provincial incidence range of 0.16-1.7% per year.[9] Newcastle disease (ND) remains a constant threat to poultry producers worldwide, despite the availability and global employment of ND vaccines since the 1950s. The extent to which small-scale poultry farmers adopt innovations such as vaccines and modern husbandry practices impacts disease control, however, these are not well understood. There is a need for knowledge and awareness of its importance and use among small-scale poultry farmers to prevent the disease as the availability of vaccines alone may not be sufficient for high levels of uptake.[10]

In a study conducted in five provinces and 11 districts of Zambia, 73.9% of the chickens tested positive for avian paramyxovirus type 1 antibodies.[11] The Provinces included Eastern, Southern, Northern, Copperbelt and Luapula. This indicates that there has been little official attention to disease detection and control in Lusaka Province as ND strains are widespread in Zambia although unidentified and underreported in some districts like Lusaka. Poultry is highly consumed in Zambia as one of the major sources of protein and source of income for poultry farmers. Statistics show that at least 74.2% of households keep chicken for food.[12] Limited studies have been conducted to isolate and genetically characterise ND strains affecting poultry

in Zambia for appropriate control decisions to be taken.[10] It was, therefore, vital that this study was conducted to address preventive measures against ND among small-scale poultry farmers who were major suppliers of poultry meat nationally. The study assessed knowledge, attitudes, and practices on Newcastle disease prevention in poultry among small-scale poultry farmers in Lusaka West, Zambia.

MATERIALS AND METHODS

Study Design

This study used a quantitative descriptive cross-sectional study design, to obtain information from the participants on their knowledge, attitude and practices concerning Newcastle disease prevention without drawing any interferences.

Study Setting and Study Population

The study was conducted in Lusaka West, in Lusaka Zambia. This was because the area had some of the largest residential areas predominately known for live poultry farming among small-scale poultry farmers in Lusaka, and as such, representativeness was easy to get from this area. The study was conducted in five areas of Lusaka West, namely, Hillview, Kapampa, Costen, Gomora and Chikondano.

Inclusion and Exclusion Criteria

The study included all poultry farmers who were present on the day of data collection from the selected areas of Lusaka West and all poultry farmers who were 18 years and above. The study excluded all poultry farmers who were present on the day of data collection but did not consent and all poultry farmers who were not selected using the selected sampling technique.

Sampling Technique

Two-stage cluster sampling technique was used for this study. Hillview, Kapampa, Costen, Gomora and Chikondano areas were split into clusters, then clusters were randomly selected and thereafter, participants were randomly selected within each chosen cluster.

Sample Size Determination

The sample size was determined using Cochran's formula below:

$$n = \frac{z^2pq}{e^2}$$

Where n is the sample size required, z is the standard normal deviation, set at 1.96 corresponding to a 95% confidence level, p is the estimated proportion of a characteristic that is present in the population, if not known is 50%, q=1-, and e is the degree of accuracy desired, set at 0.05. Cochran's formula is used to calculate the sample size for a large population (exceeding or equal to 10 000) whose variability in the proportion is not known and is, therefore, set at 0.5, which is the maximum variability[13]. Therefore, the sample size was obtained as follows:

$$n = \frac{z2\,p(1-p) =}{e2} \quad \frac{1.96^2 \times 0.50(1-0.50) =}{(0.05)^2} \quad \frac{0.9604 =}{0.0025} \quad 384.16$$

$$= 384 \text{ small} - \text{scale poultry farmers}$$

The sample size was equally distributed among the selected clusters.

Study Variables

Table 1: Variables and How They Will be Measured

Type of Variable	Specific Variable	Outcome Measurement
Dependent	Newcastle Disease Prevention	Continuous Variable
Independent	Knowledge	Five statements were developed to assess the knowledge of the small-scale poultry farmers on ND prevention and were scored using a Likert scale. Each question was measured as strongly agree (score 5), agree (score 4), neutral (score 3), disagree (score 2), and strongly disagree (score 1). Then, the knowledge levels were classified into 3: good knowledge (25-20 scores), fair knowledge (19-14 scores), and poor knowledge below (14 scores).
Independent	Attitude	Five statements were developed to assess the attitude of the small-scale poultry farmers towards ND prevention and were scored using a Likert scale. Each question was measured as strongly agree (score 5), agree (score 4), neutral (score 3), disagree (score 2), and strongly disagree (score 1). Then, the attitude levels were classified into 3: positive attitude (25-20 scores), neutral attitude (19-14 scores), and negative attitude below (14 scores).

Independent	Practices	Five questions were developed concerning ND prevention practices, which varied from 0 to 10. Each of the 5 items were assessed as 0-1 indicator variable. The variables were then given the value of 0 for ''no'' and a value of 1 for ''yes.'' Then the scores were classified into good practices (4-5 scores), fair practices (3-2 scores) and poor practices less than (2 scores).

Data Collection Tools and Procedure

In this study, data was collected using closed-ended structured questionnaires. The data collection tool was developed in English and was also translated into local languages such as Icibemba and Chinyanja for those that were not able to read and understand English. The questionnaire consisted of four parts; Part A was on the socio-demographic profile of participants, Part B addressed the level of knowledge on ND prevention, Part C was on attitudes towards ND prevention and Part D addressed practices associated with ND prevention among small-scale poultry farmers.

Data Analysis

Data were analysed using descriptive analysis utilising Statistical Package for Social Sciences (SPSS) version 25. The Chi-square test (x^2) was used to determine the degree of the association, while Pearson's correlation (r) was used to determine the strength between knowledge and attitudes and knowledge and practices of the farmers. The responses were measured using the Likert scale. Results were presented using frequency tables and where necessary pie charts.

Validity and Reliability

Validity and reliability were achieved by ensuring that the sample size represented the study population. The data collection tool was pre-tested to ensure its suitability and appropriateness when conducting the study. To further enhance validity and reliability in data collection, a pilot study was conducted in 10 miles in Lusaka to observe the time taken to complete and identify any difficulties regarding the collection of data.

ETHICAL CONSIDERATION

Ethical approval was sought from Lusaka Apex Medical University Bio-Medical Research Ethics Committee (LAMUBREC) and permission was obtained from Lusaka City Council (LCC), the Ministry of Fisheries and Livestock and the small-scale poultry farmers. All ethical issues regarding the study were addressed to the participant through an information sheet. Furthermore, informed consent was obtained from the small-scale

poultry farmers. Those who refused to participate in the study were excluded without any repercussions.

RESULTS

Out of the 384 participants that were sampled to take part in this study, 97 questionnaires were successfully answered and collected from all the study sites.

Socio-Demographic Profile of Respondents

The table below shows the socio-demographic profile of the respondents.

Table 2: Socio-Demographic Characteristics of Respondents (N=97)

Variable	Frequency	Percent (%)
Gender		
Male	69	71.1
Female	28	28.9
Age		
18-28	19	19.6
29-39	45	46.4
40-49	27	27.8
50 and above	6	6.2
Religion		
Christian	97	100
Level of education		
Primary	60	61.9
Secondary	28	28.9
Tertiary	9	9.3
Residence		
Hillview area	29	29.9
Kapampa area	15	16.5
Costen area	10	10.3
Gomora area	23	23.7
Chikondano area	19	19.6
Experience		

Less than 1 year	17	17.5
Between 1 and 4 years	34	35.1
Between 5 and 8 years	30	30.9
Between 9 and 12 years	12	12.4
More than 12 years	4	4.1
Total	**97**	**100**

Table 2 above indicates that most of the respondents were male (71%), with the majority aged between 29 and 39 years old (46%), and the mean age was 35 years old. All the respondents were Christians by religion (100%).

The study revealed that most of the respondents had attained primary level of education (62%) and most of them were from Hillview area of Lusaka West (30%). It was also discovered that the majority of the respondents had work experience in poultry ranging between 1 to 4 years (35%), while those with more than 12 years work experience in small-scale poultry farming (4.1%) were the minority.

Level of Knowledge on Newcastle Disease Prevention Among Small-Scale Poultry Farmers.

TABLE 3: The Distribution of Level of Knowledge on Newcastle Disease Prevention

Statements	Frequency	Percent (%)
Newcastle disease is a contagious bird disease caused by the virulent NDV		
Strongly agree	14	14.4
Agree	44	45.4
Neutral	39	40.2
Newcastle disease is spread primarily through direct contact between healthy birds and the bodily discharges of infected birds		
Strongly agree	32	33
Agree	58	59.8
Neutral	6	6.2
Disagree	1	1.0

Clinical signs associated with NDV in chickens are highly variable and include respiratory, circulatory, gastrointestinal and nervous signs depending on the virus strain and host		
Strongly agree	39	40.2
Agree	52	53.6
Neutral	3	3.1
Disagree	2	2.1
Strongly disagree	1	1.0
Vaccination of birds against ND is done at 3-6 weeks interval		
Strongly agree	14	14.4
Agree	55	56.7
Neutral	16	16.5
Disagree	12	12.4
Newcastle disease vaccine LaSota has shown to be effective for vaccination of chickens to protect against ND		
Strongly agree	21	21.6
Agree	51	52.6
Neutral	14	14.4
Disagree	10	10.3
Strongly disagree	1	1.0
Total	**97**	**100.0**

With reference to Table 3 above, the study showed that the majority of the poultry farmers (45.4%) agreed with the statement: "*Newcastle disease is a contagious bird disease caused by the virulent NDV*". Further, most of the farmers agreed (59.8%) that: "*Newcastle disease is spread primarily through direct contact between healthy birds and the bodily discharges of infected birds*".

The study also discovered that the majority of the small-scale poultry farmers knew the clinical signs associated with Newcastle disease as they agreed (53.6%) with the statement: "*Clinical signs associated with NDV in chickens are highly variable and include respiratory, circulatory, gastrointestinal and nervous signs depending on the virus strain and host"*.

Most of the farmers agreed (52.6%) with the statement that *"Newcastle disease vaccine LaSota has shown to be effective for vaccination of chickens to protect against ND"* and most agreed (56.7%) birds should be vaccinated against ND at 3-6 weeks intervals.

Measurement of the Level of Knowledge on Newcastle disease Prevention

The level of knowledge was classified into 3: good knowledge (25-20 scores), fair knowledge (19-14 scores), and poor knowledge below (14 scores). Evidence from the study shows that the majority of the respondents had good knowledge (58.8%), while the larger minority had fair knowledge (40%).

Attitudes on Newcastle Disease Prevention among Small-scale Poultry Farmers

TABLE 4: The Distribution of Attitudes Toward Newcastle Disease Prevention

Statements	Frequency	Percent (%)
Guidelines for the use of vaccination alongside stamping out are followed		
Strongly agree	9	9.3
Agree	67	69.1
Neutral	16	16.5
Disagree	4	4.1
Strongly disagree	1	1
Quarantine period after the vaccination of birds must be observed		
Strongly agree	17	17.5
Agree	67	69.1
Neutral	7	7.2
Disagree	6	6.2
Newcastle disease is not treatable, that's why prevention through the implementation and adherence to biosecurity measures before entering the farms is important for disease control		
Strongly agree	26	26.8
Agree	55	56.7
Neutral	5	5.2
Disagree	9	9.3
Strongly disagree	2	2.1

Birds can become infected with Newcastle disease if not properly vaccinated		
Strongly agree	29	29.9
Agree	65	67.0
Neutral	3	3.1
Dead birds can spread ND if not properly disposed of		
Strongly agree	43	44.3
Agree	53	54.6
Strongly disagree	1	1.0
Total	97	100.0

As indicated in Table 4 above, the study revealed that most (69.1%) of the respondents follow guidelines of vaccination alongside stamping out. The majority of the farmers agreed (69.1%) that "*quarantine period after vaccination of birds must be observed"*, and most of them agreed (56.7%) that "*Newcastle disease is not treatable, that's why prevention through the implementation and adherence to biosecurity measures before entering the farms is important for disease control"*.

The study also reported that most of the respondents had a positive attitude with regard to disposal of dead birds. The majority agreed (54.6%) that "*dead birds can spread ND if not properly disposed of"*.

Measurement of the Attitude Towards Newcastle Disease Prevention

The level of attitude was classified into 3: positive attitudes (25-20 scores), neutral attitudes (19-14 scores), and negative attitudes below (14 scores). The study revealed that the majority of the respondents (71.13%) had a positive attitude towards Newcastle disease prevention, while the minority (28.87%) had a neutral attitude.

Association between Knowledge and Attitude Towards Newcastle Disease Prevention

The study established a strong association between knowledge and attitudes, with a chi-square value of 23.496 and a *p-value* of *0.003.*

TABLE 5: The Knowledge and Attitudes Association Test

Chi-Square Test			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	23.496[a]	8	.003
N of Valid Cases	97		

Table 5 above shows a Chi-square test for a statement on knowledge, *"Newcastle disease is a contagious bird disease caused by virulent Newcastle disease virus (NDV) affecting many domestic and wild avian species;* and a statement on attitudes; "*Newcastle disease is not treatable, that's why prevention through strict implementation and adherence to biosecurity measures is important"*.

Practices Associated with Newcastle Disease Prevention Among Small-Scale Poultry Farmers

TABLE 6: The Distribution of Practices Associated with Newcastle Disease Prevention

Variable	Frequency	Percent (%)
Do you vaccinate your birds at a 3-6 weeks interval to protect them against ND?		
Yes	82	84.5
No	15	15.5
Do you vaccinate your new birds before mixing them with old birds?		
Yes	69	71.1
No	28	28.9
Do you implement any biosecurity measures, such as the provision of foot baths at the poultry farms, as well as, cleaning and disinfection of the poultry houses?	87	89.7
Yes	10	10.3
No		
Do you clean and disinfect the utensils of flocks like egg crates affected with ND before using them for healthy flocks?	84	86.6
Yes	13	13.4
No		
Do you properly dispose of any dead birds?		
Yes	57	58.8
No	40	41.2
Total	**97**	**100.0**

With reference to Table 6 above, the majority of the respondents' vaccinated their birds at 3 to 6 weeks intervals against ND. Most of the poultry farmers had implemented biosecurity measures as well as adhered to them (89.7%).

Most of the farmers (86.6%) cleaned and disinfected utensils of flocks affected with ND before using them for healthy birds. It was also discovered from the study that the majority of the respondents disposed of any dead birds (58.8%).

Measurement of the Practices Associated with Newcastle disease prevention

Five questions were developed concerning ND prevention practices. Each of the five items was assessed as a 0-1 indicator variable. The variables were then given the value of 0 for ''no'' and a value of 1 for ''yes,'' then the scores were classified into good practices (4-5 scores), fair practices (3-2 scores) and poor practices less than (2 scores). The study revealed that the majority of the respondents (73.2%) had

good levels of practice about Newcastle disease prevention, while the minority had poor levels of practice (5.1%).

Association between Knowledge and Practices Associated Newcastle Disease Prevention

The study revealed a weak association between knowledge and practices, with a Pearson's Chi-square value of 2.994 and a *p-value* of *0.224.*

TABLE 7: The Association between Knowledge and Practices

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.994[a]	2	.224
N of Valid Cases	97		

Table 7 above shows a Chi-square test for a statement on knowledge, *"Newcastle disease is a contagious bird disease caused by virulent Newcastle disease virus (NDV) affecting many domestic and wild avian species";* and a question on practices; "Do you vaccinate your birds at a 3 to 6 weeks interval to protect them against Newcastle disease?"

DISCUSSION

The present study found that the majority of the respondents were male (71.1%). The findings are similar to that of a study conducted in Thyolo District, in Malawi, that found that the majority of the small-scale poultry farmers were male (51.7%).[14] This implies that men are more in charge of livestock activities, including chicken-raising activities. However, the present study contradicts the findings of a study in Nairobi, Kenya that revealed that more women (64%) were involved in small-scale poultry farming, suggesting that gender roles within communities make women get involved in subsistence farming like chicken production.[15] The present study found the mean age to be 35 years old. This is similar to a study conducted in Cote d'Ivoire in which it was found that the average age of the farmers was 46 years old.[16] The implication is that people take up farming in their early 30s as a means of diversifying their sources of income.

The findings of the study revealed that the majority of the respondents (51%) agreed with the statement, "*Newcastle disease vaccine, LaSota has shown to be effective for vaccination of chickens to protect against Newcastle disease"*. This could have been attributed to the levels of experience of the small-scale poultry farmers and supported by a chi-square tabulation, which indicated that the *p-value* was 0.004 indicating a strong association between knowledge and experience. The study suggests that the experience levels of the majority of the respondents (between 1 and 4 years) could have led to this response, as more and more farmers could have become more aware of the best and

most effective preventive measures based on experience. These findings are similar to a cross-sectional study, which was done in Tanzania, which reported that 81% of the respondents agreed with the statement *"LaSota (administered via drinking water) is considered as a most effective adoption strategy to protect against Newcastle"*.[17] Additionally, the current study findings are also in agreement with another study conducted in Manyoni District, in Tanzania, where 45% of the respondents were aware that the Newcastle disease can be prevented through the use of the Lasota Vaccine.[16]

Figure 1: The Newcastle Disease Vaccine (LaSota Vaccine) Source: Field Data (2022)

The study also found that the majority of the respondents 58%, agreed with the statement, "*Newcastle disease is spread primarily through direct contact between healthy birds and the bodily discharges of infected birds".* This implies that a large majority of the respondents had good knowledge of the mode of transmission of NDV, which could also have been influenced by the levels of experience and beliefs. These findings are similar to those of a study conducted in Pakistan, which found that the majority (78%) of the farmers were aware that Newcastle disease transmission was primarily through direct contact between healthy and infected birds, through droppings and secretions from the nose, mouth and eyes of infected birds.[18]

This study revealed that the majority of the respondents had a positive attitude (71.1%) towards ND prevention. Findings from the study revealed that 54.6% of the respondents agreed with the statement "*dead birds can spread ND if not properly disposed of"*. These findings are similar to the findings of a study conducted in Tanzania,[19] which reported that 70% of the farmers had a positive attitude towards ND prevention. This similarity could have been a result of the good knowledge and beliefs of the farmers on ND. For example, the belief that it is unacceptable to use dead carcasses as a source of food for their family and pets. Another study conducted in Kenya showed that having good knowledge about vaccines and ND prevention was associated with more positive attitudes towards ND prevention.[20]

The study findings revealed that the majority of the respondents practised vaccination as a means of preventing Newcastle disease, as evidenced from the study which showed that 84.5% vaccinated their birds at a 3 to 6 weeks interval. The study suggests that the high uptake of vaccines could have been linked to the knowledge levels, and attitude towards Newcastle disease prevention, which could have also been attributed to experience levels and fear of experiencing business losses due to chicken mortalities from Newcastle. These findings are similar to a study that was conducted in Sokoto State, Nigeria among 160 commercial and backyard poultry farmers, in which it was found that 82% practised vaccination as a means of preventing

Newcastle disease.[21] However, a case study conducted in Ethiopia on the epidemiology of Village chicken diseases contradicted the findings of the present study. The findings showed that none of the chicken owners interviewed had ever vaccinated their chickens to protect against Newcastle disease.[22] The reason for this variation between the two (2) studies could be a result of the difference in chicken breeds, as most poultry farmers do not vaccinate village chickens as it is not seen as a priority.

The study results revealed that the majority of the respondents (89.7%) implemented biosecurity measures, such as the provision of foot baths at the entrance of poultry farms, as well as, cleaning and disinfection of poultry houses. This could have been a result of the good knowledge and attitude towards Newcastle disease prevention, as well as past bird mortalities that the farmers had experienced. These findings are not consistent with the findings of a study conducted in Benue State, Nigeria which revealed that poultry farmers' biosecurity practices were poor.[23] The disparity in the findings of the two studies may suggest that the levels of knowledge on ND may be low in some regions due to a lack of training and awareness of poultry farmers on biosecurity practices, and the lack of enforcement and monitoring of these practices on the farms.

Furthermore, the study results also revealed that 57% of the respondents properly disposed of their dead birds by either burning or burying them. These findings are consistent with a study conducted in Uganda, which found that nearly half (42%) of the respondents disposed of their dead birds by burning as compared to the study conducted in Khartoum State, Sudan, which found that only 7% of the farmers disposed of their dead birds properly.[24,25] This implies that good knowledge and attitude of the poultry farmers may influence certain practices regarding ND prevention such as appropriate disposal of dead poultry.

LIMITATIONS OF THE STUDY

1. The major challenge of the study was the unknown population size of small-scale poultry farmers in Lusaka West. Hence, obtaining a sample size which may not have been representative of the entire farmer's population in the area.
2. The use of a quantitative study design restricted the amount of information that was shared and obtained from the small-scale poultry farmers due to the closed-ended questions used.

Despite the aforementioned challenges, the study managed to sample 97 farmers, which stood as a representative sample. Although the questions were closed-ended, farmers were open enough to share more details on the objectives of the study and hence, more information was obtained on Newcastle disease prevention.

CONCLUSION

In this study, knowledge of Newcastle disease prevention among small-scale poultry farmers in Lusaka West, in Lusaka Zambia was found to be good (58.8%). This could have been attributed to the levels of experience that the majority of the respondents had in small-scale poultry farming. The

findings of this study revealed that the majority of the respondents (71.1%) had a positive attitude towards Newcastle disease prevention. This could be a result of the good levels of knowledge that most of the respondents had on Newcastle disease prevention. The study findings also showed that respondents had good levels of practice (73.2%) in Newcastle disease prevention. Practices such as timely vaccination (82%), implementation and adherence to biosecurity measures (87%) and proper disposal of birds (57%) are being implemented. The high levels of good practice could be attributed to the fear of losing birds and incurring any business losses.

RECOMMENDATIONS

Recommendations made with respect to the study findings are as follows;

To Ministry of Fisheries and Livestock; Lusaka City Council and Poultry Association of Zambia.

1. Promote awareness and knowledge on the importance of vaccination of birds as a means of prevention of Newcastle disease.
2. Improve and enhance Newcastle disease detection and control through rapid test kits, and optimisation of access to service delivery of vaccines in Lusaka, and the whole country, at large.
3. Put up programmes that offer training to small-scale poultry farmers on biosecurity, disease prevention and adoption of modern husbandry practices suitable for poultry production.
4. Adopt a national prophylactic vaccination policy that will indicate the vaccination schedule. For instance, mode of vaccination, period of vaccination, and revaccination.
5. Conduct targeted disease surveillance, prevention and control awareness campaigns.

Future Research

1. There is a need for further research on the extent to which small-scale poultry farmers adopt innovations such as vaccines and modern husbandry practices.
2. Further research is needed to determine the prevalence of Newcastle disease in Zambia.

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AUTHORS' CONTRIBUTION

Esther Munanjala and Chilufya Muya designed the study, interpreted results and wrote the report. E. Munajala collected and coded the data. C. Muya read and approved final manuscript, while B. Mumba edited and read the manuscript for completion.

DECLARATIONS

Ethics Approval

Ethical approval was sought from the Lusaka Apex Medical University Bio-Medical Research Ethics Committee (LAMUBREC) whose reference number is **00429-22**.

Consent for Publication

Not applicable

Availability of data and study materials

Not applicable

Conflict of Interest

The author declares no competing interests. This manuscript is not under review with any journal except UNZAJABS.

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