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Assessment of Antibiotics Usage in Aquaculture in Sokoto State, Nigeria

Bello Abdulrashid[1]*, Hassan Ibrahim[2], Usman Garba Rambo[3] and Saulawa Mahmud Abdullahi[4]

[1]Ministry of Animal Health and Fisheries Development Sokoto State, Nigeria.
[2]Public Health Emergency Operation Center, Zamfara State, Nigeria.
[3]Veterinary Teaching Hospital, Usmanu Danfodiyo University Sokoto, Nigeria.
[4]Department of Veterinary Public Health and Preventive Medicine, Faculty of Veterinary Medicine, Bayero University Kano, Nigeria.
Correspondence Author Email address: resheedtambuwal@gmail.com; Tel: +2348035377779

ABSTRACT

Currently, antibiotics are widely used in aquatic animals for prevention, control and treatment of infections, as food supplement for growth, to optimize productivity and prevent or reduce mortality. With the increasing use of veterinary drugs in aquatic food production, there is global concern about the rationale use of antimicrobials, the consumption of antimicrobial residues in aquatic foods and their effect on human health. This study was undertaken to assess and evaluate the antibiotics usage in aquaculture in Sokoto State, Nigeria. A structured questionnaire survey was conducted in which all the fifty-one (51) registered fish farmers in Sokoto State were interviewed. The results showed that thirty-five (68.627%) respondents admitted that they frequently administered drugs to their fish with or without veterinary prescription and supervision, while 31.373% of respondents were not using any antibiotics. So also, twenty-five (49.01%) respondents admitted ignorance of withdrawal period while thirty-one (60.78%) respondents admitted using Oxytetracycline singly or in combination with other antibiotics. It was observed that there is no significant association between the use of antibiotics and the educational qualification of the farmers (P>0.05). It is therefore, recommended that the government through participatory extension services, develop and encourage the aquaculturists to adopt innovations in fish farming especially those that discourage the indiscriminate use of antibiotics.

Keywords: *Antibiotics, Antimicrobials, Aquaculture, Nigeria, Oxytetracycline, Sokoto State*

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INTRODUCTION

The FAO has defined aquaculture as the farming of aquatic organism in both coastal and inland areas, involving interventions in the rearing process to enhance production. Aquaculture is the fastest-growing food-producing sector in the world, with an average annual growth rate of 8.9% since 1970, compared to 1.2% for capture fisheries and 2.8% for terrestrial farmed meat production systems over the same period (Subasinghe, 2005). World aquaculture has grown tremendously during the last fifty years from the production of less than a million tons in the early 1950s to 63.6 million tons by 2011 and with a production value of about USD 126.775 billion (FAO, 2012). Aquaculture production in Nigeria was about 200,535 metric tons in 2012, contributing about 24% of domestic fish production (FAO, 2012) and 259,106 metric tons in 2022 making it among the largest producers in Africa (Odu-onikosi, et. al., 2024). This is a significant increase considering the status as at 2006 where aquaculture production in Nigeria was about 40,000 metric tons contributing only 6% of domestic fish production (Adeogun et al., 2007).

Recent trends all over the world, is indicating a decline in landing from capture fisheries, an indicator that fish stocks have approached or even exceeded the point of maximum sustainable yield (Adewumi and Olaleye, 2011). Aquaculture, therefore, remains the only viable alternative for increasing fish production in order to meet the present demand and protein need of the people.

The intensification of aquaculture has led to the increasing use of drugs and other chemicals in order to reduce mortality and increase yield and production. Antimicrobial regiments are being employed prophylactically and therapeutically to combat the fish health condition and promote growth. A number of these chemoprophylactic and chemotherapeutic agents are used in feeds or directly into the culture after lowering the level of water.

Oxytetracycline, a broad-spectrum antibiotic discovered in the 1940s is active against a wide variety of bacteria (Rafati et al., 2018), it is widely used in aquaculture as a therapeutic or prophylactic agent because of its broad spectrum activity and its low price. It was the first antibacterial approved by United States Food and Drug Administration for use in finfish aquaculture (USFDA, 2009).The widespread use of these antibiotics for treating bacterial diseases has also been associated with the development of antibiotic resistance in *Aeromonas hydrophila, A.salmonicida, Edwardsiella tarda, E. icttaluri, Vibrio anguillarum, V. salmonicida, Pasteurella piscida* and *Yersinia ruckeri* (Serrano, 2005). In aquaculture sector, the widespread use of antibiotics for treating bacterial diseases or as a growth promoter is said to be associated with the development of antibiotic resistance in pathogenic bacteria (Griffin, 2000). The ingestion of antibiotic-contaminated fish has the potential of altering the human gut flora, favouring infectious micro-organisms such as *Salmonella* (Cabello, 2003). The objective of this research was to assess and evaluate routine antibiotic usage in aquaculture and the most commonly used antibiotics by aquaculturist in Sokoto State.

MATERIALS AND METHODS

Study Area

The study was conducted in Sokoto State, Nigeria. Sokoto State is located in the Northern Sudan Savanna ecological zone in Northern Nigeria. With a land area of 28,232.37sq kilometers, the state is located between longitudes 11° 30` East and 13° 50` East and between latitude 4°North and 6° North (Umar, 2013). It is bordered in the North by the Niger Republic, Zamfara State to the East and Kebbi State to the South and West (Figures 1 & 2). The population of Sokoto State based on 2016 population estimates by the National Population Commission is 4,998,100. The annual rainfall of Sokoto State stands around 600mm, while mean annual minimum and maximum temperatures of 21.5^{0}C and 34.9^{0}C respectively have been recorded (Umar, 2013). The dry season starts from October and lasts up to April in some parts and may extend to May or June in other parts. The wet season, on the other hand, begins in most parts of the State in May and lasts up to September or October (Adegboyega *et al.,* 2016).

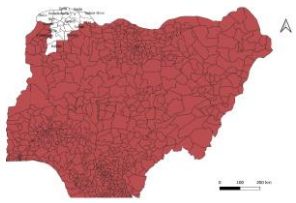

Figure 1: Map of Nigeria Showing Sokoto State

Figure 2: Map of Sokoto State, Nigeria

Study Design

The epidemiological study method used in this study was cross sectional. There is disproportionate distribution of the active fish farms across the 3 Agricultural Zones. Thirty-seven (37) farms from three local government areas were identified as active fish farms/ponds in Sokoto North Agricultural Zone and were all selected for questionnaire survey. Similarly, eight (8) and six (6) farms were identified as active farms from Sokoto South Agricultural Zone and Sokoto East Agricultural Zone respectively.

Questionnaire

All the fifty-one (51) identified fish farms and ponds in Sokoto State were registered for the questionnaire survey. A well-structured questionnaire pre-tested for validity was administered to all 51 identified active aqua culturists in Sokoto State. They were categorized into three groups according to their location within the three (3) agricultural zones as follows;

Sokoto South Agricultural/Senatorial Zone which comprises of Kebbe, Tambuwal, Shagari, Yabo, Bodinga, Dange-Shuni and Tureta Local Government Areas (LGAs).
Sokoto North Agricultural/Senatorial Zone comprises of Sokoto South, Sokoto North, Wamakko, Silame, Tangaza, Binji and Kware Local Government Areas (LGAs).
Sokoto East Agricultural/ Senatorial Zone comprises Gwadabawa, Illela, Gada, Goronyo, |Wurno, Rabah, Isa, and Sabon Birni Local Government Areas (LGAs).

The questionnaire comprises of sections on socio-demographic characteristics of the farmers, fish farming operations, knowledge and practices of antibiotic usage and the observance of the withdrawal period in their aquaculture. The questionnaire was validated by a group of experts (aquaculturists) from the Fisheries Department of the Faculty of Agriculture, Usmanu Danfodiyo University Sokoto. A pre-test of the questionnaire survey was carried out with four catfish producers in Kebbi State, for a better understanding and clarity of the questions. The practice of antibiotic usage including, indications, prescription, sources and administration, was assessed. Also, the farmers' knowledge and attitudes towards antibiotic residues and bacterial resistance were investigated.

Sampling

A purposive sampling technique was employed for the selection of LGAs from agricultural zones. In this case therefore, only LGAs with active fish farms were selected in this survey. All active farms within each selected LGAs were selected. This study interviewed all managers of selected fish farms in Sokoto State.

Data Analysis

Results of the questionnaire survey were tabulated and represented in percentages. SPSS software was employed for statistical analysis. Associations between variables (Education versus use of antibiotics and Education versus knowledge of withdrawal period) were determined using Chi-square.

RESULTS

The result of the questionnaire survey was extracted, analyzed and presented as follows;

Sex of Farmers

From the fifty-one (51) farmers that responded to this survey, forty-eight (48) (94.12%) were males, while three (3) 5.88% were females who are all from the Sokoto North Agricultural Zone.

Educational Level of Respondents

Among the socio-demographic attributes of the farmers, is their educational level. They were asked about their level of education as follows; Non-formal education, primary education, secondary education and tertiary education; the result is as presented in (Table 1). The result showed 37 (72%) farmers are educated up to tertiary level, followed by secondary education level with 11 (21%) respondents. Only one of the respondents had primary education while 2 3.92% have non-formal education.

Table 1: Level of Education of Farmers.

Education level of farmer	No. of Respondents	Percentage (%)
Non-formal education	2	3.92
Primary education	1	1.96
Secondary education	11	21.57
Tertiary education	37	72.55
Total	51	100

Use of Antibiotics in Fish Farming

Farmers were also asked whether they use antibiotics in their culture or not and how often they use them. Thirty-five (35) farmers representing (68%) revealed that they routinely administer antibiotics to their fishes.

Types of Antibiotics Used

The thirty-five (35) farmers that responded to using antibiotics in their culture were further asked about drugs they use in their fish farming. Are they using single-constituent drugs or multi-constituent drug formulations? The investigation revealed that 60% of those using antibiotics uses Oxytetracycline as a single constituent drug, nonetheless, others admitted to using several drug combinations ranging from Oxytetracycline-Penicillin, Oxytetracycline-Gentamicin. Other single constituent drugs reportedly used by the farmers are Erythromycin, Enrofloxacin, and Penicillin among others. As shown in the (Table 2).

Table 2: Farmer's Responses to the Questionnaire.

Antibiotics Used in Culture	No. of Users	Percentage (%)
Oxytetracycline alone	21	60
Oxytetracycline vs Penicillins	5	14.286
Oxytetracycline vs Erythromycin	2	5.714
Oxytetracycline vs Gentamicin	1	2.857
Oxytetracycline vs Metronidazole	1	2.857
Oxytetracycline vs Sulphadimethoxine	1	2.857

Table 2: Contd

Enrofloxacine alone	1	2.857
Erythromycine alone	1	2.857
Sulphadimethoxine vs Gentamycin	1	2.857
Penicillin	1	2.857
Total	35	100

Knowledge of Withdrawal Period and Antibiotics Residue

The knowledge of farmers with respect to the importance of drug residues in food animals and observance of withdrawal periods of the drugs they routinely use in their fish farms before disposing of their fish was also investigated. From their responses, twenty-six (50.98%) of the farmers admitted to being aware and also observes the withdrawal period of the drugs.

Relationship between Educational Level and the Use of Antibiotics

The association between the educational qualification of the farmers and the use of antibiotics were statistically tested by chi-square using SPSS software. Educational level and the use of antibiotics as variables were statistical analyzed, after which it was observed that there was no significant association between the use of Antibiotics and educational qualification of the farmers (P>0.05) (Table 3).

Table 3: Statistical Relationship between Education and Use of Antibiotics

Use of Antibiotics			
Education		No	Yes
	Non formal education	0	2
	Secondary Education	2	10
	Tertiary education	12	25
Total		14	37

P= 0.630. Kappa= 0.018

Relationship between Education and Knowledge of Withdrawal Period

In this study it was interestingly found that there is a link between educational level and Knowledge of withdrawal period. Because farmers with a tertiary level of education were found to be more aware of the withdrawal period of drugs. While those with no formal education had the least awareness of the drug withdrawal period (Table 4).

Relationship between Education and Knowledge of Drug Residues

Similarly, this study found that farmers with tertiary education are more aware of drugs residue in fish tissue in relation to those with non-formal education. This relationship was found to be statistically significant (P<0.05) as shown in (Table 5).

Table 4: Relationship between Education and Knowledge of Withdrawal Period

Knowledge of the Withdrawal Period				
Education		No	Yes	Total
	Non formal education	1	1	2
	Secondary Education	10	2	12
	Tertiary education	15	22	37
Total		25	37	51

P = 0.024. Kappa = -0.088.

Table 5: Relationship between Education and Knowledge of Drug Residue

Knowledge of the Withdrawal Period				
Education		No	Yes	Total
	Non formal education	1	1	2
	Secondary Education	10	2	12
	Tertiary education	15	22	37
Total		25	37	51

P = 0.024. Kappa = -0.088.

Following tertiary education, are the farmers with secondary education in terms of knowledge of drug residue.

DISUSSION

In recent years, the rapid growth in the human population, exacerbated by conflicts and famine accounts for a significant proportion of the global food challenges. Satisfying the increase in demand for food has led to intensification and mechanization of agricultural practices. Aquaculture is a large and growing industry that contributes about 60% of the world supply of protein (Olatoye and Basiru, 2013). In Nigeria, there has been a steady increase in aquaculture practice in the form of small, medium and large-scale production with catfish being the most popular. However, challenges facing the industry ranges from infectious and non-infectious diseases which constitute major constraints. Overcoming these challenges has resulted in the indiscriminate use of drugs for either treatment of diseases or as growth promoters.

The findings of this study showed that majority of the respondents (94.12%) were males. This implies that males were more involved in fish farming in Sokoto state. This is evident also by the more males on the register of the Sokoto State Catfish Farmers Association than females. The dominance of males in aquaculture in Sokoto state might be cultural. This finding is in agreement with the finding in a similar survey conducted on antimicrobial usage in livestock management in North-Eastern Nigeria by Sunday *et al*. (2017) in which 54% of respondents were males. It is also in agreement with a recent study conducted on commercial poultry layer farmers in South-west Nigeria by Adebowale *et al.* (2016), in which 71.8% of respondents were identified as males.

This study also reported that majority of those engaged in fish farming in Sokoto State ware educated to tertiary education level (72%), compared to those who have only secondary education. This trend may be as a result of sustained government engagement of educated youths into agriculture in order to reduce the level of unemployment which is high. This corroborated the recent study by Adebowale *et al*. (2016) where 83.5% of the respondents were reported to have attended tertiary education. Nevertheless, the level of education of farmers does not seem to influence the use of antibiotics in their respective fish farms ($p>0.05$), as many of the farmers were found to engage in uncontrolled use of antibiotics without veterinary prescription and supervision.

The findings of this study on the use of antibiotics, indicated that majority (68%) of farmers administered antibiotics to their fish or aquaculture with or without veterinary supervision. This according to most of them was to reduce mortality and improve productivity especially during the early phase and the last phase of the culture. Olatoye and Basiru (2013) reported in their study that, 95% of the respondents frequently administered drugs (in feed and water) to their fish without veterinary prescription.

Oxytetracycline has been observed in this study as the most commonly used antibiotics in aquaculture in Sokoto State, perhaps because they are cheap, effective and readily available in the market, as 60.78% of the respondents admitted using Oxytetracycline singly or in combination with other antibiotics in feed or in water, at least once during each farming cycle. This concurs with the findings of the study on antibiotics usage in aquaculture by Olatoye and Basiru, (2013) who reported that, Oxytetracycline was the most frequently administered antibiotics both to the fish stocks and fish feed by 73% of the respondents. Also supporting the findings in this study were studies in poultry production in Ogun, South West Nigeria by Adebowale *et al.* (2016) which reported tetracycline as the most frequently used antibiotics by majority of poultry farmers.

About half (51%) of the respondents admitted ignorance of the withdrawal period of the drugs as well as residue of such drugs in edible tissue of the fish offered for human consumption, they were not observing the withdrawal periods of antibiotics. This ignorance is particularly dangerous and is of serious concern to public health. It might be due to lack of awareness which might be due to eminent lack or unavailability of fish veterinary specialist as complained by majority of the respondents. However, there seems to be a significant relationship between the educational level of the farmers and the knowledge of the withdrawal period of drugs in fish ($p<0.05$). This indicates that, the higher the educational level of the farmer, the more he may be aware of a drug withdrawal period and drug residue. This finding was similar to what was obtained in previous studies which reported that 85.5% of the respondents were neither aware of the withdrawal period for antibiotics nor the potential hazards of antibiotic residue in human (Olatoye and Basiru 2013).

REFERENCES

Adebowale O. O., Adeyemo O. K Olajoju Awoyomi, Racheal Dada and Oluseyi Adebowale (2016). Antibiotic use and Practices in Commercial Poultry Laying Hens in Ogun State Nigeria, *Revue d'élevage et de médecine vétérinaire des pays tropicaux,* 40-45

Adeogun O.A., Ogunbadejo H.K., Ayinla O.A., Oresegun A., Oguntade O.R., Tanko A. and Williams S.B. (2007). Urban Aquaculture: Producer Perceptions and Practices in Lagos State, Nigeria*. Middle-East J. Sci. Res*. 2 (1): 21-27

Adewumi and Olaleye (2011). Catfish Culture in Nigeria: Progress, Prospects and problems. *African Journal of Agricultural Research,* 6(6): 1282-1285.

Cabello F.C. (2003). Heavy Use of Prophylactic Antibiotics in Aquaculture: a Growing Problem for Human and Animal Health and for the Environment. *Environmental Microbiology,* 8(7): 1137-1144.

Food and Agricultural Organisation (FAO) (2012). FAO. The State of the World Fisheries. Food and Agriculture Organization, Rome, Italy 230pp.

Olatoye I. O. and Basiru A. (2013). Antibiotic Usage and Oxytetracycline Residue in African Catfish. *world journal of fish and marine sciences,* 5(3): 302-309.

Rafati L., Mehdi M., Mohamed H.E. and Aria S. (2018). The Analysis of Oxytetracycline Residue in Tissues of Cultured Rainbow Trout (*Oncorhynchus mykiss*). *Health Scope international quarterly journal*, 7: 2.

Serrano P. H. (2005). Responsible Use of Antibiotics in Aquaculture. Food and Agricultural Organisation of the united nation, Rome: 2-12.

Subasinghe R., Arthur J., Phillips M., and Reantoso M. (2005).Thematic Review on Management Strategies for Major Diseases in Shrimp Aquaculture. *FAO, UN, Cebu, Philippines. Tropical Medicine and Hygiene,* 95: 127-130.

Umar, A. T. (2013). Evidence of Climate Change, The Impact of Climate Change on Sokoto State, Nigeria: Evidence and Challenges, *1st edit,* UNDP/Sokoto State Government.

United States Food and Drug Administration (USFDA) (1997). Extra label Animal Drug Use: Fluoroquinolones and Glycopeptides; Order of Prohibition. *Federal Registrar*, 62(99): 27944-27947.