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Use of Antibiotics and Knowledge of Antibiotics Resistance by Selected Farmers in Oyo Town, Nigeria

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Abstract. This survey was carried out to investigate antibiotics usage and knowledge of antibiotic resistance among farmers in Oyo town, Nigeria. Data was collected using a questionnaire and interviews. A snowball sampling technique was used to select 150 farmers and veterinary drug shop owners. The famers were involved in cattle, fish and poultry faming. The farmers administered antibiotics to their animals when the animals were sick (curative), to prevent secondary bacterial infection after a viral infection and on healthy animals (for prophylaxis). Majority of the respondents had easy access to antibiotics and information about them. On average, farmers had some knowledge about antibiotics resistance but not on how it spread. About 62% of the respondents believed that antibiotic resistance was a problem of other countries not Nigeria. They also did not believe that sub-optimal dosing of antibiotics leads to resistance. It was concluded that there is need for public awareness on the risk of misuse of antibiotics in animals and of consuming livestock products with unsafe levels of antibiotic residues.

Keywords: Antibiotics, Drug resistance, Livestock.

INTRODUCTION

Antibiotics are naturally occurring, semi-synthetic and synthetic compounds with antimicrobial activity that can be applied parentally, orally or topically (Geidam *et al.*, 2009). They are among the most widely used veterinary drugs in the livestock industry (Simon and Baxter, 2006) to enhance growth rates, health, feed efficiency, production, or for therapeutic reasons (Dipeolu *et al.*, 2002; Donoghue, 2003).

In Nigeria, a large population of poultry, fish and cattle farming is done by the so-called backyard farmers who readily have access to veterinary (vet) drugs and quite often purchase drugs over the counter for administration without veterinary prescription and supervision. This results in the indiscriminate use of these drugs, especially in food animals (Dipeolu, 2004). Consequently, the inappropriate use and handling of these antibiotics has led to occurrence of harmful residues in edible animal products like milk (Olatoye and Ehinmowo, 2009; Shareef *et al.*, 2009). Veterinary drug residues in animal products may be produced by exposing animals to drugs or contaminants in a numbers of ways including:

- Failure to adhere to official drug use instructions.
- Use of feed unintentionally cross contaminated during feed mixing

- Use of mislabelled feed
- Pesticide, chemical or heavy metal contamination of feed ingredients or water (Donoghue, 1998; Donoghue, 2001; Sasanya *et al.*, 2005; Doyle, 2006).

Currently, a large populace of Nigeria is at high risk of ill-health caused by the consumption of animal products from animals with toxic levels of antibiotic residues. Taking cognizance of this risk, this study was conducted to assess the knowledge of antibiotics and antibiotics resistance among cattle, poultry and fish farmers and veterinary drug shop owners in Oyo town Nigeria.

METHODS

The study was conducted in Oyo town, Oyo State, Nigeria. A close ended questionnaire was used to seek information from farmers about the use of antibiotics on their various farms. Questionnaire was used in face-to-face interview with the farmers. The research maintained absolute confidentially throughout the study. A total of 150 respondents consisting of poultry farmers, fisheries farmers, cattle farmers and vet shop owners were interviewed.

RESULTS

Table 1: Socio-economic characteristics

		Poultry n(54)	Fishery n(34)	Cattle n(34)	Vet shop operators n(28)	Total 150
Gender	Male	38(70.37%)	24(70.59%)	27[79.41]	19(67.86%)	108(72%)
	Female	16(29.63%)	10(29.41%)	7[20.59]	9(32.14%)	42(28%)
Age	20-30	3(5.56%)	3(8.82%)	4(11.76%)	3(10.71%)	13(8.67%)
	31-40	6 (11.11%)	7 (20.59%)	16 (47.06%)	8 (28.56%)	37(24.67%)
	41-50	25 (46.30%)	15 (44.12%)	4 (11.76%)	10 (35.71%)	54(36%)
	51-60	16 (29.63%)	5 (14.71%)	5 (14.71%)	4 (14.29%)	30(20%)
	61 +	4(7.41%)	4 (11.76%)	5 (14.71%)	3 (10.71%)	16(10.67%)
Marital status	Married	31(57.41%)	20(58.82%)	20(58.83%)	23(82.14%)	94(62.67%)
	Single	17(31.48%)	12(35.29%)	10(29.41%)	4(14.29%)	43(28.67%)
	Widow	0(0%)	2(5.88%)	3(8.82%)	1(3.57%)	6(4%)
	Divorced	6(11.11%)	0(0%)	1(2.94%)	0(0%)	7(4.67%)
Family size	1-5	9(16.67%)	14(41.18%)	1[2.94%]	6(21.43%)	30(20%)
	6-10	25(46.30%)	10(29.41%)	4[11.76%]	16(57.14%)	55(36.67%)
	11 +	20(30.04%)	10(29.41%)	13[38.24%]	6(21.43%)	49(32.67%)
Education	Illiterate	0(0%)	2(5.88%)	22(64.71%)	0(0%)	24(16%)
	Primary	1(1.85%)	1(2.94%)	8(23.53%)	0(0%)	10(6.67%)
	SSCE	22(40.74%)	15(44.12%)	2(5.88%)	5(17.86%)	44(29.33%)
	NCE	6(11.11%)	1(2.94%)	0%	6(21.43%)	13(8.67%)
	OND	6(11.11%)	8(23.53%)	0%	0(0%)	14(9.33%)
	HND	3(5.55%)	5(14.71%)	0%	2(7.14%)	10(6.67%)
	BSc	16(29.63%)	2(5.88%)	2(5.88%)	14(50%)	34(22.67%)
	MSc	0(0%)	0(0%)	0%	1(3.57%)	1(0.67%)

The result of socio- economic parameters is presented in Table 1. It was observed that male constituted majority in poultry, fish, cattle and vet shop owner. In poultry 70.37% were males while females were 29.63%, in fishery 70.59% were male while

female were 29.41%, in cattle production 79.41% were male while female were 20.59%, 67.86% of vet shop owners were male while females were 32.14%. The highest number of farmers were with the age range of 41-50 years and most of the farmers were married. SSCE holders were in the majority, and there were no PhD holders among the farmers. Sixteen percent (16%) of the respondents were illiterate with 67.7% of these being cattle farmers.

From Table 2, 36% of the respondents were poultry farmers, and 22.67% were fish farmers, while 22.67% were cattle farmers and 18.67% were vet shop owners. About Eleven percent (11.48%) of the respondents practiced extensive, and 39.34% practiced semi intensive, and 47.54% practiced intensive system of farming (Table 3).

Table 2. Animal Species.

	Frequency	(%)
Layers birds	54	36.0
Fishery	34	22.67
Cattle	34	22.67
Vet shop	28	18.67
Total	150	100

Table 3. Production System

Parameter	Poultry	Fishery	Cattle	Total
Extensive	6 (11.11%)	0 (0%)	8 (23.53%)	11.48%
Semi intensive	18 (33.33%)	10 (29.41%)	20 (58.82%)	39.34%
Intensive	30 (55.56%)	24 (70.59%)	4 (11.76%)	47.54%

Table 4. Access to antibiotics and information related to antibiotics.

		Poultry n(54)	Fishery n(34)	Cattle n(34)	Vet Shop operators n(28)	Overall
Access to antibiotics	Very Easy	15 (27.78%)	5 (14.71%)	7 (20.59%)	1 (3.57%)	18.67%
	Easy	35 (64.81%)	27 (79.41%)	25 (73.53%)	27 (96.43%)	76%
	Difficult	4 (7.41%)	1 (2.94%)	1 (2.94%)	0%	4%
	Very Difficult	0%	1 (2.94%)	1 (2.94%)	0%	1.33%
Access to information	Very easy	16 (29.63%)	5 (14.71%)	10 (29.41%)	1 (3.57%)	21.33%
	Easy	35 (64.81%)	27 (79.41%)	20 (58.82%)	25 (89.29%)	71.33%
	Difficult	3 (5.56%)	0%	1 (2.94%)	2 (7.14%)	4%
	Very Difficult	0%	2 (5.88%)	3 (8.82%)	0%	3.33%
Sources of information	Mobile Salesmen	30 (55.56%)	19 (55.88%)	22 (64.71%)	9 (32.14%)	53.33%
	Drug leaflet	24 (44.44%)	15 (44.11%)	12 (35.29%)	19 (67.86%)	46.67%

Majority of the respondents from all the categories survey had easy access to antibiotics with poultry farmers at 64.81%, fish farmers at 79.41%, cattle farmers at

73.53% and vet shop owners at 96.43%, this was also true for access to information about antibiotics. Knowledge of farmers about antibiotics is presented in Table 5. On the average, farmers have some knowledge about antibiotics resistance with about 50% knowing there is something called antibiotics resistance. The score became low when farmers were asked about how this resistance spread, with majority responding that person to person spread is not possible, and that animal to human spread is also false, they responded that it occurred in people taking antibiotics alone.

About 62% believed that antibiotic resistance was a problem of other countries but not Nigeria. They also did not believe that sub-optimal dosing of antibiotics that lead to resistance.

Table 6 indicated that oxytetracycline (72.78%) were the most commonly used among the respondents. In vet shop the bestselling antibiotics was oxytetracycline which constituted 89.29% followed by doxycycline which is 82.14% and tyrosine which constituted 64.29%. Majority of the farmers had no idea about the super bugs and antibiotic resistance bacteria (Table 8).

Table 5. Knowledge of antibiotics resistance among farmers

Variables	Poultry	Fishery	Cattle	Vet shop operators	Overall
Antibiotics resistance occurs when your body becomes resistance to antibiotics and they no longer work as well.					
True	35 (64.81%)	16 (47.06%)	20 (58.82%)	16 (57.14%)	87 (58.0%)
False	19 (35.19%)	18 (52.94%)	14 (41.18%)	12 (42.86%)	63 (42%)
Total	54	34	34	28	150
Many infections are becoming increasingly resistant to treatment by antibiotics					
True	30 (55.56%)	20 (58.82%)	18 (52.94%)	18 (64.29%)	86 (57.33%)
False	24 (44.44%)	14 (41.18%)	16 (47.66%)	10 (35.71%)	64 (42.67%)
Total	54	34	34	28	150
If bacteria are resistant to antibiotics it can be very difficult or impossible to treat the infections they cause					
True	18 (33.33%)	23 (67.65%)	19 (55.88%)	20 (71.43%)	80 (53.33%)
False	36 (66.67%)	11 (32.35%)	15 (44.12%)	8 (28.57%)	70 (46.67%)
Total	54	34	34	28	150
Antibiotic resistance is an issue that could affect me and my family					
Yes	32 (59.26%)	18 (52.94%)	19 (55.88%)	16 (57.14%)	85 (56.67%)
No	22 (40.74%)	16 (47.06%)	15 (44.12%)	12 (42.86%)	65 (43.53%)
Total	54	34	34	28	150
Antibiotic resistance is an issue in other country but not here					
False	20 (37.04%)	8 (23.53%)	11 (32.35%)	18 (64.29%)	57 (38%)
True	34 (62.96%)	26 (76.47%)	23 (67.65%)	10 (35.71%)	93 (62%)
Total	54	34	34	28	150
Antibiotics resistance is only a problem for people who take antibiotics regularly					
True	20 (37.04%)	7 (20.59%)	8 (23.04%)	18 (64.29%)	53 (35.33%)
False	34 (62.96%)	27 (79.41%)	26 (76.47%)	10 (35.71%)	97 (64.67%)
Total	54	34	34	28	150
Bacteria which are resistance to antibiotics can be spread from person to person					
True	18 (33.33%)	12 (35.29%)	10 (29.41%)	22 (78.57%)	62 (41.33%)

False	36 (66.67%)	22 (64.71%)	24 (70.59%)	6 (21.43%)	88 (58.67%)
Total	54	34	34	28	150
Antibiotic resistance infection could make medical procedures like surgery, organ transplant, and cancer treatment much more dangerous					
True	20 (37.04%)	6 (17.65%)	5 (14.71%)	20 (71.43%)	51 (34%)
False	34 (62.96%)	28 (82.35%)	29 (85.29%)	8 (28.57%)	99 (66%)
Total	54	34	34	28	150
Antibiotic resistance in human can occur from indiscriminate use of antibiotics in animal					
TRUE	23 (42.59%)	13 (38.24%)	15 (44.12%)	19 (67.86%)	70 (46.67%)
False	31 (57.41%)	21 (61.76%)	19 (55.88%)	9 (32.14%)	80 (53.33%)
Total	54	34	34	28	150
Sub optimal dosing of antibiotics in animal can lead to antibiotic resistance in animal					
True	25 (46.30%)	16 (47.06%)	6 (17.65%)	20 (71.43%)	67 (44.67%)
False	29 (53.70%)	18 (52.94%)	28 (82.35%)	8 (28.57%)	83 (55.33%)
Total	54	34	34	28	150

Table 6. Common antibiotics use and active ingredients

Active ingredient	Antibiotic	Poultry	Fishery	Cattle	Vet shop operators	Overall
Tetracycline	Oxytetracycline	42[77.78%]	25[73.53%]	16[47.06%]	25[89.29%]	72%
Tetracycline	Doxycycline	2[3.70%]	1[2.94%]	0[0%]	23[82.14%]	17.33%
Aminoglycoside	Neomycin	14[25.93%]	1[2.94%]	0[0%]	13[46.43%]	18.67%
Aminoglycoside	Streptomycin	37[68.52%]	15[44.12%]	12[35.29%]	20[71.43%]	56%
Aminoglycoside	Gentamicin	7[12.96%]	0[0%]	4[11.76%]	1[39.29%]	8%
Penicillin	Benzypenicillin	6[11.11%]	4[11.76%]	2[5.88%]	5[17.86%]	11.33%
Penicillin	Procaine penicillin	4[7.41%]	0[0%]	0[0%]	13[46.43%]	11.33%
Fluoroquinolones	Norfloxacin	5[9.26%]	1[2.94%]	1[2.94%]	15[53.57%]	14.67%
Fluoroquinolones	Enrofloxacin	4[7.41%]	1[2.94%]	1[2.94%]	11[39.29%]	11.33%
Fluoroquinolones	Tyrosine	6[11.11%]	3[8.82%]	4[11.76%]	18[64.29%]	20.67%
Macrolide	Erythromycin	1[1.85%]	0[0%]	1[2.94%]	3[10.71%]	3.33%

Table 7. Purpose of Antimicrobial Use in Selected Farms

Diseases	Poultry n(54)	Fishery n(34)	Cattle n(34)
Gomboro	27(50%)	0(%)	0 (0%)
Newcastle	25 (46.30%)	0(0%)	0(0%)
CRD	50 (92.59%)	0 (0%)	0 (0%)
Coryza	23 (42.59%)	0 (0%)	0 (0%)
Coccidiosis	37 (68.52%)	(0%)	0 (0%)
Worms	31 (57.41%)	30 (88.24%)	19(55.88%)
Prophylaxis	43 (79.63%)	29 (85.29%)	15 (44.12%)
Others	17 (31.48%)	20 (58.82%)	8 (23.53%)

Table 8. Knowledge about Antibiotics

		Poultry n(54)	Fishery n(34)	Cattle n(34)	Vet shop operators n(28)	Overall
Super bugs	Yes	28 (51.85%)	6 (17.65%)	14(41.18%)	16 (57.14%)	64(42.67%)
	No	26 (48.15%)	28 82.35%)	20 (58.82%)	12 (42.86%0	86(57.33%)
Antibiotics resistance bacteria	Yes	31 (57.41%)	14 (41.18%)	9 (26.47%)	19 (67.86%)	72(48.67%)
	No	23 (42.59%)	20 (58.82%)	25 (73.53%)	9 (32.14%)	77(51.33%)
Where did you hear about it?	1. Doctor	12 (22.22%)	5 (14.71%)	0 (0%)	1 (3.57%)	18(12%)
	2. Pharmacist	10 (18.51%)	5 (14.71%)	1 (2.94%)	7 (25%)	23(15.33%)
	3. Family member	15 (27.78%)	5 (14.71%)	3 (8.82%)	0 (0%)	23(15.33%)
	4. Media	12 (22.22%)	10 (29.41%)	1 (2.94%)	4 (14.29%)	27(18%)
	5. Specific campaign	5 (9.26%)	1 (2.94%)	0 (0%)	11 (39.29%)	17(11.33%)
	Others	0 (0%)		0(0%)	5 (17.86%)	6(4%)

DISCUSSION

The present study was undertaken to investigate antibiotics usage by livestock farmers in Oyo town, Oyo State Nigeria. The massive use of antimicrobial agents in agriculture has supported the intensification of modern food-animal production since the early 1960s by facilitating early weaning, higher animal stocking densities, and the use of cheaper feed sources, among others, and has most likely contributed to increased outputs and lower prices of meat (Wegener, 2012). The findings in the present survey revealed that the majority of the respondents were males constituting 72% of the farmers. This finding concurs with a recent study conducted on commercial poultry layer farmers in southwest Nigeria by Adebowale *et al*., (2016) in which they reported 71.8% of respondents as men and 14.6% as women. The present study also reports that higher percentage (36%) of respondents were between 41 to 50 years of age (adults) as at the time of data collection and were the major livestock farmers observed during the course of the study. This might suggest that age is significant in livestock management. Similar finding was observed in a recent study (Adebowale *et al*., 2016) where83.5% of the respondents were reported to have attended tertiary education. One must be an adult to acquire this level of education. However, age is insignificant in livestock management when experience is the point of consideration. .

Antibiotics used in veterinary practice are in the form of therapeutic, prophylactic and growth promoters and can be used rationally or irrationally (Beyene and Tesega, 2014; Gilbert, 2012). The findings in this study indicated that farmers administered antibiotics on their animals when the animals were sick (for treatment), to prevent secondary bacterial infection after a viral infection and on healthy animals (for prophylaxis). Similar observations were reported recently in poultry production systems in Nigeria (Adebowale *et al.,* 2016; Oluwasile *et al*.,2014; Geidam *et al*., 2012), Cameroon (Kamini *et al*., 2016), Ghana (Boamah *et al.,* 2016)and Brazil (Medeiros *et al.,* 2011) in which antibiotics were administered for treatment and prophylaxis, and as growth promoters. This routine practice of administering antibiotic agents to domestic livestock for treatment, prophylaxis as well as, for growth promotion, is mostly found to influence the emergence of antibiotic-resistant bacteria that are subsequently transferred to humans through the food chain (Guetiya *et al*., 2016; Carlet *et al*., 2012;Byarugaba *et al*., 2011; Silveira *et al.,* 2009;). Although, antibiotics use as growth promoter or feed supplements have been found to improve feed conversion efficiency and increase weight gain in livestock animals (Graham *et al.,* 2007), irrational use of antibiotics on animals has caused treatment failures in many conditions and consequent drug residual effecting edible livestock products (meat, milk and egg) upon consumption by humans of insufficiently cooked products (Lawal *et al*., 2015; Vitomir *et al*., 2011) due to overuse of antibiotics in food animals. Fish farmers use antibiotics and other antimicrobial agents mostly for the prevention and treatment of diseases in fish (Bager, 1997). Though some farms do not use antibiotics directly, fish farming practices such as the use of animal manure, waste water, human excreta in fish farms and disposal of untreated effluents from fish farms may contribute to antibiotic resistance in fish farms and adjoining water bodies (Cox and Snell, 1989; Coyne *et al*., 1994).

In this study oxytetracycline was observed as the most common and frequently selected antibiotic by farmers, followed by tetracycline and collotin

antibiotics. Tetracyclines and aminoglycosides were reported as the most frequently used antibiotics in chickens in Maiduguri (Akidarju *et al*., 2010) in agreement with the finding in this study. Also supporting the findings in this study were studies in poultry production in Ogun, Southwest Nigeria where Awosile *et al*. (2014) reported that antibiotics were commonly administered either for therapy (36.2%), prophylaxis (29.3%), or both (32.8%) and to lesser extent for growth promotion (6.9%). While Neoceryl[R] (a commercially prepared broad spectrum antibiotics consisting of neomycin, erythromycin, oxytetracycline, streptomycin and colistin), Enrofloxacin and Furazolidone were the commonest antibiotics used. Similarly, in South Africa, Horton *et al*., (2011) reported tyrosine, followed by tetracyclines, oxytetracycline and penicillins as the most frequently used antibiotics in poultry. Farmers have easy access to antibiotics without a doctor's reference this could lead to abuse of antibiotics. Unfortunately, drug residues induces resistance and ineffectiveness of the drug (Donkor *et al*., 2011). WHO (2011) referred to this development as one of the most serious risks to human health at the global level. Farmers are important actors in modulating their on-farm antimicrobial use (Kramer *et al*., 2017). In this study, the knowledge of antibiotic resistance, superbug and antibiotic resistance bacteria was low among the farmers and this is seen as an impediment to controlling antibiotic resistance in both animal and humans. A high percentage of the farmers interviewed did not believe that antibiotic resistance can be transmitted from person to person and from animals to humans. These responses by farmers were found to be false because according to Canada *et al* (2017) the accumulated scientific evidence that some uses of antibiotics in food-producing animals can lead to antibiotic resistance in intestinal bacteria, and this resistance can then be transmitted to the general population, causing treatment-resistant illness. The use of antibiotics in food-producing animals can also create antibiotic resistance in non-pathogenic bacteria, the resistance genes can then be transferred to disease-causing bacteria, resulting in antibiotic-resistant infections for humans. It has also been confirmed that livestock manure disposal is one of the biggest ways antibiotic residues and resistant bacteria enter the environment.

The most popular route of communication through which farmers got their information about drug and drug-related issues was the media. Abubakar *et al*.,(2009) in their study shows that access to mass media on agricultural information of farmers in Kebbi state is through radio and television, and most of them indicated that the media sources are conventional, accessible and preferred to listen to the agricultural programmes in the night time (8pm -11.59pm). Scanfeld *et al*. (2010) in his research on the dissemination of health information through social networks like Twitter concluded that social media sites offer a means of sharing health information. Hence the media, both conventional and social was found to be efficient means of dissemination of information about use of antibiotics and potentials for antibiotic resistance in animals which can be transferred to humans. Generally speaking, mass media help extension agents to reach large numbers of farmers simultaneously. However, there is little opportunity for these farmers to interact among themselves or to provide feedback to the extension agents (van der Mheen-Sluijer, 1995).

Infections with antibiotic-resistant bacteria result in increased mortality, morbidity, and social and economic costs (de Kraker *et al*. 2011; Cosgrove and Carmeli, 2003; Cosgrove, 2006). By 2050, an estimated 10 million deaths per year

globally will be attributable to antimicrobial resistance, with a cumulative economic cost of US$100 trillion.

WHO has created a set of strategies to combat rising antibiotic resistance, which include improving sanitation and hygiene to reduce overall infection rates, and optimising the use (and preventing the overuse) of antibiotics in both humans and animals (WHO, 2015). In the battle against antibiotic resistance, greater emphasis should be placed on disease prevention, which includes strengthening hygiene and control practices and improving sanitation. Nigeria can learn from Australia which has extensive livestock production systems with comparably low use of antimicrobials due to strict biosecurity measures and regulatory control of veterinary chemicals which have contributed to a low antimicrobial risk status in food-producing animals (DPIRD, 2018). Organic farming is another way of reducing antimicrobial resistance, according to Misiewicz and Shade (2016) that organic livestock production, which prohibits the use of antibiotics for growth promotion or prophylactic purposes, provides a compelling example of successful, profitable operations and demonstrates the ability of livestock farms to operate without substantial antibiotic use.

CONCLUSION

There is need for public awareness through media programmes to educate the populace of the risk of consuming livestock products with illegal levels of antibiotic residues. The Federal and State Government authorities of Nigeria should mandate a legislation regarding drug use and veterinary drug residue control. They should also provide some basic facilities for nationwide specific residue monitoring programme and periodic surveillance of antibioticresidues in edible tissues at the level of abattoir, farms, market etc.

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