The Haryana Veterinarian (September, 2023) **62(SI-2),** 6-11 ISSN 0033-4359 (P) **Research Article**

ASSESSMENT OF DAIRY FARMER'S KNOWLEDGE, ATTITUDE AND PRACTICES ON ANTIBIOTICS AND ANTIMICROBIAL RESISTANCE

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ABSTRACT

An ex-post facto research design was used for the study with the objective of assessing the knowledge, attitude and practices followed by dairy farmers toward antibiotic use and antimicrobial resistance (AMR). A total of 120 respondents were purposively selected from two districts of Maharashtra and data was collected through a structured interview schedule. Collected data were exposed to statistical analysis, knowledge, attitude, and practices (KAP) index and results were interpreted. Almost all the variables studied *viz.* age group (67.50%), education level (61.66%), annual income (74.17%), landholding (48.33%), herd size (75.00%), experience (71.66%), milk production (79.16%), social participation (80%), extension contacts (53.33%), knowledge level (80.33%), attitude (68.33%), and practices (78.33%) grouped under medium level. Respondents had low to medium levels of knowledge about antibiotics and their use while little knowledge regarding antimicrobial resistance. The majority of the respondents used antibiotics for the treatment of animals, however, knowledge of the specific use of antibiotics, dose regime, storage, expiry, residual effect and risk of spread to humans was low to moderate. The majority of dairy farmers had an unfavorable attitude and followed low to medium levels of good practices toward the use of antibiotics and antimicrobial resistance. A significant association between education, social and extension contact of the respondents with knowledge, social and extension contact with attitude and practices score was observed. Thus, applicable informative interventions should be intended to reach and educate the farmers about the rational use of antibiotics and the development of antimicrobial resistance. Periodic training programs, awareness campaigns, workshops and demonstrations are necessary to raise awareness about the use of antibiotics and AMR.

Keywords: Antimicrobial resistance, KAP, Dairy farmers

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Development of AMR is a complex phenomenon and as a part of microbial survival strategy, it is highly challenging to mitigate AMR issues. Overuse, misuse, over-the-counter sale of antimicrobials, and their use as animal growth promoters (AGP) in livestock and poultry are considered as factors responsible for AMR spread (Landers *et al.*, 2012). Indian alone consume 3% of the total global antimicrobials in food-producing animals (Van Boeckel *et al.*, 2015). In dairy animals, antimicrobials are commonly used for treating various infections including mastitis. Due to the heavy use of antibiotics, commensal bacteria found in animals can acquire resistance (Sharma *et al.*, 2020). Studies on the drivers and determinants of antibiotic use in Indian dairy farms are lacking (Hosain *et al.*, 2021). Moreover, reliable data on the quantity and patterns of use of antimicrobials and the knowledge level of dairy farmers on AMR are not available. A study from India carried out on small-scale dairy farmers highlighted a lack of understanding of antibiotics among small-scale dairy farmers (Kumar *et al.*, 2021). Although smallholder dairy farmers may be rarely using antimicrobials directly, they must know the impact of AMR. Generating awareness among dairy farmers and also articulating suitable legislation towards the use of AMU and AMR, assessing the knowledge, attitude, and practice of animal producers is an important step (Gebeyehu *et al.*, 2021). A proper understanding of KAP among dairy farmers in relation to AMR can help in the development of intervention strategies that will address ill practices, lack of knowledge, and negative attitude.This study was conducted to analyze the knowledge level, attitude, and practices of dairy farmers regarding the use of antibiotics and antimicrobial resistance.

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MATERIALS AND METHODS

The main purpose of this study was to explore the knowledge, attitudes and practices of dairy farmers. The questionnaire design was developed based on the methodologies reviewed in the previous studies. The questionnaire consists of open-ended direct questions in simple language. An ex-post facto research design was used for this study. A total of 120 respondents were selected by purposive random sampling, 60 each from two districts viz. Pune and Satara. Purposive sampling was used because more number of dairy farmers inhabited these districts and milk production is one of the major

occupations of the farmers. The purposive sampling technique is actively used in social science research. Dairy farmers having a minimum of six dairy animals at the farm were included in the study. Observations were made based on responses given by the dairy farmers using a structured interview schedule. Statements of the schedule were prepared with the consultation of field veterinary practitioners, LDO, experts of the university, and government officers. It was initially pre-tested to check for soundness and was modified accordingly. An interview schedule was divided into different sections like the socioeconomic profile of the dairy farmers where information in terms of their age, gender, level of education, occupation, family size, annual income, land size, experience of dairying, social participation, and extension contacts was studied. Another part of the interview schedule included 41 statements on the knowledge of dairy farmers on AMU and AMR. The subsequent part comprised 21 statements on the attitude and the last section included 16 statements related to practices followed by the dairy farmers. The KAP index represents knowledge score, attitude score and practice score. It was worked out with the following formula.

Based on the total KAP scores, the respondents were classified into three categories i.e. low, medium and high KAP group by using mean and standard deviation as a measure of check. Suitable statistical tools i.e. frequency, percentage, arithmetic mean, standard deviation, and correlation were used for the analysis of the data.

RESULTS AND DISCUSSION

All the respondents were male and most of them fall under the middle-age category (67.5%). It was observed that the middle-aged group is commonly engaged in dairy farming activities as they shouldered the family responsibilities very proficiently. Similar findings were also recorded by Gebeyehu *et al.* (2021) and Sadiq *et al.* (2018). None of the respondents was illiterate and their level of education ranged from secondary schooling (27.50%), higher secondary schooling (40.83%), and graduation (31.66%). It was observed that dairying is done by the respondents as a subsidiary occupation. The family size and annual income of most of the respondents were in the middle category. The land size of the farmers was mostly found in the range of small (27.50%) to semi-medium (48.33%), however, the number of dairy animals possessed by most of the dairy farmers was in the range of 6-14 (75%). Farmers were well versed in dairy farming and animal keeping with experience of years ranging from 7-23 years (71.66%). Depending on the number of animals, overall milk production per day at the farms was noted which was at a medium level ranging from 28-80 liters (79.16%). The majority of the dairy farmers were having medium social (80%) and extension contacts (53.33%). It was observed that most of them were members of milk cooperative societies followed by Panchayat Samitee and Gram Panchayat.

Knowledge level: It was revealed that most of the respondents had a medium level of knowledge (80.83%). About 5% of respondents had a low level of knowledge and 14.16% were under the high-level category (Table 1). The majority of the respondents correctly answered questions like antibiotics can kill bacteria present in the gut and skin (85.83%), they are effective on bacteria (90%), its use as a growth promoter in livestock (61.67%), veterinary consultation is important while using antibiotics (82.50%), labeling instructions must read (89.17%), antibiotic use should stop if side effects are observed (85.83%) and milk of animals under treatment should not be consumed (63.33%). However, some of the statements were not correctly answered. Antibiotics are only effective against bacterial infections, however, all the respondents stated that antibiotics are useful against all types of diseases in animals. Over 91.67% of respondents also feel that antibiotics relieve pain, which is again a kind of grave observation. About 18.33% of respondents said that antibiotics don't cause side effects. Dairy farmers think that if animal health is not improved, the dose of antibiotics should be increased. Some of the respondents were also not aware of the fact that the milk of animals undergoing antibiotic therapy should not be consumed. Knowledge level on antimicrobial resistance was noted to be poor in most of the dairy farmers during this study. A study from India mentioned that the irrational use of antibiotics in the dairy system is aggravated by poor knowledge, misconceptions about antibiotics, easy access to antibiotics, etc. Antibiotic usage on farms was recorded as low, but 53% of those who said they had used an antibiotic also responded that they had never heard of the word “antibiotic” in the study by Kumar *et al.* (2021). The probable reason could be the lack of awareness among dairy farmers about antibiotics and their health consequences. Our findings are also in agreement with the observations made previously (Jones *et al.*, 2015; Pham-Duc *et al.*, 2019; Schwendner *et al.*, 2020).

The attitude of dairy farmers: The attitude of most of the dairy farmers towards antibiotics use, and AMR were noted as less favorable (24.17%) to moderate (68.33%). About 8.33% of respondents strongly agree to give antibiotics without veterinary consultation. The use of

Table 1. Distribution of dairy farmers according to their knowledge level towards use of antibiotics and antimicrobial resistance

N=120

Sr. No.	Statement	Response			
		YES		NO	
		F	%	F	%
A.	**Knowledge on antibiotic and its use**				
1.	Antibiotics can kill the bacteria that normally live on the skin and in the gut.	103	85.83	17	14.17
2.	Antibiotics are effective on bacteria.	108	90.00	12	10.00
3.	Antibiotics are mostly effective against viruses.	40	33.33	80	66.67
4.	Antibiotics are used as growth promoters in livestock.	74	61.67	46	38.33
5.	Antibiotics are used in the treatment of all types of diseases in animals.	120	100	00	00
6.	Antibiotics relieve pain in animals.	110	91.67	10	08.33
7.	All the antibiotics show same therapeutic effect in animal diseases.	23	19.17	97	80.83
8.	Antibiotics can kills both bacteria harmful and beneficial in the body.	29	24.17	91	75.83
9.	Antibiotics are used for the treatment of parasitic diseases.	107	89.17	13	10.83
10.	Antibiotics have no side effects.	22	18.33	98	81.67
11.	Antibiotic treatment affects the economy.	120	100	00	00
12.	Antibiotics may affect the quality of milk and milk products.	19	15.83	101	84.17
13.	Side-effects of frequently use of antibiotics at farm	00	00	120	100
14.	Veterinary consultation is important while using antibiotics.	99	82.50	21	17.50
15.	Antibiotics can be used for the treatment of any kind of diseases.	105	87.50	15	12.50
16.	Reading of all the instructions on the prescriptions before giving antibiotics is important.	107	89.17	13	10.83
17.	An antibiotic will always be effective in the treatment of same infection in future too.	32	26.67	88	73.33
18.	Antibiotics are given only with water and feed.	00	00	120	100
19.	If side effects are observed antibiotic treatment should be stopped.	103	85.83	17	14.17
20.	Dose of antibiotic is increased if improvement in animal health is not recorded.	87	72.50	33	27.50
21.	There is no need to complete antibiotic course if animal feels better.	27	22.50	93	77.50
22.	Prescribed course of antibiotic treatment must be completed.	94	78.33	26	21.67
23.	Antibiotic residues doesn't come in milk.	08	06.67	112	93.33
24.	Milk of animals under antibiotics treatment should not be used for consumption.	76	63.33	44	36.67
25.	After last dose of antibiotics milk should not be consumed for at least 72 hours.	00	00	120	100
B.	**Knowledge on Antimicrobial Resistance**				
1.	All dairy farmers have knowledge about antimicrobial resistance.	00	00	120	100
2.	Resistance to antibiotics is a worldwide problem.	80	66.67	40	33.33
3.	Antibiotic resistance in animals may increase the risk for public health	51	42.50	69	57.50
4.	Antibiotic resistance is issue that could affect to animals health.	53	44.17	67	55.83
5.	The unnecessary use of antibiotics can increase the resistance of bacteria to them.	31	25.83	89	74.17
6.	Antibiotic resistance is due to using antibiotics when they are not necessary.	30	25.00	90	75.00
7.	Irrational antibiotic use does not cause emergence of resistant bacteria	27	22.50	93	77.50
8.	There is no relationship between antibiotic use in animals and development of resistance.	55	45.83	65	54.17
9.	Frequent use of antibiotics will reduce its future impact.	28	23.33	92	76.67
10.	The use of antibiotics in livestock does not cause emergence of resistant bacteria which cause disease in humans.	16	13.33	104	86.67
11.	Use of reduced amount of antibiotics in animals will cause more harm than benefit.	23	19.17	97	80.83
12.	Use of antibiotics in animals does not affect myself or my family secondarily.	17	14.16	103	85.83
13.	Unconscious antibiotic use will give any harm to public health, even though I would continue to use antibiotics in animals.	00	00	120	100
14.	Using milk before the end of the withdrawal period will promote AMR development in humans.	00	00	120	100
15.	Use of antimicrobials in animal production boost the rate of AMR development.	18	15.00	102	85.00
16.	By avoiding over-use ofantimicrobials in animal production will reduce AMR development.	26	21.67	94	78.33

Table 2. Distribution of dairy farmers according to attitude

Sr. No.	Statement	Response									
		Strongly Disagree		Disagree Agree		Undecided		Agree		Strongly Agree	
		F	%	F	%	F	%	F	%	F	%
1.	If my animal is sick, I usually give antibiotics without a consultative of a veterinarian. (-)	17	14.17	60	50.00	07	05.83	26	21.67	10	08.33
2.	I prefer to buy antibiotics from the pharmacy without a prescription. (-)	00	00	17	14.17	06	05.00	97	80.83	00	00
3.	I shall use antibiotics according to the instructions printed on the label.	00	00	00	00	06	05.00	91	75.83	23	19.17
4.	I generally keep a stock of antibiotics at home to use the same at the time of emergency. (-)	00	00	17	14.67	05	04.17	98	81.67	00	00
5.	I always complete the course of treatment with antibiotics even if my animal feels better	06	05.00	70	58.33	00	00	43	35.83	01	00.83
6	If my animal feels better after a few days, I stop giving antibiotics before completing the course of treatment. (-)	00	00	52	43.33	09	07.50	59	49.17	00	00
7.	I always read the date of expiry of antibiotics before their use.	00	00	00	00	05	04.17	54	45.00	61	50.83
8.	The usage of intramammary antimicrobials is too high at dairy farms.	00	00	00	00	11	09.17	70	58.33	39	32.50
9.	Consuming milk from animals who were just treated with antimicrobials is good for human health.	10	08.33	19	15.83	25	20.83	66	55.00	00	00
10.	If antimicrobials were more accessible and cheaper then I will recurrently use antimicr-obials at my farm(-)	00	00	26	21.67	02	01.67	92	76.67	00	00
11.	It is advisable to always reduce the dose of anti-microbials as advised by a veterinary doctor.	00	00	31	25.83	89	74.17	00	00	00	00
12.	Antimicrobial resistance is not a significant/ major problem.	00	00	02	01.67	66	55.00	41	34.17	11	09.17
13.	Antimicrobials should only be used after taking a milk sample and conducting a susceptibility test.	0	00	01	00.83	101	84.17	18	15.00	00	00
14.	It is the duty of the veterinarian to discuss with me when he/she assumes an udder health problem in my herd.	00	00	00	00	00	00	73	60.83	47	39.17
15.	Inappropriate use of antimicrobials causes antimicrobial resistance.	00	00	37	30.83	31	25.83	51	42.50	01	00.83
16.	Strong knowledge of antimicrobials is important to me for my animals.	00	00	00	00	00	00	58	48.33	62	51.67
17.	Veterinary advice is necessary before using antimicrobials.	00	00	01	00.83	01	00.83	27	22.50	91	75.83
18.	Indiscreet AMU results in irreversible loss of drug effectiveness.	00	00	23	19.17	42	35.00	54	45.00	01	00.83
19.	Using antimicrobial alternatives like biosecurity, good hygienic practices, and vaccination can reduce AMR development.	00	00	27	22.50	14	11.67	79	65.83	00	00
20.	Training and public awareness are essential to reduce the development of AMR.	00	00	00	00	00	00	107	89.17	13	10.83
21.	I would like to gain more knowledge on the appropriate use of antimicrobials.	00	00	00	00	00	00	71	59.17	49	40.83

Table 3. Distribution of dairy farmers according to practices followed

Sr. No.	Statement	Response					
		Always		Sometimes		Never	
		F	%	F	%	F	%
1.	I will take the advice of a veterinary doctor when my animal gets sick	89	69.16	22	18.33	15	12.55
2.	I always use antibiotics without consultation when my animals get sick.	00	00	38	31.67	82	68.33
3.	Regarding antibiotic use, I follow the practices of nearby farmers.	12	10.00	93	77.50	15	12.50
4.	I prefer to take advice from other farmers/LSS when my animal gets sick.	26	21.60	74	61.67	20	16.67
5.	The most common reason for antibiotic use in animals is fever/genitourinary infection/diarrhea/mastitis.	120	100	00	00	00	00
6.	I refer to guidelines while administering antibiotics to animals.	86	71.67	28	23.33	06	05.00
7.	I always take prescriptions from veterinarians before buying drugs.	82	68.30	24	20.00	14	11.67
8.	The main purpose of the use of antibiotics is to cure sick animals.	108	90.00	12	10.00	00	00
9.	I generally purchase antibiotics from a nearby pharmacy.	120	100	00	00	00	00
10.	I always keep expired veterinary drugs for future use.	00	00	29	24.10	91	75.83
11.	I always consume milk from animals who were just treated with antimicrobials.	93	77.50	01	00.83	26	21.66
12.	I use leftover/residual antibiotics for the treatment of other sick animals later on.	93	77.50	12	10.00	15	12.50
13.	I always store antibiotics on my farm/ open space.	73	60.83	22	18.33	25	20.83
14.	I normally keep leftover antibiotics for a long time at home because they might be useful in the future.	73	60.83	47	39.17	00	00
15.	To get better a response, I sometimes give more antimicrobials to animals than the prescribed dose.	36	30.00	00	00	84	70.00
16.	I always use alternative treatment of animals like ayurvedic/ homeopathic/ Indigenous technicalknowledge.	105	87.50	15	12.50	00	00

Table 4. Association of socioeconomic variables with KAP towards antibiotics, its use and antimicrobial resistance

Variable No	Independent Variable	Pearson's correlation coefficient (r)	P value
1.	Age	0.1410	0.0621
2.	Family size	0.1417	0.0611
3.	Herd size	0.0270*	0.3847
4.	Milk production (lit/day)	0.0305*	0.3703
5.	Annual Income	-0.1344	0.0716
6.	Experience	0.0822	0.1858
7.	Education	0.5475	00.00**
8.	Social participation	-0.2233	0.0071*
9.	Extension contact	-0.7734	00.00**

(* Significant $p<0.05$, ** significant at $p<0.01$)

intra-mammary infusions seems to be more at dairy farms. About 49.17% of respondents also agreed to stop treatment in between without a complete schedule if the animal feels better. Only 42.5% of respondents agreed that inappropriate use of antimicrobials may cause resistance. However, respondents strongly agreed with the statements that sound knowledge of antimicrobials is essential (51.67%) and veterinarian advice is necessary before its use (75.83%). About 89.17% of respondents agreed with the statement that training and public awareness are essential to reduce the development of AMR (Table 2). A recent study from Cornell University, evaluate the attitudes of New York dairy farmers and managers towards antibiotic resistance and their day-to-day antibiotic use habits, and a self-reported lack of concern about antibiotic resistance as a threat to dairy cattle at the farm was observed (Casseri *et al.*, 2022).

Practices followed by dairy farmers: Practices followed by most dairy farmers towards antibiotic use and AMR were low (21.66%) to medium category (78.33%). Some respondents used antibiotics without consultation at their farms (31.67%), and over 70.5% of respondents follow the practices of nearby farmers while using antibiotics (Table 3). The advice of para veterinary persons and other farmers is also taken (21.60%-61.67%). Drugs are generally purchased from a nearby pharmacy and sometimes expired drugs are kept for future use (24.10%). The practice of

consuming the milk of animals under treatment is in existence. Over 30% of respondents use to give antibiotics in higher doses to get better results. A study from Eastern Haryana, India found judicious antibiotic usage practices among large dairy farmers, moderately prudent by medium dairy farmers, and defective by small dairy farmers (Kumar and Gupta, 2018). Most of the practices followed by dairy farmers in our study were unscientific.

KAP index of dairy farmers: The majority of the dairy farmers (65.83%) had a medium KAP level, followed by (25%) a low KAP level and (9.16%) with a high KAP level regarding antibiotics, their use, and AMR. Negative attitudes towards antibiotic use and AMR was observed. Among all socioeconomic variables, only education, extension contact, and social participation are highly significant ($p<0.01$) with KAP. Similar findings were observed by Gebeyehu *et al.* (2021). These results showed that education, social participation, and extension contact may play an important role to influence the farmers for the proper use and changing attitude towards antibiotic use and antibiotic resistance.

CONCLUSIONS

Dairy farmers had a medium-level of the socio-economic profile, having a low to medium level of knowledge towards antibiotics and their use, while low knowledge level towards AMR. The majority of the respondents had unfavorable attitudes and followed low to medium levels of good practices toward antibiotic use and AMR. A significant association between education, social participation, and extension contact with knowledge, attitude, and practices score was observed. Periodic training programs, awareness campaigns, workshops, and demonstrations would be of paramount significance to create awareness of AMR in dairy farmers.

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