

A SCALE TO MEASURE THE ATTITUDE OF VETERINARY PROFESSIONALS TOWARDS ANTIMICROBIAL RESISTANCE

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ABSTRACT

At present antimicrobial resistance appears as a global threat to animal as well as human populations. It affects the health of animals and humans as well as acts as an economic burden to animal owners due to high treatment costs and production failure. This scenario can be changed by altering the attitude of key stakeholders - veterinary professionals towards antimicrobial resistance and its stewardship programme. Thus it is essential to study the attitude of veterinary professionals towards antimicrobial resistance. A scale has been constructed to measure the attitude of veterinary professionals towards antimicrobial resistance by using Scale Product Method, which combines Thurston's equal appearing technique for items selection and Likert's technique of summated rating. The process began with identifying the aspects, reviewing literature and collecting item statements, followed by its analysis and checking of reliability and content validity for consistency and accuracy of the result. A total of 25 statements were selected, out of which 20 statements were finally included in the scale to measure the attitude of veterinary professionals towards antimicrobial resistance. The scale contains twenty statements, of which fourteen are positive, and six are negative. The constructed scale was found to be highly reliable and valid.

Keywords : scale, attitude, veterinary professionals, antimicrobial resistance

INTRODUCTION

The term "Antimicrobial resistance" refers to the ability of microorganisms, such as bacteria, to become increasingly resistant to an antibiotic to which they were previously susceptible and as a result, infections may persist in the body for a longer time, increasing the risk of spreading to others (O'Neill, 2016). Nowadays, antimicrobial resistance (AMR) is intended as a "modern" microbial facet resulting from unsuccessful and/or prolonged exposure to antibiotic treatments. It could be a result of a slow and long evolutionary process that microorganisms have performed to adapt to the changing environmental conditions or the result of a "quick" adaptation to a sudden selective pressure represented by the antimicrobial treatment (Palma *et al.*, 2020). However, the role of animal husbandry practices in tackling antibiotic resistance is still being discussed with limited awareness among stakeholders, i.e., veterinary professionals, especially in developing countries (Founou *et al.*, 2016). The emerging practices of intensive farming of the country have been posited as the hotspots of antibiotic resistance and by 2030, the use of antibiotics in food animals has been projected to increase by 82% (Boeckel *et al.*, 2015). In the middle of antimicrobial resistance crises with limited existing

treatment options, mitigation strategies mainly revolve around awareness and proper stewardship for antibiotic usage among the key stakeholders- veterinary professionals. Combating antimicrobial resistance at the field level due to a lack of knowledge and haphazard practice pattern is challenging. Veterinary professionals with a positive attitude towards antimicrobial resistance can contribute to combating antimicrobial resistance in the animal population by following standard treatment and other protocols effectively. Thus it is essential to measure the positive or negative feelings of veterinary professionals towards antimicrobial resistance. Keeping this in view, a standardized scale has been constructed to measure the attitude of veterinary professionals towards antimicrobial resistance.

OBJECTIVE

To develop and standardize a scale to measure the attitude of veterinary professionals towards antimicrobial resistance

METHODOLOGY

Attitude means the degree of "positive or negative feelings associated with some psychological objects"

(Thurstone, 1946). The “Scale Product Method” technique was used to develop the attitude scale of veterinary professionals about antimicrobial resistance. It is most widely used method to develop an attitude scale. This method combines Thurston’s technique (1928) of equal appearing interval scale for selection of items and Likert’s technique (1932) of summated rating for ascertaining the response on the scale as proposed by Eysenck and Crown (1949). With this, an effort has been made to develop an attitude scale which measures veterinary professionals’ attitudes about antimicrobial resistance. Similar procedures are followed by Bhabhor *et al.* (2022), Patel *et al.* (2022) and Maheswaran and Pandya (2022).

RESULTS AND DISCUSSION

The following procedure was adopted to develop and standardize the scale to measure the attitude of veterinary professionals towards antimicrobial resistance.

Steps in the development of the attitude scale

Item selection

The first and foremost step towards developing an attitude scale is the selection of statements or items. In the attitude scale, items making up an attitude are known as statements. A statement is defined as a sentence that says something about a psychological object. In the initial phase, a large number of statements related to a feeling of veterinary professionals about antimicrobial resistance were gathered from relevant literature, discussion with extension experts and experts from veterinary microbiology, veterinary pharmacology and toxicology, veterinary public health and epidemiology. The gathered statements were edited according to the criteria suggested by Edward (1957). Finally, 25 non-ambiguous statements were selected for the succeeding procedure of the development of a scale to measure the attitude of veterinary professionals about antimicrobial resistance. The selected statements are presented in Table 1.

Judges’ rating on attitudinal statements

In order to judge the degree of ‘most relevant’ to ‘most irrelevant’ of each and every statement five-point equal appearing interval continuum, a panel considering 50 judges were selected. The selected statements for measuring the attitude of veterinary professionals about antimicrobial resistance were sent to the experts of social science, veterinary science and extension education. The judges were requested to give their judgement in five-point equal appearing continuums of agreement, i.e., most relevant, relevant, neutral, irrelevant and most irrelevant for each statement.

Determination of scale value and quartile value

The five points of the rating scale were allocated with a score ranking from 1 for most irrelevant and 5 for most relevant. Based on 50 judges’ judgements, the median value or scale value (S value) and the Quartile (Q) value for the statement were calculated with the help of the below formula.

$$S = L + \frac{0.50 - \sum P_b}{P_w} \times i$$

Where,

S = The median or scale value of the statements

L = Lower limits of the interval in which the median falls from above statement no. 1 median falls in category 0 and 1. $L = (0+1)/2$, thus

L = 0.5

$\sum P_b$ = The sum of the proportion below the interval in which the median falls

P_w = The proportion within the interval in which the median falls

i = The width of the interval and is assumed to be equal to 1.0 (one)

The 75th centile (C_{75}) was calculated from the following formula,

$$C_{75} = L + \frac{0.25 - \sum P_b}{P_w} \times i$$

Where,

C_{25} = The median or scale value of the statements

L = Lower limits of the interval in which the median falls from above statement no. 1 median falls in category 0 and 1. $L = (0+1)/2$, thus

L = 0.5

$\sum P_b$ = The sum of the proportion below the interval in which the median falls

P_w = The proportion within the interval in which the median falls

i = The width of the interval and is assumed to be equal to 1.0 (one)

The 75th centile (C_{75}) was calculated from the following formula,

$$C_{75} = L + \frac{0.75 - \sum P_b}{P_w} \times i$$

Where,

C_{75} = The median or scale value of the statements

L = Lower limits of the interval in which the median falls from above statement no. 1 median falls in category 0 and 1. $L = (1+2)/2$, thus

$L = 1.5$

$\sum P_b$ = The sum of the proportion below the interval in which the median falls

P_w = The proportion within the interval in which the median falls

i = The width of the interval and is assumed to be equal to 1.0 (one)

The interquartile range was worked out by taking the difference between C_{75} (Q_3) and C_{25} (Q_1), which means $Q=C_{75}-C_{25}$ for each statement presented in Table 1. After that S value and Q value of each statement were used to decide whether the particular statement should be a part of the

attitude scale or not. Statements with greater median values were selected. Thus statements No. 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 18, 19, 20, 22, 23, 24 and 25, whose S value was greater than Q was selected in the first phase of selection to include in the attitude scale to measure the attitude of veterinary professionals towards antimicrobial resistance.

Thurston and Chave, (1928) suggested another criterion in addition to interquartile range for rejecting statements in scale constructed by the method of equal appearing intervals. Accordingly, when a few statements have the same scale value, statement with the lowest interquartile range value was selected. As was shown in Table 1, statement no 2 and 15 has an equal scale value of 1.77, but Q value for statement no. 2 is 1.34 and for statement no. 15 is 1.59. So, statement no. 2 was finally selected in the second phase of the selection of statements to include in the scale to measure attitude of veterinary professionals about antimicrobial resistance. Twenty statements were finally selected to measure the attitude of veterinary professionals towards antimicrobial resistance.

Table 1: Selection of statements on the basis of ‘S’ and ‘Q’ values to measure the attitude of veterinary professionals towards antimicrobial resistance

Sr. No.	Statement	S value	Q value	Selection
1	In my opinion, using too many antibiotics on animal will increase risk of AMR.	1.23	0.88	Selected
2	I believe that veterinarians do not have a significant role in preventing public health threats posed by AMR.	1.77	1.34	Selected
3	I believe that treatment of viral infections with antibiotic agents will not lead to antimicrobial resistance.	1.30	1.24	Selected
4	I believe that under dose of antibiotics in livestock will reduce chances of AMR.	1.19	0.77	Selected
5	I feel that combination of two or more classes of antibiotics is bad idea for preventing infections.	1.36	1.22	Selected
6	I think that broad-spectrum antibiotics are better choice than using of narrow-spectrum antibiotics.	1.55	1.27	Selected
7	I feel that skipping a dose of antibiotics contributes to the development of resistance.	1.25	0.96	Selected
8	In my belief, one health approach is significantly important to combat the AMR.	1.46	1.01	Selected
9	I avoid advising anyone to prescribe unnecessary drugs which leads to AMR.	1.42	1.09	Selected
10	I think that free and easy access to medicines from medical stores is not contributing to development of AMR.	1.96	2.53	Not selected
11	I feel that self-medication by the owners to their animals through information gathered from the internet or shopkeeper reduces threat of AMR.	1.79	1.62	Selected
12	I believe that lack of antibiotics susceptibility testing by veterinarians leads to AMR.	1.54	1.09	Selected

Sr. No.	Statement	S value	Q value	Selection
13	I feel that irrational use of antimicrobial agents by non-technical persons significantly increased the state of AMR.	1.50	1.12	Selected
14	I am sure that lack of regulatory policies and controlling authority contributes in development of AMR.	1.58	1.08	Selected
15	I think that unethical sale of antimicrobial agents in large quantities may reduce chance of development of AMR.	1.77	1.59	Not selected
16	In my opinion, vaccination of animals will increase AMR.	1.96	2.20	Not selected
17	I feel that poor sanitation inhibits development of AMR.	2.12	2.39	Not selected
18	I believe that animal related industries (slaughter houses, pharmaceuticals etc.) may contributes to development of AMR.	1.75	1.25	Selected
19	I feel that AMR may results due to over-use of antibiotics as a growth promoter in livestock sector.	1.33	1.00	Selected
20	I feel that use of pesticides in the fodder production for livestock may contributes to AMR.	2.26	2.00	Selected
21	I think that antibiotic residues releases in environment through human activities may not develop AMR in animal population.	2.15	2.29	Not selected
22	I am sure that veterinary extension programmes can control development of AMR.	1.39	1.00	Selected
23	I believe that proper treatment (i.e., cooking, boiling, etc) to animal produce reduces AMR in human population.	1.76	1.14	Selected
24	I feel that control of AMR in livestock sector should be prime goal of veterinary public health.	1.28	0.93	Selected
25	I feel that livestock owners are not aware of AMR.	1.21	0.85	Selected

Reliability of attitude scale

A scale is considered reliable when it consistently produces the same values when it is applied to the same sample. Split half method was used to determine reliability of attitude scale.

The 20 statements were divided into two halves, with ten odd-numbered in one half and ten even-numbered statements in the other. Thirty veterinary professionals were asked to give their opinions. Each of the two sets of statements was treated as a separate scale, and then these two sub-scales were correlated. Rulon's formula (Guilford, 1954) was used to calculate the coefficient of reliability for scale, which came to be 0.669. Reliability is directly related to the length of the scale when split into odd and even number items. The reliability coefficient which has been calculated is the value of half size of the original scale. In the case of finding reliability using the split-half method, an investigator needs to apply correction factor to consider the final value of reliability. In this scale, it was found to be 0.80. Hence scale was found highly reliable.

Rulon's Formula

$$rtt = 1 - \frac{\sigma^2 d}{\sigma^2 t}$$

$$\sigma^2 d = \frac{\sum d^2 - \frac{(\sum d)^2}{n}}{n}$$

$$\sigma^2 t = \frac{\sum t^2 - \frac{(\sum t)^2}{n}}{n}$$

Where,

rtt = Coefficient of reliability

$\sigma^2 d$ = Variance of difference

$\sigma^2 t$ = Variance of total score

The correction factor can be obtained by using Spearman-Brown formula.

$$rtt = \frac{2ro_e}{1+ro_e}$$

Where,

rtt = Coefficient of reliability of the original test

ro_e = Reliability of coefficient of odd and even score

Content validity of the attitude scale

The validity of a test depends upon the fidelity with which it measures what it is purported to measure (Kerlinger,1976). The validity of the scale was examined for content validity by determining how well contents of the scale were selected by discussing it with experts of extension, veterinary microbiology, veterinary pharmacology

and toxicology, veterinary public health and epidemiology and other academicians of Kamdhenu University, Gujarat. Hence, the present scale satisfies content validity.

Administration of the scale

Finally, 20 selected statements were randomly arranged in the final format so that bias could be avoided during the collection of responses, as shown in Table 2.

Table 2: Final scale to measure the attitude of veterinary professionals towards antimicrobial resistance.

Sr. No.	Statement	SA	A	UD	DA	SDA
1	I believe that under dose of antibiotics in livestock will reduce chances of AMR. (-)					
2	I feel that skipping a dose of antibiotics contributes to the development of resistance. (+)					
3	I believe that treatment of viral infections with antibiotic agents will not lead to antimicrobial resistance. (-)					
4	I avoid advising anyone to prescribe unnecessary drugs which leads to AMR. (+)					
5	I am sure that lack of regulatory policies and controlling authority contributes in development of AMR. (+)					
6	I believe that veterinarians do not have significant role in preventing public health threats posed by AMR. (-)					
7	In my belief, one health approach is significantly important to combat the AMR. (+)					
8	In my opinion, using too many antibiotics on animal will increase risk of AMR. (+)					
9	I feel that combination of two or more classes of antibiotics is bad idea for preventing infections. (-)					
10	I feel that self-medication by the owners to their animals through information gathered from the internet or shopkeeper reduces threat of AMR. (-)					
11	I feel that control of AMR in livestock sector should be prime goal of veterinary public health. (+)					
12	I believe that lack of antibiotics susceptibility testing by veterinarians leads to AMR. (+)					
13	I am sure that veterinary extension programmes can control development of AMR. (+)					
14	I feel that AMR may results due to over-use of antibiotics as a growth promoter in livestock sector. (+)					
15	I feel that livestock owners are not aware of AMR. (+)					
16	I believe that animal related industries (slaughter houses, pharmaceuticals etc.) may contributes to development of AMR. (+)					
17	I believe that proper treatment (i.e., cooking, boiling, etc) to animal produce reduces AMR in human population. (+)					
18	I feel that irrational use of antimicrobial agents by non-technical persons significantly increased the state of AMR. (+)					
19	I feel that use of pesticides in the fodder production for livestock may contributes to AMR. (+)					
20	I think that broad-spectrum antibiotics are better choice than using of narrow-spectrum antibiotics. (-)					

SA = Strongly Agree, A = Agree, UD = Undecided, DA = Disagree, SDA = Strongly Disagree

Out of the 20 selected statements, fourteen were positive and showed favourable attitude, and six were negative and had unfavourable attitude. Against these 20 statements, there were five columns representing five points' continuums of agreement and disagreement to the statements, followed by Likert (1932) in his summated rating technique

of attitude measurement. The five points on the continuum were strongly agree, agree, undecided, disagree and strongly disagree with respective weights of 5, 4, 3, 2 and 1 for the favourable or positive statements and with the respective weights of 1, 2, 3, 4 and 5 for the unfavourable or negative statement. The final score was obtained by adding scores

obtained by the respondent for all statements, ranging from 20 to 100.

CONCLUSION

An attitude scale was constructed to measure the attitude of veterinary professionals towards antimicrobial resistance with the help of 'Scale Product Method' which blends Thurston's technique of equal appearing interval scale for items selection and Likert's technique of summated rating. The scale constructed to measure the attitude of the veterinary professionals towards antimicrobial resistance, consisting of 20 statements, was found valid and highly reliable. Hence the same scale can be used by other researchers to measure the attitude of veterinary professionals, para-veterinarians as well as farmers with due modifications.

CONFLICT OF INTEREST

No conflict of interest among researchers.

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