Original Research Article

Construction of scale to measure the attitude of veterinarians towards antimicrobial resistance and stewardship

ABSTRACT

Antimicrobial resistance has become one of the major health problems in humans and animals. This threat is increasing ~~day by day~~daily and is fueled by a range of factors. Indiscriminate use of antibiotics in animals is one of the greatest sources for provoking the global threat. In developing countries, veterinarians are the main driving force towards the use of antibiotics appropriately in field conditions. Presently, there is no provision to monitor the type and quantum of antibiotics prescribed by veterinarians. Here in India, their attitude plays an important role to combat on antimicrobial resistance by promoting the judicious use of antibiotics in animals. To know the attitude of veterinarians in Kerala, an effort was made to develop a scale using an equal appearing interval method to measure their attitude towards antimicrobial resistance and stewardship. The final scale consisted of 15 statements comprising 7 favourable and 8 unfavourable statements to measure the attitude of veterinarians towards antimicrobial resistance and stewardship.

Keywords: Veterinarian's attitudemeasurement, scale construction, Equal Appearing Interval (EAI) method.

1. INTRODUCTION

Thurstone (1946) defined attitude as the degree of positive or negative affect associated with some psychological object such as a symbol, person, institute, ideal or idea towards which people can differ in varying degrees. Attitude is an organized predisposition to think, feel, perceive and behave towards a cognitive object.

The psychological object for the present study was conceptualized as antimicrobial resistance and stewardship. Attitude in this study was operationally defined as the veterinarian's degree of favourable or unfavourable views, opinions, feelings or interests towards antimicrobial resistance and stewardship.

The attitude of veterinarians towardsantimicrobial resistance and stewardship was assessed using an attitude scale constructed using the equal appearing interval method developed by Thurstone and Chave (1929). The following points were considered for scale development.

2. METHODOLOGY

2.1Generation of statements

A universe of 60 statements was prepared such that they reflected the attitude of veterinarians towards antimicrobial resistance and stewardship. For this, an extensive review of the literature, the themes of focus group discussions and discussion with subject experts were resorted to. These statements were edited as per the 14 criteria suggested by Edwards and Kilpatrick (1948). After editing, 42 statements were selected and these formed the universe of content. Care was taken to ensure that the statements were non-ambiguous and were not factual.

2.2Ratings of attitude statements by judges

The 42 statements so selected were then administered on an equally spaced 7-point psychological continuum to 100 judges and they were requested to give their ratings concerning each statement based on a 7-point continuum from the 'least favourable' to 'most favourable' with 'neutral' in the centre. The judges comprised facultymembers working in the Departments of Veterinary Extension Education in variousveterinary universities in India. The responses of all 60 judges were used for the final selection of statements and construction of the attitude scale. The scale value (S) and interquartile range value (Q) for each statement were then calculated.

2.3Computation of scale value (S)

The median is the value above and below which 50 per cent of the ratings fall. The median is the 50th percentile. The first quartile Q1 is the value below which 25 per cent of the cases fall, in other words, the 25th percentile. The third quartile Q3 is the 75th percentile. The inter-quartile range is the difference between the third and first quartile, or Q3 - Q1.

The median of the distribution of judgments for each statement was taken as the scale value of the statement. The scale value was calculated from the data using the formula given by Edwards (1969).

$$S = l + \frac{(0.50 - \sum pb)}{pw} \times i$$

Where,

S = the median value or scale value of the statement

l = the lower limit of the interval or sorting category in which the median falls

$\sum pb$ = the sum of the proportions below the sorting category in which the median falls

pw = the proportion within the interval or sorting category in which the median falls

i = the width of the interval or sorting category and is assumed to be 1

2.4 Computation of interquartile values (Q)

Computation of the interquartile range Q, an index of dispersion of the statements on the scale (Edwards, 1969) was as follows. To determine the Q value it was necessary to find out two other points of measure, the 75th centile value (C_{75}) and the 25th centile value (C_{25}). These two values were calculated by the following formulae.

Comment [PAB1]: I am in support of the historical context of the scale; but, more value can be had by updating this information.

$$75^{th} \text{ centile value } c_{75} = l + \frac{(0.75 - \sum pb)}{pw} \times i$$

Where,

c_{75} = the 75 th centile value

l = the lower limit of the interval or sorting category in which the 75th centile falls

$\sum pb$= the sum of the proportion below the sorting category in which the 75th centile value falls

pw = the proportion within the interval or sorting category in which the 75th centile value falls

i = the width of the interval or sorting category and is assumed to be 1.0.

$$25^{th} \text{ centile value } c_{25} = l + \frac{(0.25 - \sum pb)}{pw} \times i$$

Where,

c_{25} = the 25 th centile value

l = the lower limit of the interval or sorting category in which the 25th centile value fell $\sum pb$= the sum of the proportions below the sorting category in which the 25th centile value fell

pw = the proportion within the sorting category in which the 25th centile value fell

i = the width of the interval or sorting category and is assumed to be 1.0.

The Interquartile range, denoted by the Q value was calculated by deducting the 25 th centile (C_{25}) value from 75 th centile (C_{75}) value.

Q value = 75 th centile value (C_{75}) – 25 th centile value (C_{25})

In situations of agreement among the subjects in judging the degree of favourableness of a statement, the Q value would be small. A large Q value would indicate disagreement among the judges about the degree of the attribute possessed by a statement and hence can therefore be taken as an indication that there was something wrong with the statement. Thrustone and Chave (1929) observed that large Q values primarily indicated that the statement was ambiguous or that the statement was interpreted in more than one way by the subjects.

The interquartile range set the indication for the selection of statements. Statements with larger Q- values were eliminated from the final list of statements.

2.5 Selection of attitude statements for inclusion in the final scale

The attitude items to be included in the final attitude scale were selected based on the distribution of scale values uniformly along the psychological continuum with high scale values and smaller Q values. Based on this criterion, 15 statements were finally selected for the attitude scale.

Table 1. Statements selected for the attitude scale with high S and smaller Q values

Sl.no.	Statements	Scale (S) value	Q value
1	I wait for the results of laboratory diagnostic tests before prescribing antimicrobials.	6.57	1.45
2	Certain priority antibiotics must be restricted for use in human medicine only.	6.56	1.53
3	As a veterinarian animal health rather than human health is my concern. *	6.43	1.73
4	I prescribe third and fourth-generation antimicrobials as a last resort in my treatment protocols.	6.35	1.89
5	All Veterinarians must be aware of the principles of antimicrobial stewardship.	6.32	1.78
6	I advise progressive farmers to resort to the use of antimicrobials in their animals to save time. *	6.19	1.60
7	There is no harm in stopping antibiotic therapy midway if the animal shows an early response. *	6.19	1.65
8	Adoption of stewardship practices in the veterinary profession is waste of time. *	6.17	1.28
9	Antibiotics are very good growth promoters and can be encouraged	6.15	1.82

	better productivity.*		
10	Antimicrobial-resistant is not an issue as new drugs are being discovered and are available in the market to overcome it. *	6.11	1.15
11	There is nothing wrong with dispensing antibiotics without a prescription from a veterinarian. *	6.08	1.61
12	Veterinarians should focus on treatment with antibiotics rather than its consequences on society. *	6.08	1.68
13	Veterinarians must consider the use of antimicrobials as a last resort.	6.06	1.16
14	Veterinarians have a significant role to play in preventing public health threats due to antimicrobial resistance.	6.05	1.53
15	For every single case, I deliberately choose the appropriate antimicrobial after considering the merit of the case.	6.00	1.89

* *Unfavourable attitude statements*

2.6Standardisation of the scale

2.6.1 Reliability of the scale

According to Kerlinger (1964), reliability is the accuracy or precision of a measuring instrument (see also, Manterola *et al*., 2018 Ranstam, 2008; Trajković, 2008). The reliability of the test was determined by Cronbach's alpha coefficient of reliability test. The test was administered to 40 non-sample veterinarians who were selected randomly from the Kannur (20) and Kozhikode (20) districts of Kerala. They were asked to give their responses to the 15 attitude scale statements on a continuum of 'strongly agree' to 'strongly disagree'. The collected data were tabulated and analysed to estimate the alpha value. The formula for calculating the alpha value was as follows

$$\alpha = \frac{K}{K-1}\left(\frac{\sum_{i=1}^{K}\sigma^2 y_i}{\sigma^2 x}\right)$$

Where,

α = Cronbach's alpha reliability coefficient

K = Number of items

$\sigma^2 y_i$ = the variance of item I for the current sample of persons

σ^2 x = the variance of the observed total test scores

The Statistical Package for the Social Sciences (SPSS)for Windows, Vversion 26.0 was used to analysis the data (calculate the alpha value).

The Cronbach's alpha was found to be 0.871, which indicated a strong internal consistency among the 15 items.

Reliability statistics	
Cronbach's alpha	No. of items
0.871	15

In Table 2, the column containing the 'corrected item-total correlation' indicated that there was an average and positive correlation between the scores on the one item and the combined score of the remaining items except for item 1 and item 4 i.e., r = 0.276 and r = 0.221 respectively. However, item1 and item 4 had a weak correlation with the combined score of the remaining items, the alpha did not increase to a large degree by deleting either of these items (i.e. α = 0.873 and α = 0.877 respectively). Therefore, it was concluded that there was no need to eliminate these two items from the total set of 15 items of the attitude scale to be used for further data collection from the actual respondents of the study area.

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Table 2. Cronbach's alpha test results for internal consistency of attitude scale

Items	Scale means if an item deleted	Scale variance if item deleted	Corrected item-total correlation	Cronbach's alpha if the item deleted
Item 1	79.1000	203.221	0.276	0.873
Item 2	79.2000	194.164	0.512	0.864
Item 3	79.6250	182.856	0.610	0.859
Item 4	79.3750	201.522	0.221	0.877
Item 5	79.8500	170.951	0.784	0.849
Item 6	79.7000	177.754	0.668	0.856
Item 7	79.6750	177.046	0.691	0.854
Item 8	79.0250	213.769	0.424	0.880
Item 9	79.7500	196.397	0.416	0.873
Item 10	79.4500	185.433	0.637	0.858
Item 11	79.8000	178.933	0.661	0.856
Item 12	79.6750	187.251	0.472	0.866
Item 13	79.4500	185.433	0.637	0.858
Item 14	79.8000	178.933	0.661	0.856
Item 15	79.6750	187.251	0.472	0.866

The developed attitude scale had a Cronbach's alpha (α) value that was more than 0.80 which was good and indicated a strong internal consistency among the set of items (Cronbach,1951; George and Mallery, 2003; Kline, 1994). Thus, it was concluded that the items used in the test for data collection were appropriate and reliable.

2.6.2 Content validity of the scale

It referred to the representativeness or sampling adequacy of the content of a measuring instrument (Kerlinger, 1973). Content validity was ensured by subjecting the selected 15 items to 40 judges to obtain opinions. The judges comprised faculty members working in the Departments of Veterinary Extension Education in the veterinary universities in Kerala and Tamil Nadu. Judges were asked to indicate the extent to which each attitude item covered the domains of the psychological object 'antimicrobial resistance and stewardship' or to exercise their judgment as to the relevance of the property being measured. The responses were obtained on a four-point continuum for each item *viz*., 'most adequately covers', 'more adequately covers', 'less adequately covers' and 'least adequately covers'. Scores of 4, 3, 2 and 1 were assigned for the points on the continuum respectively. A total of 30 judges responded by sending their judgments. The mean scores of each item were calculated. The mean score of 2.5 was fixed as the basis for deciding the content validity of the scale. If the overall mean score of the attitude items as rated by the judges was above 2.5, the scale item would be selected if not otherwise(Harisha *et al.,* 2020). In the present case, the overall mean score was worked out as 3.22 and therefore the content validity of the constructed attitude scale was ensured.

3. RESULTS AND DISCUSSION

Out of the fifteen selected statements, 7 statements were indicators of a favourable attitude and 8 statements were indicators of an unfavourable attitude. For practical use, thesefifteen attitude statements should be arranged randomly to avoid biased responses. The final scale can be administered to the respondents of the study and the responses to each statement can be obtained

on a five-point continuum *viz.,* strongly agree, agree, undecided, disagree and strongly disagree with weights of 5,4,3,2 and 1 respectively for favourable statements and reverse scoring for unfavourablestatements. The weight of the selected category should be multiplied by the scale value of the particular statement to get the final score for each item. The attitude score of each respondent can be calculated by summing up the scores obtained for all the statements. Based on the total scores obtained, the respondents can be categorized as those with an as less favourable, moderately favorable and highly favourable attitude.

The scale so developed could be of valuable use to various agencies and practitioners interested in measures to mitigate antimicrobial resistance in various parts of the world. The scale that has been developed in this paper assumes significance in the aforementioned context. A similar scale to assess attitude was constructed by Iqshanullah *et al,* (2019) who developed a scale to assess the attitude of rural women towards social change.

4. CONCLUSION

The present study explores the development of a psychometric tool to assess the attitude of veterinarians toward antimicrobial resistance and stewardship. In this study, the universe of statements was derived from an extensive review of literature, codes and themes obtained from thematic analysis of focus group discussions and the validity of the statements was ensured through the judges rating while reliability and internal consistency were ensured with Cronbach alpha. The reliability and validity of the scale indicated the precision and consistency of the results.

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