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Research Article

Empirical assessment on adoption of ethno veterinary practice for mastitis by the dairy farmers of Tamil Nadu

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Abstract

The present study was undertaken to understand the adoption status, perceived attributes and economic impact of ethno veterinary practice for mastitis. Farmers were aware of the ethno veterinary practice for mastitis through social media platforms like WhatsApp and Facebook (66%); various online sources (62%); friends and relatives (62%); popular journals and magazines (52%); veterinary officers (36%) and constituent units of TANUVAS like veterinary colleges and KVKs and VUTRCs (30%). Majority of the farmers (60%) completely adopted the ethno veterinary practice for treating mastitis, while 30% partially adopted and only 10% of the farmers discontinued the practice. Nearly half (48%) of the farmers had a medium level of adoption behaviour about the innovation, followed by high (36%) and low (16%) levels. Most of the farmers perceived that using ethno veterinary practice for mastitis treatment was cheaper in price, culturally acceptable, abundantly resourceful, cognitively easy, observable, trailable, exorbitantly profitable, physically compatible, adoptable, situationally feasible and relationally independent. However, the practice was perceived as labour-consuming, lacking in multiple-use potential and time-consuming. Partial budgeting analysis revealed that net income of the farmers increased by Rs.1,922/- per dairy animal in every incidence of mastitis due to adoption of ethno veterinary practices for mastitis treatment in their dairy animals. The present status of adoption of innovation by farmers and their adoption behaviour was positively correlated with change in net income at 1% level, while the adoption behaviour was positively correlated with the system of rearing dairy animals at 5% level.

Keywords: Adoption, Attributes, Behaviour, Ethno veterinary, Mastitis

Highlights

- Social media platforms like WhatsApp and Facebook served as the major source of awareness about ethno veterinary practice for the treatment of mastitis for two-third (66%) of the farmers.
- Sixty per cent (60%) of the farmers completely adopted and thirty per cent (30%) of the farmers partially adopted the ethno veterinary practice for treating mastitis.
- Nearly half (48%) of the farmers had a medium level of adoption behaviour followed by high (36%) level of adoption behaviour regarding the ethno veterinary practice for mastitis because of its cheaper price, exorbitant profits, situational feasibility, cultural acceptability, physical compatibility, relational independence, less complexity, adaptability, resource abundance, trialability and observability nature.
- Net income of the dairy farmers was increased by Rs.1,922/- per dairy animal by adopting the ethno veterinary procedures in every incidence of mastitis.

INTRODUCTION

It is commonly noticed in developing countries that technologies and recommendations are propagated without conducting any adaptive research at the field level. Also, most of the research on adoption behaviour focused mainly on the characteristics of the farmers as an important factor in adoption. However, variables like innovation attributes, economic climate, structural constraints and technology suitability should also be included to increase the predictability of adoption

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behaviour (Wadsworth, 1995).

A meta-analysis by Thirunavukkarasu and Narmatha (2016) on the adoption of dairy innovations revealed that only a little research was carried out to understand the relationship between the adoption of innovations and their attributes. The existence of a gap in understanding the importance of innovation attributes and inadequate validation of innovations at the field level are the reasons for the poor adoption of dairy innovations.

Mastitis is one of the major diseases concerning the dairy industry. Farmers generally depend on antibiotics, parenteral and intra-mammary infusions for treatment and they spend nearly Rs. 3,500/- per animal for treatment. Das *et al.* (2018) also reiterated Rs. 2100/- was incurred as expenditure for treatment with appropriate antibiotics for 7 days mastitis therapy. High costs and inaccessibility, together with other problems associated with modern healthcare systems, forced the farmers to switch to traditional treatment practices. In developing countries, traditional veterinary medicine is important because modern medicines or remedies for animal health care are either inaccessible or unaffordable by poor rural people. Ethno veterinary practices are developed by farmers based on their knowledge, experience, and skills using locally available plants and herbs, which are considered to be affordable, effective, have limited side effects, and are socially acceptable and easily available.

The medicinal mixture for mastitis has to be freshly prepared every day using 250 g of aloe vera, 50 g of turmeric, and 15 g of calcium hydroxide (lime) for treatment purposes. The medicinal mixture should be applied 10 times per day for five consecutive days, involving very minimum expenses. For animals having clinical mastitis with blood in milk, in addition to the above, a mixture consisting of 30 g or 2 hands full of curry leaves with 100 g of jaggery must be fed orally twice daily till the condition resolves. Further, it was observed that the total cost spent for mastitis treatment by using ethno veterinary medicine was around Rs. 100/-. Keeping this in mind, the research was undertaken to study the adoption behaviour of farmers regarding the ethno veterinary practice for mastitis and to assess its economic impact.

MATERIALS AND METHODS

Ex post facto research design was used for the study. A list of potential beneficiaries across Tamil Nadu for the adoption of ethno veterinary practice for mastitis was prepared in consultation with technology developers and other possible stakeholders from different units of TANUVAS. The list of beneficiaries collected was then arranged in order and serially numbered, which served as the sampling frame for the selection of respondents. From the sampling frame, 50 farmers were randomly selected using the random number table (Ray and Mondal, 2014). Cross sectional data was collected using pre tested interview schedule; tabulated and analyzed by using SPSS software (Ver. 20.0).

The present status of the adoption of ethno veterinary practice for mastitis was studied by using an interview schedule developed by Rathod *et al.* (2016) with scores of 3, 2, 1 and 0 for complete adoption, partial adoption, discontinuance and rejection, respectively. The different attributes of ethno veterinary practice for mastitis perceived by the dairy farmers like relative advantage, compatibility, complexity, observability and trialability were studied using the scale developed for this purpose. The overall adoption behaviour of farmers was classified into low, medium and high based on the total scores obtained for indicators of perceived attributes of innovations by using Dalenius-Hodges stratification procedure.

Partial budgeting analysis was done to assess the benefits of adopting the ethno veterinary practice for mastitis. It consists of four components, of which (i) added income and (ii) reduced costs are termed as positive financial changes, whereas (iii) added costs and (iv) reduced income are termed as negative financial changes. Then, the difference between the sums of positive and negative financial changes will give the change in net income due to the adoption of a particular innovation in the farming system. A negative change in net income indicates that the adoption of the particular innovation has reduced whole farm income, and the adoption decision should be reversed, while a positive change in net income indicates that the adoption of the particular innovation is profitable. The relationships between the dependent and independent variables were analyzed using Spearman's rank order correlation.

RESULTS

Source of awareness of ethno veterinary practice for mastitis

Social media platforms like WhatsApp and Facebook served as the major source of awareness about ethno veterinary practices for the treatment of mastitis for two-third (66%) of the farmers, followed by online sources (62%), friends & relatives (62%) and popular journals & magazines (52%) (Table 1). The farmers regularly attended various exhibitions and mass

contact programmes regarding livestock rearing and agriculture, and hence, it gave them the opportunity to learn about the availability of these publications.

Table 1. Source of awareness of ethno veterinary practice for mastitis

Sl. No.	Source of awareness	F	Percentage
1	Friends and relatives	31	62%
2	Veterinary officers	18	36%
3	Extension workers	1	2%
4	TANUVAS	15	30%
5	Radio/Television	0	0%
6	Newspaper	1	2%
7	Journals/Magazines	26	52%
8	Social media	33	66%
9	Online sources	31	62%

The information regarding the ethno veterinary treatment procedure for mastitis was informed to the farmers by veterinarians (36%) and constituent units of TANUVAS (30%) through on-campus and off-campus training programmes as well as through advisory services. Only a meagre percentage of the farmers had obtained information from extension workers (2%) and newspapers (2%). None of the farmers accessed the information regarding the ethno veterinary practice for mastitis through radio and television.

Present status of the adoption of ethno veterinary practice for mastitis

Table 2 revealed that 60% of the farmers had complete adoption of ethno veterinary practice for mastitis. Nearly one-third (30%) of the farmers partially adopted the ethno veterinary practice for treating mastitis. Only 10% of the farmers discontinued the practice. None of the farmers rejected the ethno veterinary practice due to its potential advantages.

Table 2. Present status of the adoption of ethno veterinary practice for mastitis

Sl. No.	Adopter Category	Frequency	Percentage
1	Complete adoption	30	60%
2	Partial adoption	15	30%
3	Discontinuance	5	10%
4	Rejection	0	0

Perceived attributes of ethno veterinary practice for mastitis

Relative advantage: All the farmers perceived that the initial cost for adoption of innovation was cheap, and 90% of the farmers perceived that the innovation was exorbitantly profitable. It is evident from the Table 3 that 58% of the farmers perceived the ethno veterinary procedure for mastitis as time consuming. Present innovation was exclusively used for treating only mastitis, as expressed by 70% of the dairy farmers, while 30% of the farmers perceived that it had multiple benefits like effective prevention of mastitis recurrence, reduction of convalescence period and maintenance of organic dairy herd.

Table 3. Perceived attributes of ethno veterinary practice for mastitis

Sl. No.	Attribute	Indicators	Opinion	F	%	Opinion	F	%
1	Relative Advantage	Initial Cost	Cheap	50	100%	Expensive	0	0%
		Profitability	Exorbitant	45	90%	Meagre	5	10%
		Time consumption	Time saving	21	42%	Time consuming	29	58%
		Multiplicity of use	Yes	15	30%	No	35	70%
2	Compatibility	Situational	Feasible	40	80%	Unfeasible	10	20%
		Cultural	Acceptable	50	100%	Not Acceptable	0	0%
		Physical	Compatible with needs	45	90%	Incompatible with needs	5	10%
		Relational	Independent	39	78%	Dependent	11	22%
3	Complexity	Cognitive	Easy	49	98%	Complex	1	2%
		Application	Adoptable	43	86%	Unadoptable	7	14%
		Resource	Abundant	50	100%	Scare	0	0%
		Labour	Saving	8	16%	Consuming	42	84%
4	Observability	—	Visible	48	96%	Invisible	2	4%
5	Trialability	—	Trialable	48	96%	Not trialable	2	4%

Compatibility: It can be inferred from Table 3 that the majority (80%) of farmers perceived the ethno veterinary procedure for mastitis treatment as feasible in farmers' situation, culturally acceptable (100%); physically compatible with their needs (90%) and relationally independent (78%) as the farmers can easily prepare and apply the mixture on the affected dairy animals by their own without any technical assistance.

Complexity: Majority of the dairy farmers perceived the ethno veterinary practice for mastitis treatment as cognitively easy (98%) and adaptable (86%). All the farmers opined that resources for ethno veterinary treatment for mastitis were abundantly available with the farmers because ingredients like aloe vera, turmeric, lime, oil, mixer grinder and lemons were mostly used for household purposes and it was always available with the farmers in their homes, backyard, farm or neighbours. However, majority of the farmers perceived that ethno veterinary practice for mastitis was labour consuming (84%).

Observability: The result of adopting ethno veterinary practice for mastitis treatment was perceived as visible by 96% of the farmers because they could readily notice the change in the nature of milk and udder, reduction in swelling of udder and teat, and reduction of flakes and blood in milk within 2-3 days after the application of ethno veterinary preparation. Only very few farmers (4%) perceived that they could not notice the healing of udder due to severity of infection and faulty adoption procedure.

Trialability: Majority of the farmers (96%) perceived that ethno veterinary practice for mastitis treatment was trialable in nature. Very few farmers (4%) perceived that ethno veterinary practice for mastitis treatment was not trialable because they maintained high yielding crossbred animals, and they felt that adopting the ethno veterinary procedure may lead to decreased production and extended treatment duration.

Overall adoption behaviour of the dairy farmers regarding ethno veterinary practice for mastitis

From Table 4, it can be concluded that nearly half (48%) of the farmers had a medium level of adoption behaviour followed by high (36%) and low (16%) levels of adoption behaviour. Bhise *et al.* (2018) and Sakthipriya and Mohan (2018) also reported that majority of the farmers belonged to medium adoption category of attributes. The ethno veterinary practice for mastitis was cheaper in price, exorbitantly profitable, situationally feasible, culturally acceptable, physically compatible, independent, cognitively easy, adaptable, abundantly resourceful, trialable and observable, which are the reasons for medium and high levels of adoption behaviour.

Table 4. Overall adoption behaviour regarding ethno veterinary practice for mastitis

Sl. No.	Categories	Frequency	Percentage
1	Low (<6.58)	8	16%
2	Medium (6.58-9.23)	24	48%
3	High (>9.23)	18	36%

Partial budgeting

In order to work out the details of benefit obtained by adopting the ethno veterinary practice for mastitis, partial budgeting analysis was undertaken for a single dairy animal in a single incidence of mastitis during which the ethno veterinary procedure for mastitis was employed, and the results are given in Table 5.

The results indicated that neither any additional income was contributed nor the income of the dairy farmers was reduced due to the adoption of ethno veterinary practice in the mastitis affected dairy animals. But the adoption of ethno veterinary practices in the mastitis affected dairy animals has reduced the cost of allopathic treatment by Rs. 2,205/- per dairy animal for a single incidence of mastitis, which comprises of treatment fee paid to the veterinarians (Rs. 2,077/-) and medicines purchased for intra-mammary infusions (Rs. 128/-). With regard to expenditure, an added cost of Rs. 283/- was incurred towards the purchase of ingredients for a single incidence of mastitis. Thus, net income of the dairy farmers was increased by Rs. 1,922/- per dairy animal in every incidence of mastitis.

Table 5. Partial budgeting on adoption of ethno veterinary practice for mastitis

Positive financial changes		Negative financial changes	
Positive financial changes	**Negative financial changes**	**Positive financial changes**	**Negative financial changes**
Added income (Rs.)	0.00	Added cost (Rs.)	283.20
Reduced costs (Rs.)	2,205.00	Reduced income (Rs.)	0.00
Subtotal (A) (Rs.)	2,205.00	Subtotal (B) (Rs.)	283.20
Change in net income (A – B) (Rs.)			1,921.80

Table 6. Relationship between independent and dependent variable regarding ethno veterinary practice for mastitis

Sl. No.	Variables	Present status of adoption	Adoption behaviour
1.	Age	-0.143	0.028
2.	Education	0.228	0.239
3.	Operational land holding	0.224	0.101
4.	Area under fodder cultivation	0.199	0.232
5.	Primary occupation	-0.061	0.205
6.	Experience in dairy farming	-0.174	-0.012
7.	System of rearing dairy animals	0.000	-0.289*
8.	Dairy animal possession	0.046	-0.040
9.	Extension agency contact	-0.023	-0.022
10.	Mass media exposure	0.224	0.095
11.	Change in net income	0.485**	0.404**
12.	Present status of adoption	—	0.648**

** Correlation is significant at the 0.01 level (2-tailed), * Correlation is significant at the 0.05 level (2-tailed)

From Table 6, it is evident that the status of adoption of ethno veterinary practices for mastitis as well as adoption behaviour of the dairy farmers had highly significant positive correlation with change in net income due to adoption of technology, whereas significant negative correlation was noticed between adoption behaviour of the dairy farmers and system of rearing dairy animals. A highly significant positive correlation between the present status of adoption and the adoption behaviour clearly defines the role of perceived attributes in adopting the ethno veterinary practices for mastitis. Dibaba and Goshu (2019) also confirmed that perception of farmers toward the attributes of high yielding wheat varieties affected its adoption significantly and positively.

DISCUSSION

Source of awareness of ethno veterinary practice for mastitis: The dairy farmers were active members in various social media groups dedicated for agriculture and animal husbandry activities wherein descriptive contents regarding the preparation and application of herbal paste for mastitis in multimedia format are frequently shared. Also, the lockdown imposed during the COVID-19 pandemic provided plenty of free time for the farmers, and hence, they utilized online sources like webinars and other programmes related to animal husbandry. Proximity, frequent interaction and visibility of the results with friends and relatives would have enabled the farmers to acquire information about ethno veterinary practices for treatment of mastitis. Consulting veterinarians had also recommended this procedure as a preliminary measure in case of their delayed availability as well as adjuvant therapy for allopathic treatment. It could be concluded that personal and local communication channels, social media and various online resources were actively involved in propagating the ethno veterinary practice for mastitis among the farming community, which are in line with the findings of Devi and Verma (2011), Reshtia *et al*. (2021) and Singh *et al.* (2021), who stated that majority of the farmers used social media and interpersonal communication sources like neighbours and relatives as the major sources for their information needs.

Present status of the adoption of ethno veterinary practice for mastitis: The treatment procedure for mastitis can be initiated by the farmers themselves immediately after noticing the changes in milk and udder to avoid the delay in treatment. The ingredients needed for the preparation of the mixture are readily available in the local area. Further, the outlined procedure was cost effective; yielded better results in terms of early and complete cure, improved udder pliability, quick return and sustained milk production and reduced recurrence than allopathic procedure; absence of side effects and withdrawal effects of antibiotics in milk unlike allopathic medicine and suitability for certified and traditional organic farmers. Because of these reasons complete adoption of ethno veterinary practice for mastitis noticed among the majority of the dairy farmers.

In certain incidences, the veterinarians suggested to combine the ethno veterinary practice with allopathic medicine to obtain quicker and better results in severely affected dairy animals. In addition, farmers are also using allopathic medicines along with ethno veterinary to reduce the number of applications per day due to agriculture and other occupational pressures resulting in partial adoption of the technology. However, preparation of fresh mixture on daily basis and multiple

applications are difficult to follow; fibrosis of udder and poor response to ethno veterinary practice due to delayed presentation might be the reasons for shifting to allopathic treatment procedures.

Perceived attributes of ethno veterinary practice for mastitis: The farmers expressed that the ingredients required for preparation of mixture are readily available at no cost or low cost in the near vicinity and the procedure was exorbitantly profitable as the expenditure towards preparation and application of mixture was very less i.e. Rs. 283/- for single incidence of mastitis when compared to allopathic treatment procedure with the average treatment cost of Rs. 2,000/- per dairy animal per incidence. However, the ethno veterinary preparation for mastitis is applied topically and takes more time for the phyto chemicals to get absorbed and act upon resulting in longer course of treatment ranging between 5 to 15 days when compared to allopathic medicine where the drugs are mostly applied systemically and cure mastitis within 3-5 days.

Four-fifth (80%) of the farmers perceived that ethno veterinary procedure for treatment of mastitis as the farmers were having medium dairy herd size in semi-intensive system predominantly located in rural areas. Further, all the ingredients required for the preparation of the mixtures, like aloe vera, turmeric, lime and lemons, were readily available to them, and the practice is being adopted traditionally. Hence, the farmers perceived the innovation as situationally feasible as well as culturally acceptable and readily accepted it without any hesitation. Moreover, the farmers can initiate the mastitis treatment during beginning stage for getting successful results; requirement of residue free dung and urine for preparation of manure, panchkavya and amirthakaraisal for organic farming; and production of antibiotic residue free wholesome milk for children to prevent allergies resulting them as a physically compatible practice among the dairy farmers.

The farmers can easily comprehend the knowledge about the ingredients required, preparation, procedure for applying the mixture, and its availability. Further, the outlined ethno veterinary procedure for mastitis treatment like fresh mixture preparation daily, washing of udder, stripping of milk, repeated application of the paste and feeding lemons were very simple to practice and did not require any technical skill by the farmers which made the farmers to feel the innovation as cognitively easy and adoptable. However, farmers had to prepare the mixture freshly on a daily basis for effective results; the mixture had to be applied multiple times in a day for 5-15 days depending upon the severity of infection and number of quarters involved, which were considered as laborious by the farmers since they were engaged in other agricultural works and business.

The present findings of the study are in concurrence with De *et al.* (2004) and Rathod and Chander (2016), who stated that indigenous therapies were easy to understand, easy to prepare and use, locally available, effective, quick healing, cost effective, limited side effects and socially acceptable.

Social media, online sources and interpersonal communication sources like neighbours and relatives have contributed immensely to the information needs regarding ethno veterinary practices for mastitis. However, the public extension and research system as well as mass media had contributed little to the diffusion of technology among the farmers.

The role of perceived attributes of the ethno veterinary practices for mastitis in adoption was clearly evident from the significant association between the adoption status and adoption behaviour of the dairy farmers. Majority of the dairy farmers were in the medium and high level of adoption behaviour and they perceived that the ethno veterinary practice for mastitis was cheaper in price, exorbitantly profitable, feasible in farmers' situations, culturally acceptable, physically compatible, independent, cognitively easy, adoptable, abundantly resourceful, trialable and observable. The net income of the dairy farmers was increased by Rs.1,922/- per dairy animal in every incidence of mastitis due to reduction in cost for allopathic treatment and intra-mammary infusions. The research system should address the issue of relative advantage and complexity attribute of the innovation by making a ready-to-use product in the form of spray or paste to reduce the time required for preparation and application of the mixture every time.

Conflict of interest: Authors have no conflict of interest in this study.

Author's contribution: SK: Engaged in data collection, analysis and preparing original draft; NN: Involved in conceptualization, data curation, supervision, draft correction and final editing; VU, KS, GK: Involved in conceptualization and supervision.

Data availability statement: All the data supporting the research findings have been presented in this paper. The corresponding author is willing to provide the raw data upon reasonable request.

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