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Perception and Analysis of Existing Practices Associated with Risk of Brucellosis among Dairy Farmers

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ABSTRACT

The study to measure the perception and identify risky practices at the farm and household level on commercial dairy farms in six districts of Haryana and Punjab states was conducted during 2018-19. Dairy farmers' responses were obtained through an interview using a well-structured interview schedule. Univariate Logistic regression models were used to analyze the potential predictors for the risky behaviours of respondents. Binary logistic analysis revealed that Wald statistics values were significant at a 1% level for the explanatory variables viz., education while occupation and herd size were found significant at a 5% level. Half of the respondents (52.50%) had a high perception towards brucellosis disease risk. About one-third of the respondents (28.33%) of the respondents were found in the category of moderate perceptual level. Pearson chi-square indicates that there were significant associations for health status variables such as landholding, annual income, herd size, and milk production with the perception of respondents. Poor understanding of brucellosis, the presence of manifold risky practices, and incorrect perception of respondents need an urgent policy for the prevention and control of brucellosis in farm animals.

INTRODUCTION

India witnessed a rapid increase in milk production during the past two and half decades and holds the first position in the world (Sudhanshu, 2019). Dairying has considerable potential for generating additional income and provide employment through various sectors (Gupta et al., 2013; Singh et al., 2014; Singh et al., 2017; Verma et al., 2020). With the promotional policies of governments to fund the livestock and processing sectors, many entrepreneurs are choosing this enterprise (Jose et al., 2019). However, presence of Brucellosis as an endemic disease was reported in India by several researchers (Khurana et al., 2012; Deka et al., 2020) which is recognized as one of the most serious problems affecting the sustainability of dairy farming in India. The Brucellosis is a serious threat and accounted for 95.60 per cent of the total losses occurring due to brucellosis in livestock populations (Singh et al., 2015). In dairy animals, brucellosis primarily affects sexually mature female animals and leads to abortion in the last trimester, retained foetal membrane, the birth of unthrifty calves, repeat breeding, and infertility. The aborted animals release the pathogen by vaginal, uterine discharge, and milk which becomes the carrier of disease and spread over the herd through ingestion of infected materials. Human beings are the accidental hosts of brucellosis. In humans, this disease results from inhalation of the

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pathogen, or moves into by scratches in the skin. The use of unprocessed milk and milk products, and the handling of materials without any protection from infected animals lead to human infection. Due to these reasons, the person with frequent contact with farm animals in the endemic region is subjected to higher risk. Bovine brucellosis although has been eradicated in developed countries, it is still common in developing countries like India (McDermott et al., 2013). The presence of brucellosis in dairy farms of Haryana and Punjab state was studied by Chand and Chhabra (2013) and revealed overall herd prevalence was found to be 65.54 per cent (78/119). Whereas, state-wise herd prevalence of brucellosis was found 62.79 per cent (54/86) in Haryana and 72.72 per cent (24/33) in Punjab. The study aims to measure the perception and risk factors associated with Brucellosis among commercial dairy farmers of Haryana and Punjab states.

METHODOLOGY

This study was conducted in three districts of Haryana (Sirsa, Hisar and Karnal) and three districts of Punjab states (Ferozepur, Gurdaspur and Ludhiana). The data was collected by using a well-structured interview schedule. These districts were selected on the basis of highest cattle population, and researchers' convenience, but also represent the social and physical differences of both states. From each selected district 20 respondents were selected by snowball sampling method. The respondents were selected based on the criteria that they have at least 25 dairy animals. Thus, a total of 120 units were identified, selected and interviewed to get first-hand information on existing practices, risks, and perceptions of the respondent towards brucellosis for the present study. To identify the variables responsible for the risk of brucellosis several logit models were devised and tested (Lal et al., 2016). Although authors have presented the logit versions, probit forms were also tried thoroughly. However, as there was minute variation between them, only the logit is reported here comparing risky practices and non-risky practices of dairy farmers to identify significant variables for discrete dependent variables taking the binary value of either 0 or 1 (Lal et al., 2018). The dependent variable takes the value 1 with a probability to be non-risky (p), or the value 0 with probability to be risky (1-p). In this research, farmers were grouped as risky and non-risky based on their scale value, a score of 1 was given to non-risky and value 0 was given to risky. Statistical analysis tools; frequency, percentage, Univariate logistic regression model, and Pearson chi-square test were calculated by using SYSTAT VERSION 6.0.1 software to draw meaningful conclusions.

RESULTS AND DISCUSSION

Existing practices (Factors) associated with risk of Brucellosis

Initially, 11 predictive variables were taken but the final model was fitted with 5 factors. The five explanatory or predictive variables that are selected for the binary logistic regression model have been discussed based on the model output. The analysis asserted that 79.2 per cent was the overall percentage correctness of the total prediction for the risky practice of respondents toward brucellosis (Table 1). This empirical fact depicted that the variables predicted the model as Nagelkerke R square statistics indicated overall modest fit for the model was 0.297 or 29.70 per cent. Binary logistic analysis revealed the Wald statistics were significant at 1 percent level for the explanatory variables viz., education. Variables like occupation and herd size were significant at 5 per cent level. Variable family size was significant at 10 per cent level while age had not a significant relationship with the risk of following existing practices towards brucellosis even at 10 per cent level. The result revealed that age was not found to be statistically significant even at P<0.10, with the Wald statistics value of 1.325. The reason may be for the non-significant relationship between age and risk of following existing practices towards brucellosis was knowledge of good hygienic practices. It does not depend on age of farmers while other variables like education, family size, occupation and herd size was found to be statistically significant at P<0.01, P< 0.10, P<0.05 and P<0.05 with the Wald statistics value of 7.599, 3.606, 6.199 and 4.496, respectively.

Perception of commercial dairy farmers towards brucellosis disease risk

A critical look at Table 2 revealed that the majority of the respondents had positive perceptions about the 'Brucellosis Disease Risk'. Respondents strongly responded in favour of almost all the positive statements, like: (19) Willingness to vaccinate heifers (13) Vaccinating heifers on the recommendation of veterinary doctor (2) Family life at risk due to brucellosis in dairy animals; (5) Dairy animals infected by licking or eating the placenta of affected animals; (12) Making arrangements for vaccination of heifers against brucellosis; (10) News of brucellosis influenced to get vaccination in farm animals; (18) Vaccination of animal to prevent spreading the disease to other animals; (6) Probability of getting brucellosis infection were more if sleep inside the animal shed; (15) Following health instructions provided through various sources on brucellosis

Table 1. Binary logistic regression pertinent to existing practices of dairy farmers

Predictive variables	B	S.E.	Waldvalue	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Age	-.021	.018	1.325	1	.250	.980	.946	1.015
Education	.428	.155	7.599	1	.006***	1.534	1.132	2.080
Family size	.232	.122	3.606	1	.058*	1.261	.993	1.603
Occupation	.923	.371	6.199	1	.013**	2.517	1.217	5.206
Herd size	.028	.013	4.496	1	.034**	1.028	1.002	1.055
Constant	-5.819	1.766	10.854	1	.001	.003		

***Significant at 0.01 level of significant; **Significant at 0.05 level of significant; *Significant at 0.10 level of significant; S.E.=Standard Error; C.I.= Confidence Interval; df=Degree of freedom

(Table 2) with the chi-square value of 241.17, 208.50, 172.83, 140.83, 128.91, 120.00, 120.00, 105.67 and 100.17, respectively, which was found to be significant at 1% level. From this, we can conclude that there is a trend of positive response towards brucellosis disease risk, and a significantly more number of subjects are in agreement with the perception statements on brucellosis disease risk. In contrast, they strongly responded against the negative statements, like (24) distrust on veterinary doctor's advice to get brucellosis vaccination'; (1) do not bother for brucellosis in dairy animals; (3) If dairy animals get brucellosis, it would be not serious than other diseases; (20) unable to afford to get vaccination in dairy animals (Table 2) with the chi-square value of 78.17, 65.83, 54.00 and 44.67, respectively. From this, it is evident that a significantly more number of respondents are in disagreement with the negative perception statements on brucellosis risk. Whereas they positively responded for the negative statements like: (23) Veterinary doctors/clinic that gives the brucellosis vaccination is hard to reach at grassroot level; (21) Inadequate knowledge of brucellosis transmitted from animals to humans and vice-versa; (14) they don't know how to ask to doctor about brucellosis; (22) Non-availability of the vaccine in the market interfere the process of vaccination against brucellosis; (Table 2) with the chi-square value of 80.83 71.41, 19.91 and 18.58, respectively, which was found to be significant at 1% level. The findings of the study supported by Ntirandekura et al., (2018) who revealed that although respondents recognized brucellosis as a zoonotic disease, they consider it of less importance. However, they perceived the interactions between humans, livestock and wildlife together with movements between borders to be potential risks for introduction of brucellosis in their communities. Kansiime et al., (2014) conducted their study on Knowledge and perceptions of brucellosis in the pastoral communities adjacent to Lake Mburo National Park, Uganda revealed that majority of the respondents (99.30%) had ever heard about brucellosis which is commonly known as 'brucella' and perceived that brucellosis affects all age groups and all sexes and majority (66.20%) mentioned that the disease is not seasonal.

Overall perception towards brucellosis disease risk

Table 3 revealed that the maximum number of the respondents (52.50%) was having a high perceptual level, while only 19.17 per cent of the respondents were in the category of low perceptual level. However, 28.33 per cent of the respondents were found in the category of having moderate perceptual level. The results indicated that 97 respondents were having moderate to high perceptual level towards Brucellosis Disease Risk. That means respondents were much concerned for brucellosis disease. From this, we can conclude that there is a trend of positive response and concern for this disease among commercial dairy farmers and a significantly 80.83 per cent of respondents (with a minimum score of 79 in the 100 point scale) are having a moderate to high perceptual level towards brucellosis risk. Majority of the respondents had high perception of brucellosis disease risk due to severity of the disease. Verma et al., (2019) emphasized that educational module had significant relevance to overcome against brucellosis among commercial dairy farmers. The study conducted

Table 2. Chi-squire values in respect of perception items

S.No.	Statements	χ^2
1	I do not bother for brucellosis in my dairy animals.	65.83**
2	My family life will be at risk due to brucellosis in the dairy animals of my farm.	172.83**
3	If my dairy animals get brucellosis, it would be not serious than other diseases.	54.00**
4	There may be a chance of getting brucellosis in the future if I consume uncooked milk and its products from the infected dairy animals.	41.83**
5	Dairy animals may be infected by licking or eating the placenta of affected animals.	140.83**
6	The probability of getting brucellosis infection will be more, when I will sleep inside the animal shed.	105.67**
7	When I avoid my animals licking my body, I may set a good example for others.	23.75**
8	Even if I don't vaccinate heifers against brucellosis, I think that the chances of infection will be less.	29.17**
9	I don't think my family member likely to get brucellosis	17.41**
10	News of brucellosis would influence me to get brucellosis vaccination in animals	120.00**
11	I shall access online resources which can serve as the most appropriate means of information being provided on brucellosis.	21.08**
12	I will make arrangements for vaccination of heifers against brucellosis, once I observe the symptoms in other animals.	128.91**
13	I would prefer to vaccinate heifers at my farm for brucellosis, if veterinary doctor recommend it.	208.50**
14	I don't know how to ask about brucellosis risk for my family.	19.91**
15	I would follow, if health instructions provided through various sources on brucellosis.	100.17**
16	I am sure that I can comprehend health advice from my veterinarian about brucellosis risk prevention.	38.67**
17	I think, by doing surveillance for brucellosis, future problems of heifers may be prevented.	21.25**
18	I would get brucellosis vaccination to prevent spreading the disease to other animals	120.00**
19	I am willing to vaccinate my farm heifers, if I am sure it would prevent brucellosis.	241.17**
20	I could not afford to get brucellosis vaccination in dairy animals.	44.67**
21	I have inadequate knowledge of diseases transmitted from animals to humans and vice-versa.	71.41**
22	Non-availability of vaccine in the market may likely to interfere with the process of vaccination against brucellosis.	18.58**
23	Veterinary doctors/clinic that gives the brucellosis vaccination is hard to reach in my locality.	80.83**
24	I do not trust a veterinary doctor's advice to get a brucellosis vaccination.	78.17**

*Significant at 5% level; **significant at 1%; (*df*=5-1=4). Table values of chi-square at 4 *df* were 9.49 and 13.28 at 5 and 1% level of significance, respectively.

Table 3. Overall perception level of respondents towards brucellosis disease risk (n=120)

S.No.	Perception level	Respondents	
		Freq-uency	Percen-tage
1.	Low perceptual level (<78.63)	23	19.17
2.	Moderate perceptual level (78.63 to 92.76)	34	28.33
3.	High perceptual level (>92.76)	63	52.50

by Mondal et al., (2022) reported that overall perception index was estimated to be 68, indicating that consumers have a favourable perception of milk consumption and dairy farming. The findings of Mangesho et al., (2017) revealed that pastoralists do not perceive the threats of zoonosis unless they have been able to link the biomedical realities, for example, from hospital or veterinary diagnosis with the visible or actual disease. The perceptions may also be muted by indigenous practices, which render the food safe, such as the use of herbs during cooking and eating of meat and milk.

Socio-personal and socio-economic variables influencing perception level of commercial dairy farmers towards brucellosis disease risk (n=120)

To find out that which socio-personal and socio-economic variables are influencing the perception level of the commercial dairy farmers towards brucellosis disease risk. For this Pearson chi-square values were calculated using SYSTAT VERSION 6.0.1 among different variables and perception level. By applying the Pearson chi-square test it was found that there were no significant associations for socio-demographic factors or health status variables (Table 4) such as age, education, family size, and experience in commercial dairy farming with the perception level. The landholding, annual income, Herd size and Milk production was highly associated with perception of commercial dairy farmers towards brucellosis disease risk as the chi-square value, i.e. 22.182,13.063, 11.438 and 17.778 was significant at 1%, 5% and 0.001% level with *P*-value of 0.000, 0.011, 0.022 and 0.001, respectively. So, it can be concluded that these socio-demographic variables and perception level was not independent. The study conducted by Mishra et al., (2021) revealed that perception and socio-demographic profile of respondents had positive correlation towards social media.

CONCLUSION

The studies revealed that majority of the respondents were not aware of brucellosis as zoonotic disease, burying aborted foetus with slaked lime and wash hands before and after milking. All the respondents engaged in at least one practice that is risky to them. The overall awareness of zoonotic diseases among commercial dairy farmers is abysmally poor. The perception of dairy farmers in the study area predisposes them to the risk of zoonotic diseases, thus presenting serious challenges to the development of nation. Awareness program should be started through public education on brucellosis and their preventive and control measures as a matter of urgency to make sure public well-being and safety.

Table 4. Relationship between socio-economic profile of the respondents and perception level

S.No.	Variables	Categories	Perception			df	χ^2 (P-value)
			Low	Medium	High		
1.	Age	Low	13 (10.83)	17 (14.17)	30 (25.00)	4	0.681(0.954)
		Medium	6 (5.00)	9 (7.50)	19 (15.83)		
		High	4 (3.33)	8 (6.67)	14 (11.67)		
2.	Education	Low	4 (3.33)	8 (6.67)	12 (10.00)	4	0.576(0.966)
		Medium	14 (11.67)	18 (15.00)	35 (29.16)		
		High	5 (4.17)	8 (6.67)	16 (13.33)		
3.	Family-size	Low	9 (7.50)	15 (12.50)	37 (30.83)	4	3.941(0.414)
		Medium	6 (5.00)	9 (7.50)	14 (11.67)		
		High	8 (6.67)	10 (8.33)	12 (10.00)		
4.	Land-holding (ha)	Low	3 (2.50)	3 (2.50)	4 (3.33)	4	22.182**(0.000)
		Medium	9 (7.50)	22 (18.33)	55 (45.84)		
		High	11 (9.17)	9 (7.50)	4 (3.33)		
5.	Annual Income (rupees)	Low	4 (3.33)	17 (14.17)	36 (30.00)	4	13.063**(0.011)
		Medium	15 (12.50)	10 (8.33)	18 (15.00)		
		High	4 (3.33)	7 (5.84)	9 (7.50)		
6.	Herd size	Low	7 (5.83)	10 (8.33)	35 (29.17)	4	11.438*(0.022)
		Medium	8 (6.67)	18 (15.00)	19 (15.83)		
		High	8 (6.67)	6 (5.00)	9 (7.50)		
7.	Milk production (litres/day)	Low	3 (2.50)	9 (7.50)	34 (28.33)	4	17.778**(0.001)
		Medium	14 (11.67)	13 (10.83)	14 (11.67)		
		High	6 (5.00)	12 (10.00)	15 (12.50)		
8.	Experience in commercial dairy farming (year)	Low	7 (5.83)	8 (6.67)	14 (11.67)	4	4.477(0.345)
		Medium	10 (8.33)	23 (19.17)	39 (32.50)		
		High	6 (5.00)	3 (2.50)	10 (8.33)		

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