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Behavioral determinants of brucellosis incidence among stockbreeders and their family members in rural area based on PRECEDE model

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Abstract:

INTRODUCTION: Brucellosis is one of the common diseases between humans and animals. The purpose of this study was to investigate behavioral determinants of brucellosis incidence among stockbreeders and their family members in a rural area based on the PRECEDE model.

MATERIALS AND METHODS: This cross-sectional study was carried out among 540 stockbreeders and their family members in Northeastern Iran in 2019. Sampling was done in two stages including stratified sampling and random sampling method. Data collection was conducted by a valid and reliable questionnaire developed based on the PRECEDE model. Data were analyzed using SPSS16 through Pearson correlation coefficient, independent *t*-test, and ANOVA. Furthermore IBM SPSS AMOS version 20 was used for the path analysis.

RESULTS: The mean age of the participants was 39.02 ± 16.41 years, of whom 53.1% and 46.9% were men and women, respectively. About 23.9% of the participants had a history of brucellosis in their families. Enabling factors were the most important determinant of self-efficacy and self-efficacy was the most important determinants of behavior. Evaluation of the chi-square indicators, chi-square ratio to degree of freedom, root mean square error of approximation, adjusted goodness of fit index, parsimony comparative fit index, comparative fit index, incremental fit index, and parsimonious normed fit index indices indicated that the model was well fitted and there was a positive and significant relationship between the predisposing, enabling, and reinforcing factors on the one hand and behavior on the other. chi-square indicators, chi-square ratio to degree of freedom, root mean square error of approximation, adjusted goodness of fit index, parsimony comparative fit index, comparative fit index, incremental fit index, and parsimonious normed fit index

CONCLUSION: Designing and implementing health plans based on the PRECEDE model with more emphasis on self-efficacy as the most important behavioral determinants can bring about a positive effect on enhancing the brucellosis preventing behaviors.

Keywords:

Behavior, brucellosis, preventive PRECEDE, stockbreeders

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Introduction

Brucellosis is one of the most important zoonotic diseases caused by Brucella and causes a huge amount of life and financial damage in animals and humans.[1,2] This disease is considered as a major challenge and a threat to public health due to its physical problems and reducing productivity of the infected individuals.[3,4]

According to the World Health Organization (WHO) estimates, about half a million people are infected with this disease annually,[5] and the share of the Eastern

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Mediterranean region, which also includes Iran, is 45,000 cases. According to the WHO, only one out of every five cases of this disease is diagnosed,[6] with an estimated 4%–10% of brucellosis cases identified in developing countries.[4] Brucellosis is a native disease in Iran[7] and the share of the rural areas is higher than that of the urban areas.[8]

The incidence of the disease has been reported to be 2 per 100,000 in countries such as Australia and up to 500 per 100,000 in some developing countries. Iran's incidence of human brucellosis is among the five highest worldwide. Estimates of the frequency of brucellosis in Iran range from 0.5%–10.9%, depending on the area.[9,10] Human brucellosis was first diagnosed in 1932 in Iran, and the animal vaccination program began in 1949 in this country.[11]

Most parts of Iran are endemic to this disease, especially the areas where most of the individuals are stockbreeders and in close contact with livestock.[5,12]

Khorasan Razavi Province is located in the Northeast Iran, and it has a long border with Afghanistan, which is a country with a high prevalence of brucellosis. Due to the high rate of human mobility and animal dealing between these two countries, which tendentiously occurs, through Khorasan-e Razavi Province, this area is at a high risk for brucellosis. The incidence of the disease in Torbat Heydariyeh has been increasing since 2011, which is much more (21 cases per 100,000 individuals) than the country average estimate.[13]

Although the control and eradication of brucellosis in humans is largely dependent on health measures, vaccination, an disease reduction among animals, observing individual health issues, preventing the spread of disease, and preventive behaviors are also important protective actions for human health.[14,15]

Human brucellosis treatment imposes a high-cost burden on both the individual and society. Researchers estimate that the cost of treating each patient with brucellosis is approximately 1000 dollars.[16] Based on a study by Singh in India in 2015, brucellosis caused 3.4 billion dollars of damage to the country's livestock sector.[17]

The results of various studies show that behavioral factors and misconceptions are very important in the development of brucellosis. For example, a study in Southwestern Nigeria showed that the consumption of unpasteurized milk and raw meat as well as living with animals was among the most high-risk behaviors in the transmission of brucellosis.[18]

In another study in Iran, consumption of the raw camel milk for the treatment of dyspnea and hemorrhoid; the use of animal urine for the treatment of kidney stones and cough; the use of raw liver, testicles, and spleen for the treatment of enuresis; the use of raw liver for the treatment of anemia; the use of the first raw milk of the cows which have newly given a baby; sleeping inside the skin of the freshly slaughtered livestock to treat joint pain and relieve fever; and lack of vaccination of the cattle to prevent their weight loss, lactation reduction, and sterilization are the most prevalent misconceptions among stockbreeders that increase prevalence of the disease.[19]

Most studies on brucellosis have exploited statistical methods to investigate the factors affecting the disease. Such studies often lack a theoretical framework to provide an analytical background. It seems necessary to use a comprehensive framework to deal with all aspects of the disease.[20]

Meanwhile, the PRECEDE–PROCEED model has been proposed as a framework and planning model for identifying needs in health education and health promotion. This model has been developed by Green *et al*..,[21] and one of the most important features of this model is to provide a comprehensive view of the desired topic. According to this model, for behavioral change, one should not only focus on the individual's behavior but also the individual's surroundings and factors influencing the behavioral change should also be considered.[22,23] Regarding the prominent role of this model, Green and Crotter (2005) point out that this model is flexible, standardizable, measurable, and committed to the principle of participation, and has a process structure for adopting the best evidence-based applications. Some of the areas in which this model has already been used include unification, improving community participation, requirement assessment, ensuring acceptance behaviors, implementing health and prevention programs in the workplace and schools, and improving self-care.[24] Since the present study is based on adopting preventive behaviors, so using the PRECEDE model as a participatory and planning model can be very helpful in this regard, this study was designed and implemented to behavioral determinants of brucellosis incidence among stockbreeders and their family members in rural areas based on the PRECEDE model.

Materials and Methods

Study design and setting

This cross-sectional study was conducted in 2019 in Torbat Heydariyeh city of Khorasan Razavi province in Iran. Khorasan-Razavi province is located in Northeast Iran and Torbat Heydariyeh city is one of the southern cities of this province. The mean population of this

city in urban and rural areas was 134,516 and 81,894, respectively, according to the census of the year 2017. The most people in rural areas of this city are occupied to farming and animal husbandry.

Participants and sampling procedures

This descriptive cross-sectional study was conducted from January 15, 2019, to June 17, 2019, on 540 stockbreeders and their family members. Sampling was done in two stages. In the first stage based on the stratified sampling, Torbat Heydariyeh city was divided into four regions: North, South, East, and West. Then, two villages with the highest prevalence of brucellosis during the past year were selected from each region. In the next stage, we went to the health house of each village, and selected samples randomly through each household's health record using the integrated health system (SIB system). Thenwe went to the selected households and explained to them purpose of the study and self-administr ated-questionnaires were completed by them.

Inclusion and exclusion criteria

The inclusion criteria had a health record in the health home of the village, age of 18–60 years, residing in the village for at least 1 year, and completing a written consent form to participate in the study. Besides, those who were illiterate and very old who were unable or unwilling to participate were excluded from the study.

Measurement

In this study, a researcher-made questionnaire was used. This questionnaire was developed in two stages including Stage1 and Stage 2. Stage1: To get comprehensive data, first, a qualitative content analysis study was conducted in villages with high brucellosis prevalence (based on the statistics and documents of Province Health Center). Data were collected through semi-structured interviews with 30 stockbreeders, their family members, and other influential individuals (health experts, veterinarians, butchers, physicians, shepherds, village council, Health Care Provider of rural area [Behvarz], and community health volunteers). Participants were selected using the snowball method. Following the interviews, a questionnaire was developed based on the PRECEDE model, and its validity and reliability were confirmed. Stage2: To determine the content validity, the questionnaire was given to 11 experts to declare their opinion about the items of questionnaire and validity of the questionnaire was confirmed. Furthermore, reliability of the questionnaire was confirmed in a pilot study among 30 stockbreeders and their family members. This pilot sample was not included in the final sample.

The questionnaire consisted of two parts: (1) demographic characteristics (age, sex, marital status, education level, and occupation, as well as a family history of brucellosis) and (2) structured standard questionnaire for measuring the factors affecting the incidence of brucellosis based on the PRECEDE model. The behavioral factor assessment scale consisted of 7 items, each with five possible answers (always, most often, sometimes, rarely, and never). The environmental factor assessment scale consisted of 3 items, each with three possible answers (yes, no, and somewhat). The educational and ecological assessment scale consisted of 25 items, which were divided into three subscales: (a) predisposing factors, (b) enabling factors, and (c) reinforcing factors.

Predisposing factors

These factors were employed to assess the knowledge, attitude, and self-efficacy of the individuals regarding the brucellosis-preventing behaviors.

Knowledge

This subscale consisted of 4 items, each of which with three three-point responses (yes, No, and I do not know).

Attitude

This subscale consisted of 4 items measured by a 3-point Likert scale (I agree, No idea, and I disagree).

Self-efficacy

This subscale was comprised 3 items, each with a 5-point response (Always, Most often, Sometimes, Rarely, and Never).

Enabling factors

This subscale consisted of 3 items, each with a 5-point response (Always, Most often, Sometimes, Rarely, and Never).

Reinforcing factors

This subscale consisted of 7 items, each with a 5-point response (always, most often, sometimes, rarely, and never).

After confirming the validity and reliability of the study instrument, the questionnaire was distributed among samples and fulfilled by them.

Statistical analysis

Data were analyzed using statistical package for social sciences (SPSS) v. 16 (SPSS Inc., Chicago, IL) SPSS version 16. At first, the demographic and other characteristics of the subjects were presented. Then, the PRECEDE model constructs (continuous variables) were calculated using the descriptive tests, mean, and standard deviation (SD). Pearson correlation coefficient was employed to examine the relationship between variables. Moreover, the Kolmogorov–Smirnov (K-S) test was used to evaluate the data normal distribution. Independent *t*-test and ANOVA were used for comparing the mean

score. Furthermore, IBM SPSS AMOS version 20 was used for the path analysis.

Structural equation modeling was performed to facilitate the analysis of the relationship among the predisposing, enabling, reinforcing, behavioral, environmental, and self-efficacy factors [Figure 1]. The arrows indicate the paths from the external variables (predisposing, enabling, and reinforcing) to preventive behaviors,

Model evaluation was performed using the following indices: Chi-square indicators (χ^2), Chi-square ratio to degree of freedom (χ^2/df), Root Mean Square Error of Approximation (RMSEA), Adjusted Goodness of Fit Index (AGFI); Parsimony Comparative Fit Index (PCFI), Comparative Fit Index (CFI); Incremental Fit Index (IFI) and Parsimonious Normed Fit Index (PNFI).[25,26] The model was considered to be a good fit if χ^2/df <5, RMSEA $\leq$0.08, AGFI >0.8, PCFI and PNFI >0.5, and CFI and IFI >0.9.[27,28]

Results

The mean (SD) age of the participants was 39.02 ± 16.41 years, of whom 53.1% and 46.9% were men and women, respectively. In addition, 6.9% of the samples had university degrees and 23.9% had a history of brucellosis in their families [Table 1].

The univariate K-S test was used to evaluate the data normality, which showed that the predisposing, enabling, reinforcing, self-efficacy, behavior, and environment scales were distributed normally.

The Cronbach's alpha coefficient and content validity index (CVI) and content validity ratio (CVR) were used to determine the internal reliability and validity of the questionnaire. Cronbach's alpha coefficient was between 0.70 and 0.87 and CVI was between 0.79 and 0.88 and CVR was between 0.71 and 0.78 [Table 2].

Table 1: Frequency distribution of demographic and other factors of the understudied population

Variables	*n* (%)
Gender	
Male	287 (53.1)
Female	253 (46.9)
Marital status	
Marriage	492 (91.1)
Single	48 (8.9)
Education level	
Literacy for reading and writing	92 (17)
Primary school	233 (43.1)
High School	178 (33)
Academic	37 (6.9)
Do you have cows, sheep or goats?	
Yes	528 (97.8)
No	12 (2.2)
Where are kept your livestocks?	
Inside the house	292 (54.1)
Outside the house	248 (45.9)
What is your dairy consumption?	
Local	469 (86.9)
Pasteurized	71 (13.1)
Family history of being with brucellosis	
Yes	129 (23.9)
No	411 (76.1)

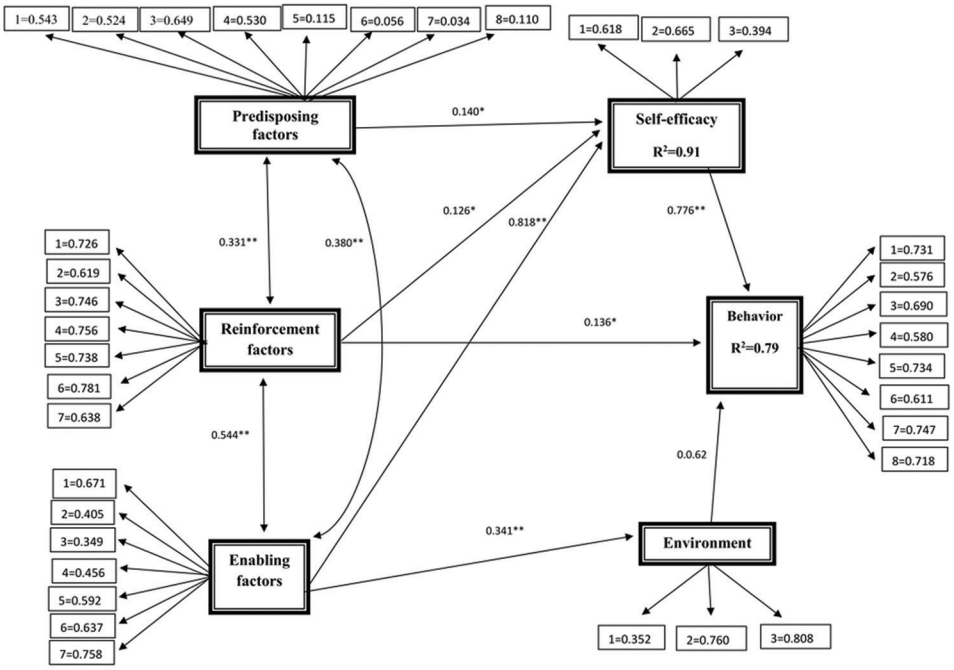

Figure 1: SEM and path coefficient between variables (*P <0.05, **P <0.001)

Table 2: Cronbach's alpha and content validity ratio and content validity index constructs

Variables	Cronbach's alpha	CVR	CVI
Predisposing factors	0.71	0.78	0.79
Reinforcement factors	0.86	0.77	0.88
Enabling factors	0.78	0.78	0.81
Self-efficacy	0.70	0.76	0.8
Environment	0.77	0.71	0.81
Behavior	0.87	0.72	0.84

CVR=Content validity ratio, CVI=Content validity index

The mean scores of behavioral determinants of brucellosis incidence including predisposing, enabling, reinforcing, self-efficacy, environmental, and behavioral factors as well as association of them with demographic characteristics are demonstrated in Table 2. Furthermore, the mean (SD) values of knowledge, self-efficacy, and behavior for men and women were 8.53 ± 2.19 and 8.79 ± 1.98, 10.65 ± 2.72 and 10.65 ± 2.89, and 25.03 ± 7.97and 25.15 ± 8.23, respectively [Table 2].

Most of the participants had primary education (43. 1%) and only 6.9% of them had university education. The mean score of self-efficacy for those with university education was significantly more than the primary (P = 0.038). There was also a statistically significant difference between the men and women in the mean scores of the reinforcing (P = 0.037) and enabling factors (P = 0.004). There was a statistically significant difference between the self-efficacy (P = 0.035) and attitude scores (P = 0.003) in different age groups so that the mean scores of attitude and self-efficacy were higher in participants over 51 years old [Table 3].

The Pearson correlation coefficient indicated that there was a direct and significant relationship between self-efficacy and predisposing, enabling, and reinforcing factors (P < 0.001). Moreover, there was a direct and significant relationship between the behavior on the one hand and the predisposing, enabling, reinforcing, self-efficacy, and environmental factors on the other hand (P < 0.001) [Table 4].

The analysis was performed to evaluate the paths of the PRECEDE constructs [Figure 1]. Based on the results of the data analysis in the path analysis, the main indicators showed that the final model had a good fit [Table 5].

The relationship between the PRECEDE model constructs and the level of the brucellosis preventive behaviors as well as the determination of the strongest determining constructs of behavior in the fitted model predictive of the preventive behaviors is demonstrated in Figure 1.

As shown in Figure 1, the constructs of the predisposing, enabling, and reinforcing factors have three path coefficients (beta standard coefficient) of 0.140, 0.126, and 0.818 in relation to self-efficacy constructs, respectively. In other words, these coefficients show the predictive power of these three constructs in relation to self-efficacy.

The construct of reinforcing factors had a direct effect (B = 0.136) with no mediator on the level of the preventive behavior, and also, the construct of the enabling factors with B= 0.341 had the predictive power for the environmental factors [Table 6].

The self-efficacy construct as a mediating factor indicated a 91% change in the rate of the brucellosis-preventive behaviors. Overall, 71% of the changes in the preventive behavior level were explained by this model [Figure 1].

The self-efficacy and enabling factors constructs have, respectively, a direct effect and an indirect effect on behavior. The direct and indirect effects of the variables on each other are illustrated in Table 6. As shown in Table 6, self-efficacy has the greatest impact on the brucellosis-preventive behaviors.

Discussion

Since brucellosis is one of the most prevalent zoonotic diseases in Iran with many health and economic consequences, recognizing the effective factors in controlling and preventing the disease is of great importance.

The purpose of this study was to investigate the behavioral determinants of brucellosis incidence among stockbreeders and their family members in a rural area based on the PRECEDE model. The PRECEDE model included predisposing, enabling, reinforcing, environmental, and behavioral factors.[29]

About 53.1% of the participants were male who were more likely to develop brucellosis due to their interaction with livestock and the risk factors. Their information, their perceptions of reinforcing factors, and enabling factors regarding the brucellosis prevention were lower compared to women. Similar results were found in a study in Tajikistan, showing that stockbreeders were significantly at risk of brucellosis.[30]

Studies have revealed that men were more likely to have the disease in comparison to women, suggesting that it was due to the type of work, more contact with livestock, and their products.[31,32] Contrary to these studies, a study in Saudi Arabia showed that the prevalence of brucellosis was higher in women than in men.[33]

Understanding reinforcing factors such as family support, community, health personnel, village councils, friends, and relatives and enabling factors such as resources, facilities, skills, and access can have a significant impact

Table 3: Brucellosis control and prevention predisposing, enabling, reinforcing, self-efficacy, environmental, and behavioral factors

Behavioral Determinants Variables	Mean±SD							
	Knowledge	Attitude mean	Self-efficacy	Enabling	Environmental	Behavioral	Reinforcing	Predisposing
Gender								
Male	8.53±2.19	10.26±1.98	10.65±2.72	19.74±5.88	6.77±1.86	25.03±7.97	24.01±6.82	18.80±2.80
Female	8.79±1.98	10.04±2.27	10.65±2.89	21.34±6.33	6.71±1.92	25.15±8.23	25.28±6.73	18.83±2.96
P	0.171	0.236	0.998	0.004	0.741	0.869	0.037	0.90
Education								
Literacy for reading and writing	9.11±2.00	9.90±2.21	9.79±2.71	19.69±5.30	6.83±1.67	23.70±7.70	23.28±6.16	19.02±2.91
Primary school	8.75±2.05	10.05±2.19	10.88±2.86	20.68±6.37	6.88±1.92	25.68±8.37	25.74±6.90	18.80±2.77
High school	8.28±2.22	10.46±1.85	10.80±2.82	20.44±6.12	6.61±1.87	25.11±8.12	24.22±6.85	18.76±2.96
University	8.62±1.75	10.47±1.81	10.60±2.16	21.22±5.9	6.40±2.14	24.97±6.80	23.14±6.36	19.10±2.77
P	0.04	0.013	0.038	0.632	0.432	0.363	0.125	0.875
Job								
Farmer	8.86±6.43	9.96±1.93	10.02±2.77	18.52±5.92	6.83±2.12	25.31±8.82	22.96±7.63	18.66±3.61
Farmer/agriculture	8.74±2.23	10.13±2.11	11.17±2.62	20.77±6.30	6.83±1.82	26.37±8.11	24.78±7.04	18.87±2.95
Household	8.73±1.95	10.19±2.19	10.62±2.92	21.18±6.51	6.75±1.88	25.20±8.43	25.22±6.91	18.92±2.81
Student (in university)	8.33±1.41	10.44±1.01	10.59±1.97	21.66±4.52	6.88±2.31	26±6.36	25.11±4.53	18.77±1.78
Student (in university)	6.66±1.52	11±1.00	8±1.73	16.33±5.50	6.66±3.21	19.66±8.50	25.33±8.32	17.66±2.30
P	0.017	0.046	0.197	0.488	0.002	0.193	0.216	0.579
Age								
18-30	8.36±2.03	10.34±1.99	10.57±2.80	20.04±6.56	6.37±1.90	24.02±7.82	23.85±6.69	18.71±2.89
31-50	8.68±2.12	10.14±2.15	10.76±2.75	21.07±5.95	6.95±1.91	25.98±8.08	25.18±6.76	18.83±2.91
>51	9.04±2.12	9.93±2.25	10.55±2.96	19.85±5.82	6.76±1.88	24.53±8.47	24.28±7.15	18.82±2.88
P	0.060	0.003	0.035	0.256	0.085	0.892	0.286	0.721
Family history of brucellosis								
Yes	8.53±2.08	10.40±1.91	10.33±2.70	18.77±5.47	6.59±1.80	23.25±7.59	23.07±6.82	18.94±2.92
No	8.68±2.10	10.80±2.19	10.79±2.80	21.12±6.22	6.82±1.90	25.77±8.15	25.21±6.68	18.77±2.84
P	0.477	0.148	0.109	<0.0001	0.234	0.003	0.002	0.55

SD=Standard deviation

Table 4: The Pearson correlation test between all variables

Variables	1	2	3	4	5
Predisposing factors	1				
Reinforcement factors	0.501**	1			
Enabling factors	0.110*	0.515**	1		
Self-efficacy	0.204**	0.477**	0.577**	1	
Environment	0.083	0.244**	0.297**	0.180**	1
Behavior	0.191**	0.581**	0.691**	0.626**	0.280**

*P<0.05, **P<0.001

on enhancing preventive behaviors. Therefore, access to the facilities, resources, and services needed, such as vaccination, testing, and killing of contaminated animals, and access to personal protective equipment such as masks, glasses, and gloves when exposed to potentially contaminated animals can be effective in reducing and controlling the disease.[34,35]

In the present study, only 10.4% of the participants stated that their livestock had been vaccinated by veterinarians in the past year, and 13.2% stated that they had access to personal protective equipment; moreover, 25.1% stated that they had been provided with training classes on brucellosis held by the health and veterinary departments. Therefore, not only the individuals should be targeted for disease control but also the whole environment surrounding them, such as the family, related organizations (veterinary, health department, government, etc.), and key and influential individuals (health communicators, village councils) should be considered. In this regard, a study in Kenya showed that almost all stockbreeders declared that only a limited number of them vaccinated their livestock. They demanded reinforcing the livestock services, improving equipment and services at health centers, and providing training about the disease in rural communities.[34]

The mean score of self-efficacy and attitudes in the participants with a low education level was lower than that with a higher education level. Self-efficacy is the judgment of an individual about his/her ability to perform a particular task. Bandura believes that "self-efficacy is an important component of one's performance. This is because it acts as an independent part of his basic skills;" this is in line with the results of the study conducted by Jahangiry in Iran.[9]

Furthermore, the results of a study in Iran showed that people with a high level of education have a

positive attitude toward the brucellosis preventive behaviors.[36]

In the current study, there was a significantly positive relationship between the predisposing, reinforcing, enabling, environmental, and self-efficacy factors with preventive behaviors. This means that by increasing the scores of the PRECEDE model constructs, the brucellosis prevention behaviors among stockbreeders and their family members increase as well. Similar studies[20,36,37] have been shown the effective role of environmental, enabling, reinforcing, and behavioral factors in the prevention and control of brucellosis.

Path analysis showed that there was a direct relationship between reinforcing factors and preventive behaviors.

Given the PRECEDE model, encouragement and support of the clients by health workers, family members, relatives, friends, and local influential individuals (village council members and school teachers) increase the chance of continuation of the recommended behaviors. In addition, by pursuing the desired behavior at home, the responsibility of performing the behavior is transferred to the clients, and self-care and self-efficacy are reinforced among them. Since in this model, unlike traditional education, the emphasis is more on the responsibility and self-care by the clients.[21]

In addition, based on the path analysis results, predisposing factors were indirectly influencing behavior through self-efficacy. This means that by enhancing the individuals' knowledge, attitudes, and beliefs, self-efficacy can be enhanced among them so that they are empowered and able to have more control over their health.[38] In the studies accomplished in this area, the causes of developing the disease included the patients' insufficient knowledge and attitude concerning the transmission ways of brucellosis, and most patients had a history of use of unpasteurized dairy products.[39-41]

In the present study, enabling factors were also indirectly effective in the preventive behaviors by influencing the environmental factors. In this way, the health sector could provide access to resources and facilities through interacting with other organizations such as veterinary organization, education department, agricultural jihad organization, and rural councils (providing adequate health care, paying loan for livestock storage upgrading, paying indemnity for slaughtering contaminated livestock, providing free protective equipment such as gloves and masks, and providing vehicles to transport livestock waste out of the village). These measures certainly have a significant impact in enhancing the preventive behaviors. Similarly, a study in the United States found that in areas where veterinarians were more likely to attend to provide veterinary services, the number of positive cases of brucellosis was significantly lower.[42]

In this study, the constructs of self-efficacy as a mediating factor showed a 91% change in the rate of the brucellosis preventive behaviors. Overall, 71% of the changes in preventive behavior level were explained by this model.

Table 5: Models' evaluation of overall fit measurements

Goodness of fit indices	SEM
χ^2	1651.580
df	570
χ^2/df	2.898
P	<0.001
CFI	0.902
AGFI	0.804
RMSEA	0.062
PNFI	0.709
PCFI	0.765
IFI	0.901

CFI=Comparative fit index, AGFI=Adjusted goodness of fit index, RMSEA=Root mean square error of approximation, PNFI=Parsimonious normed fit index, PCFI=Parsimony comparative fit index, IFI=Incremental fit index, df=Degree of freedom, SEM=Standard error of mean

Table 6: Direct and indirect effects of precede constructs on preventive behavior

Determinants or predictors	Causal effect		
	Direct	Indirect	Total effects
Enabling factors-self-efficacy	0.818**	-	0.818
Reinforcement factors-self-efficacy	0.127*	-	0.127
Predisposing factors-self-efficacy	0.140*	-	0.140
Enabling factors-environment	0.341**	-	0.341
Enabling factors-behavior	-	0.656**	0.656
Reinforcement factors-behavior	0.136*	0.098	0.234
Predisposing factors-behavior	-	0.109*	0.109
Self-efficacy-behavior	0.776**	-	0.776
Environment-behavior	0.062	-	0.062
Through total causal effect	2.4	0.863	3.263
Percentage of indirect and in directs effects	2.4/3.263=73.55	0.863/5.680=26.45	

*P<0.05, **P<0.001

In the study of Babazadeh[43] also, self-efficacy was the most important behavioral determinant that was in line with our study.

Limitations of this study include the high level of dispersion of the villages studied and low level of literacy among some of the participants in the study areas, so completing the questionnaires was sometimes highly time consuming.

Despite effective preventive measures, brucellosis still remains a significant health and economic issue. Regulations, policies, organization, and appropriate training to address current deficiencies in improving community health remain to be revised.

Conclusion

There is evidence showing that rural residents and their family members play an important role in controlling this disease. Designing and implementing health plans based on the PRECEDE model with more emphasis on self-efficacy as the most important behavioral determinants can bring about a positive effect on enhancing the brucellosis preventing behaviors.

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Conflicts of interest

There are no conflicts of interest.

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