Factors Associated with the Level of Knowledge of Dairy Cattle Farmers Towards Brucellosis in Kawasan Usaha Peternakan (Kunak), Bogor District

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ABSTRACT

Level of farmer's knowledge have an importance role in the disease prevention and control of livestock. The purpose of this research was to evaluate the level of KUNAK dairy cattle farmer's knowledge regarding brucellosis and factors that associated to it. A series of questions were asked to the respondents regarding their knowledge of brucellosis. Respondents of 70 farmers were selected with cluster random sampling technique for this research. Data were collected through interviewing respondent using the questionnaire regarding the knowledge of brucellosis in terms of its mode of transmission, symptoms, prevention and treatment. Questionnaire was done in the form of closed question. The analysis was done using chi square test in determining the association of factors affecting level of dairy cattle farmer's knowledge and odds ratio (OR) in determining the strength of affecting level of dairy cattle farmer's knowledge. The general result of the level of knowledge of farmers in KUNAK were good being the majority of them were in that category. The farmers of KUNAK had a higher level of knowledge in terms of prevention and symptoms of brucellosis than mode of transmission or treatment of it. The factor that has the most significance to the level of knowledge of KUNAK dairy farmers are the ones with a working experience more than 5 years in this field with 18 times more knowledgeable than farmers with less than 5 years of working experience. The need of disease awareness programs was required for the farmers in broadening their minds towards other aspects of a disease for them to better combat the problems in their day to day business.

Keywords: Bogor, Brucellosis, Farmer, Knowledge, KUNAK

Introduction

Brucellosis, caused by the *Brucella* species, is a highly contagious zoonotic disease affecting humans and a wide range of terrestrial animals. It is classified as one of the neglected zoonotic diseases with a serious public health importance worldwide. It is estimated that a quarter of human cases go unreported, yet half a million cases per year are recorded (Corbel, 2006). The bacterial pathogen is classified by the CDC as a category B pathogen that has potential for development as a bio-weapon. *Brucella* spp. are considered as the most common laboratory-acquired pathogens. The geographical distribution of brucellosis is constantly changing with new foci emerging or re-emerging (Seleem *et al.,* 2010). Brucellosis has been called many names including Malta fever and Mediterranean fever in humans and Bang's disease or 'Contagious abortion' in cattle.

The *Brucella* genus is a gram-negative, facultative, intracellular coccobacilli comprised of species based on biochemical features and their correlation with preferred host species. Cattle are primarily infected with *B. abortus*, but can also be infected with *B. melitensis* especially when cattle are kept together with small ruminants. Sheep, goats, pigs and dogs are amongst the other animals that can be infected by different species of the genus. *B. melitensis* is considered to have the highest zoonotic potential, followed by *B. abortus* and *B. suis* (Alton and Forsyth, 1996).

Primary clinical manifestations of brucellosis among livestock are related to the reproductive tract, with abortion after the 5th month of gestation being the cardinal sign. Reduced milk production further adds to the significant loss of productivity caused by the disease, and in males it can also cause orchitis and epididymitis (Radostits *et al.,* 2007). Females cow usually abort only once, presumably due to acquired immunity. There is often heavy shedding of bacteria through the placenta, fetal fluids and vaginal exudates. The mammary gland and regional lymph nodes can also be infected leading to bacteria excretion

in milk. The most common route of transmission between animals is through direct contact with an aborting cow and the aborted fetus or by indirect contact with contaminated fomites. Ingestion of contaminated feed, fodder and water may also play a secondary role. Susceptibility to infection depends on age, breed and pregnancy status, with sexually mature animals being much more susceptible to infection (Poester *et al.,* 2013).

Humans are almost exclusively exposed to brucellosis via contact with infected animal secretions, primarily through calving and abortions, or through the consumption of contaminated, unpasteurized dairy products, or undercooked meat. As a result, people who have frequent contact with animals such as veterinarian, abattoir staff and livestock owners, in areas where brucellosis is endemic are at high risk of contracting the disease. Symptoms of the disease in humans are nonspecific, but can include fever, sweating, anorexia, malaise, weight loss, depression, headache and joint pains (Corbel, 2006). The diverse clinical symptoms mean that the disease can often be confused with malaria and influenza, possibly leading to underestimates of the true incidence rates worldwide.

Although brucellosis has been eradicated in most developed countries that have implemented a tight eradication program (Makita *et al.,* 2008), the economic and public health impact of brucellosis remains of concern in developing countries (Roth *et al.,* 2003). The disease remains endemic among Africa, Mediterranean, Middle East, parts of Asia and Latin America. Prevalence of brucellosis can vary according to climatic conditions, geography, species, sex, age and diagnostic tests applied (Gul and Khan, 2007; Boral *et al.,* 2009), as well as the trend for increasing intensification of animal production, which favors the spread and transmission of the infection (Jones *et al.,* 2013). Lack of awareness, policies or appropriate use of resources may also contribute to this development.

The incidence of brucellosis in Indonesia is shown from the results of serological tests carried out by Industrial Relations Commission of Victoria (IRCVS), Australia against workers in dairy cows, pig pens and pig abattoir in DKI Jakarta, detected the presence of antibody titers of *Brucella sp* bacteria (Sudibyo, 1995). The high prevalence of brucellosis in livestock in Indonesia which reaches 40% and spread in almost all provinces in Indonesia allows for the occurrence of transmission of brucellosis to humans (Noor, 2006). 'Kawasan Usaha Peternakan' (KUNAK), where this survey was done, is one of the Indonesia government actions to increase the production and rearing of dairy cattle. According to the Directorate General of Animal Husbandry and Health of Indonesia, domestic production of milk can only supply about 20% of the demand for milk resulting in the dependence still occurs on milk imported from abroad. Topographic of KUNAK is bumpy to hilly and is 600-700 meters above sea level. This area is fairly suitable as a place for producing dairy cows by both large companies or as people's livestock.

On the other hand, farmer's knowledge had been proven in many cases that had a relatively high affect in preventing brucellosis to spread, especially regarding the mode of transmission of brucellosis (Arif *et al.*, 2017; Kozukeev *et al.*, 2006; Sofian *et al.*, 2008). The current study aimed to assess the extent of knowledge and understanding of brucellosis in KUNAK dairy farmers and identify the factors that have a significant impact on the level of knowledge of the farmers regarding brucellosis. It is expected that the findings of this study will helpful to devise future disease control and prevention programs and optimizing the knowledge of dairy farmers in general.

The aim for this survey was to measure the degree of knowledge of the farmers and to determine the factors that influence it in KUNAK, Bogor, West Java of brucellosis in terms of symptoms, mode of transmission, prevention and treatment of brucellosis.

Materials and Methods

The research was conducted by survey with cross sectional study design. The data were collected by interview through questionnaire devised methodically. Analysis of the data done at Epidemiology Laboratory, Division of Veterinary Public Health and Epidemiology, Faculty of Veterinary Medicine, IPB University.

KUNAK is an area specifically for dairy farming in Bogor district. There are around 88 farmers with a total population of 1207 adult dairy cows in the area. Farmers collaborate in 6 groups with about 6-19 farmers each. This study involved 70 respondents of farmers selected using cluster random sampling techniques. Farmers are taken proportional allocation from the number of farmers in each cluster (group of farmers).

The questionnaire was filled with questions regarding farmers characteristic, farm management, health management and reproduction, duration and management of brucellosis, access to information regarding brucellosis, involvement of farmers to the management of the farm and knowledge of the farmer to brucellosis handling as shown at conceptual framework in Figure 1. Pre-test study was carry out to test the questionnaire's validity and reliability. We performed a reliability analysis and calculation of the Cronbach alpha value after obtaining data from the respondents.

Assessment of the level of knowledge of respondents was designed by using eleven statements. The statement consists of positive statements and negative statements. Every correct answer from a statement about the knowledge of brucellosis was given a value of one, while a wrong answer or does not know (no idea) were given a zero value. The maximum
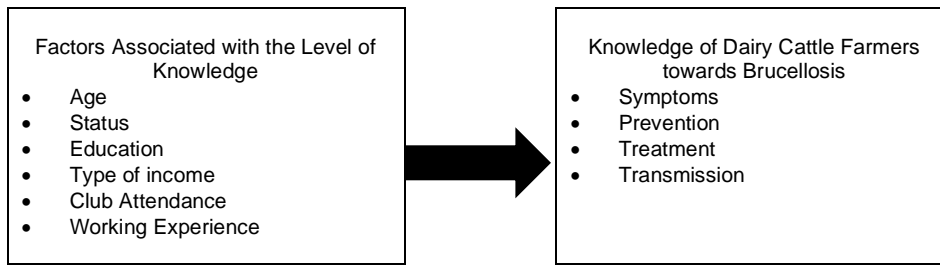
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Figure 1: A conceptual framework that shows the relationship between knowledge and the factors that have an affect toward the level of knowledge of dairy cattle farmers of KUNAK.

value of the knowledge level was eleven and the minimum value was zero. Based on the assessment criteria above, the scoring will be as given: Bad knowledge if the value was ≤ 5, Good knowledge if the value was ≥ 6.

The data collected were analyzed by descriptively for the level of knowledge and analytically on the factors associated the level of knowledge. The analytical analysis was done through chi square in determining the significance of factors association and odds ratio (OR) in determining the strength of the associated factors.

Results and Discussion

Demographic of respondent

A total of 70 respondents of the interview through questionnaire had been collected and sorted as shown in Table 1. The demographic of the respondents was sorted into age, education, working experience, type of income and status of the worker. Characteristics of farmers is a description of a special situation of research respondents that distinguishes traits from one trader to another. These characteristics were combined into an overall picture of dairy farmers in KUNAK. Several respondent characteristics observed as research variables include age of farmers, education of farmers, experience of farmers in dairy cattle rearing and management. The characteristics of the farmers were in relation to the value of farmer's knowledge about brucellosis.

From Table 1, majority of the farmers in KUNAK are of an age more than 36 years old and

have been working as a dairy cattle farmer for more than 5 years with a percentage of 64.29% and 85.71% respectively. Amongst the farmers most of them have a low education and work as a dairy cattle farmer as their main source of income, with 75.71% and 85.71% respectively. Meanwhile, majority of the respondents are workers in the farm as opposed to owners.

Level of knowledge about brucellosis

The Table 2 below shows the general level of knowledge attained by the 70 respondents. The scoring method were set as Poor with a total correct answered lower than or equal to 5, and Good with a total score correct answer greater than or equal to 6.

The overall knowledge regarding brucellosis of the farmers at KUNAK are quite high where majority of the respondents achieve a result in the good degree of knowledge regarding brucellosis, where 58.6% have a good grasp of understanding regarding brucellosis. Out of the poor level of 41.47%, 4 respondents received '0' total score from the questionnaire and none received a full score of 11. Generally, the result shows a most satisfactory outcome in the level of knowledge of the farmers about brucellosis being close to ¾ of the respondents manage to acquire a score of than or equal to 5.

The results of this study on the level knowledge about the brucellosis has similar results have been shown in a study in Uganda that showed a high awareness of brucellosis among the community participants (Kansiime *et al.*, 2014) and in Egypt where the majority of the

Table 1. Characteristic of farmers in KUNAK dairy farms

Variables	Description	Total respondent	
		Total	%
Age	< 36 years old	25	35.71
	> 36 years old	45	64.29
Education	None and pass elementary school (SD)	30	42.86
	Pass junior high school (SMP)	23	32.85
	Pass senior high school or higher	17	24.29
Working Experience	< 5 years	10	14.28
	> 5 years	60	85.71
Type of Income	Main	60	85.71
	Side	10	14.28
Status	Owner	18	25.71
	Worker	52	74.29

Table 2. Level of knowledge of respondents in KUNAK

Level of knowledge	Total (n=70)	
	Total	%
Poor (<= 5)	29	41.4
Good (>= 6)	41	58.6

farmers were aware of brucellosis which the authors explained by an endemic situation of brucellosis in the study area (Holt *et al.*, 2011).

Specific knowledge of brucellosis by category
Figure 2 and Figure 3 are the result attained from the result of level of knowledge of farmers segregated into 4 main category of brucellosis which are mode of transmission, symptoms, prevention and treatment. Figure 2 are a more specified result from each question regarding the level of knowledge in terms of its category. The question was further categorized into 4 factors relating to brucellosis to understand the area of brucellosis that the respondents have good grasp over the others.

As shown in the Figure 2 most the respondent has a high grasp of knowledge in prevention of brucellosis with 75.71% answered true (2.86% answered wrongly and 21.43% had no idea the lowest among the other categories) in the question relating to prevention, while a lower grasp of knowledge regarding to the treatment of brucellosis.

The lower knowledge on treatment of brucellosis shows that it does concurrent with most of the respondents working in the farms have no background of having studied veterinary medicine and remained focus on the knowledge of preventing diseases to occur and spread in their farm and indirectly increased their revenue from their sales. This further enforced by the Indonesian government with The Government of

Republic of Indonesia's Regulation No. 95 2012 Part 9 Article 97-99 and consistent with the Law of the Republic of Indonesia No. 18 year 2009 that stated the authority of veterinary authority in comparative medicine, and veterinarian competency to oversee animal welfare and ethical treatment. Additionally, brucellosis requires prolonged treatment with a various combination of antibiotics that can lead to permanent and disabling sequelae with a devastating financial and economic consequences (Smits and Cutler, 2004).

The situation in KUNAK had a similarity to a study done by Cloete *et al.* (2019) regarding the knowledge of South African cattle keeper group on brucellosis stated that even when the participants (respondents) knew about brucellosis and their government stand on vaccination and controlling it, but they lacked more in-depth knowledge with particular reference to zoonotic implications and disease prevention.

Moreover, the most worrying of all was the high percentage of respondent in not having any idea of the transmission of brucellosis. Similar cases had been reported in Jordan (Musallam *et al.,* 2015) and Uganda (Kansiime *et al.,* 2014). Kozukeev *et al.* (2006) found that good knowledge of mode of transmission of brucellosis from animals to humans had a protective effect towards human infection.

From the Figure 3, the highest most respondent answered true was the used of disinfectant to clean the shed after an outbreak of
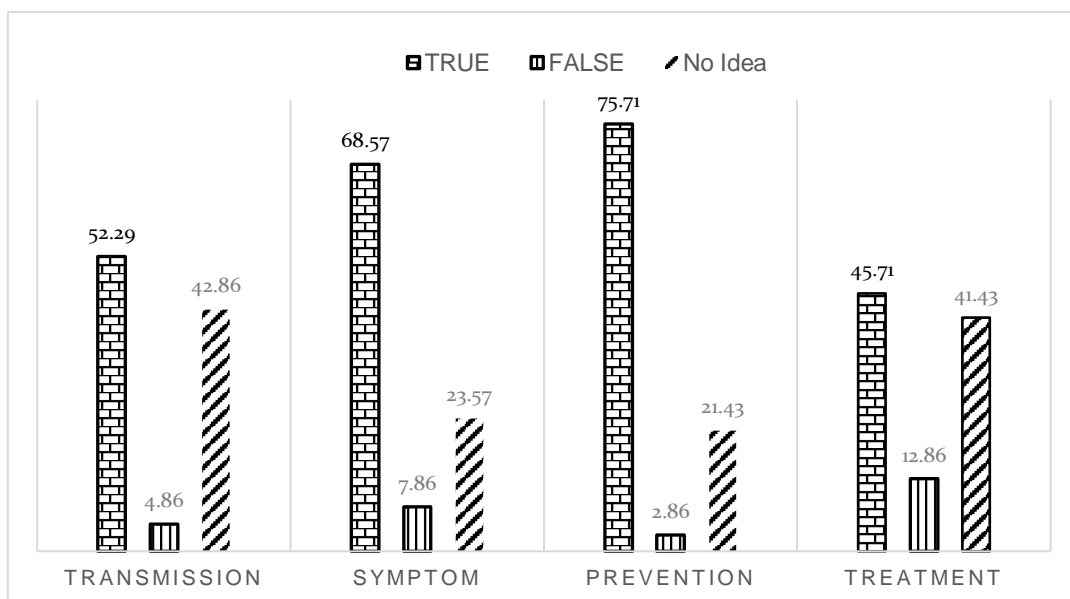

Figure 2: Percentage of answers by respondent categorized into 4 main topics of brucellosis.
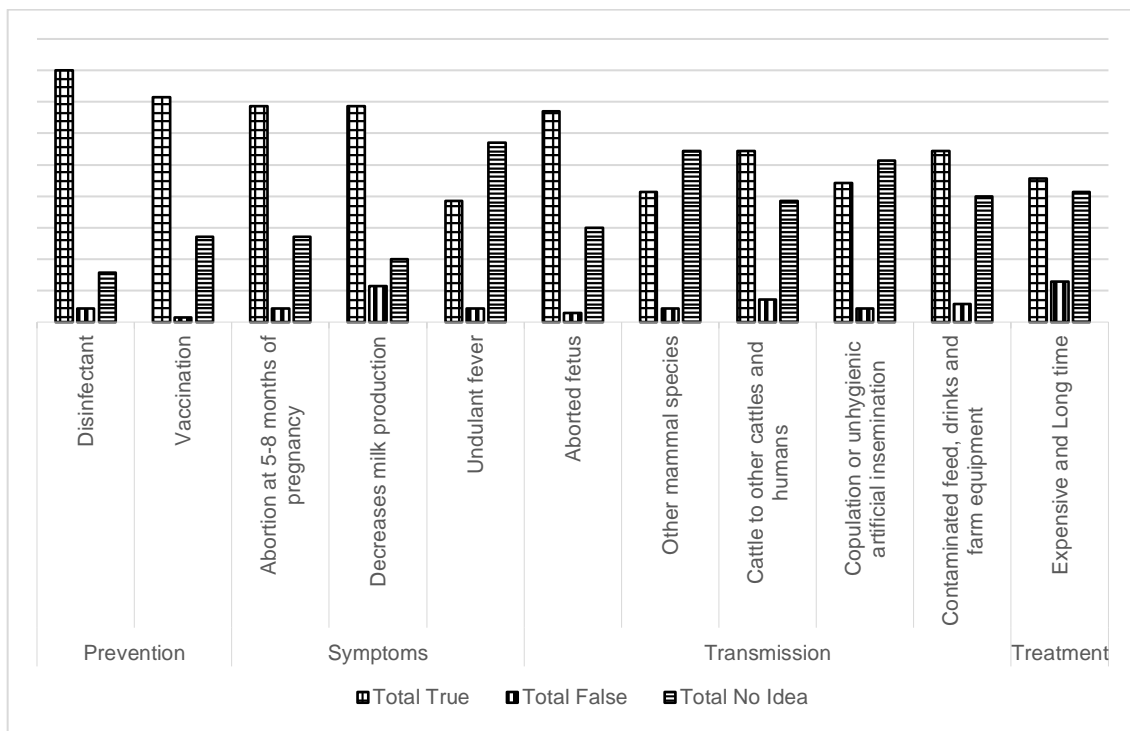
Figure 3: Percentage of answer by respondent for each question.

brucellosis with 80.0%, and the lowest question with the true answered by the respondents are brucellosis infection in human causes undulant fever with 38.6%. The average percentage of correct response to all question was 57.6%.

In the Figure 3 above we can see the degree of knowledge of the farmers regarding to the specific question asked during the interview. The question was constructed into three choices answer of true, false and no idea option for the respondent to select. The questions are designed to be an all true answer regarding brucellosis.

Furthermore, as was shown in Figure 3 have a worrying level of knowledge in regards to the symptoms of brucellosis on humans and at its ability to infect other mammals. Although brucellosis on human are considered fatal, it can cause a detrimental and debilitating effect toward the human physiology, more chronic and persistent. In cases of acute brucellosis, it has been discovered to have disability comparable to that of acute malaria, while chronic or localized brucellosis has been estimated to have disability comparable to osteoarticular disease (Dean *et al.*, 2012).

Study about brucellosis awareness and knowledge conducted by Zhang *et al.* (2019), stated that a pool percentage of 35.9% of participants out of 30 case studies done worldwide have the necessary knowledge to brucellosis's mode of transmission and the common awareness of symptom of brucellosis was abortion had a 37.2% pool awareness, followed by reduction in milk production with 18.5%.

Factors that are affecting level of knowledge of KUNAK dairy cattle farmers

There were 6 factors that are used in determining the level of knowledge of KUNAK farmers are age, education level, types of income, club attendance, status and working experience. The results were calculated through chi square and odds ratio evaluation with a confident interval of 95% as shown in Table 3. According to the results obtain it showed that working experience had a major significance in relation to the level of knowledge regarding brucellosis, while the other factors were less significant.

Age and knowledge relations in regard to brucellosis showed a less significant results in comparing between a young farmer and an old farmer. Age different related knowledge did not distinguish within high- or low-knowledge group (Arbuckle *et al.*, 1990; Meinz, 2000). This result was also shown from a study done in Ecuador where no differences were found in the level of knowledge of the disease amongst people in different age group, proving that age has no bearing in the level of knowledge (Ruano and Aguayo, 2017).

In regards to education level it had a very less than desirable results in comparison to previous researches that stated with the increased in education level leads to a higher level of knowledge of brucellosis (Ruano and Aguayo, 2017). Another conflicting literature stated that the education systems have little effect in the relation of age and/or knowledge (Salthouse, 2003).

Table 3. Determined factors that are affecting the level of knowledge of KUNAK dairy cattle farmers

Characteristics		Level of Knowledge		p-value	Odds Ratio	Confidence Interval 95%
		Poor	Good			
Age	Young	11	14			
	Old	18	27	0.803	1.179	0.438-3.171
Education	Low	22	31			
	High	7	10	0.999	1.014	0.334-3.075
Types of Income	Main	24	36			
	Side	5	5	0.7950	0.667	0.174-2.553
Club Attendance	Yes	19	33			
	No	10	8	0.2573	0.461	0.155-1.367
Status	Owner	5	13			
	Worker	24	28	0.267	0.449	0.140-1.441
Working Experience	Less Than 5 Years	9	1			
	More Than 5 Years	20	40	0.001*	18.000	2.129-152.162

* significant at 0.05 Factors that correlates with the degree of knowledge (less than 5 and more than 5 of total knowledge score)

Regarding working experience relationship had a massive significance on the level of knowledge on brucellosis. On top of that, from the odds ratio of the farmers who have more than 5 years of experience in the fields of dairy cattle farming have 18 times more knowledge than farmers who had an experienced of less than 5 years. From this finding it has been shown that previous experience with brucellosis in livestock and brucellosis prevalence levels are positively correlated with awareness and knowledge levels of brucellosis (Zhang *et al.*, 2019). In regards to that, a study showed that the farmers who had previously experienced brucellosis in their herds had a higher probability of having greater knowledge of bovine brucellosis, which was also consistent with having knowledge obtained from experience with the disease (Diez and Coelho, 2013). In a separate study a group of respondents with no formal training in milk handling but had close to 40 years of experience have a high level of awareness and understanding of milk borne zoonotic related diseases such as tuberculosis and brucellosis (Addo *et al.,* 2011).

Conclusions

In conclusion, majority of the dairy cattle farmers at KUNAK have a good level of knowledge regarding brucellosis. The farmers also showed a higher degree of knowledge in terms prevention and symptoms of brucellosis, while the knowledge of mode of transmission and treatment are still low in comparison. The factors that had been determined to have the most affect towards the level of knowledge of farmers was working experience of farmers in the field of dairy cattle farming, farmers with more than 5 years of working experience are more knowledgeable in terms of brucellosis than farmer who had less than 5 years of working experience.

Acknowledgment

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