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Exploring the Knowledge, Attitude, and Practice of Brucellosis Among Cattle Farmers in Kelantan

By

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A Thesis Submitted in Fulfillment of the Requirements of Degree of Veterinary Medicine

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CERTIFICATION

This is to certify that we have read the research paper entitled "Exploring the Knowledge, Attitude and Practices of Brucellosis Among Cattle Farmers in Kelantan" by Nur'ain 'Aisyah Binti Shahrom, and in our opinion, it is satisfactory in terms of scope, quality, and presentation as partial fulfillment of the requirements for the course DVT55204 - Research Project.

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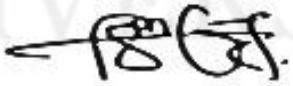

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KNOWLEDGE, ATTITUDE AND PRACTICES OF BRUCELLOSIS AMONG FARMERS IN KELANTAN

ABSTRACT

Brucellosis is a zoonotic disease that affects both animals and humans, resulting in significant economic losses and public health risks. This study aimed to assess the knowledge, attitudes, and practices (KAP) regarding brucellosis among livestock farmers in Kelantan. A structured questionnaire was distributed to 35 respondents selected through online self-administered questionnaires and random interviews with farmers. Data was analyzed using descriptive statistics and chi-square tests to identify factors associated with KAP levels. The results of this study revealed that 40% (n = 14) of respondents had good knowledge of brucellosis in cattle, while 28.6% (n = 10) had moderate knowledge of brucellosis in cattle. Attitudes toward brucellosis in cattle are generally moderate. For practice, 45.7% (n = 16) of farmers have a moderate level of practice in preventing brucellosis in cattle. The study highlights the need for increased education and awareness programs to improve farmers' understanding and control measures against brucellosis.

Keywords: Brucellosis, Kelantan, Livestock farmers, Public health, Zoonotic disease

ABSTRAK

Brusilosis ialah penyakit zoonotik yang menjejaskan haiwan dan manusia, serta menyebabkan kerugian ekonomi dan risiko kesihatan awam yang ketara. Kajian ini dijalankan untuk menilai tahap pengetahuan, sikap dan amalan (KAP) berkaitan brusilosis dalam kalangan penternak di Kelantan. Satu set soal selidik berstruktur telah diedarkan kepada 35 responden melalui kaedah soal selidik kendiri dalam talian dan temu bual secara rawak dengan penternak. Data dianalisis menggunakan statistik deskriptif dan ujian Chi-square bagi mengenal pasti faktor yang berkaitan dengan tahap KAP. Hasil kajian menunjukkan bahawa 40% (n=14) responden mempunyai tahap pengetahuan yang baik tentang brusilosis pada lembu, manakala 28.6% (n=10) mempunyai tahap pengetahuan sederhana. Sikap terhadap brusilosis dalam kalangan penternak secara umum berada pada tahap sederhana. Dari segi amalan pula, 45.7% (n=16) penternak menunjukkan tahap amalan pencegahan yang sederhana terhadap penyakit ini. Kajian ini menekankan keperluan untuk meningkatkan program pendidikan dan kesedaran bagi memperkukuh pemahaman serta langkah kawalan brusilosis dalam kalangan penternak.

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ABREVIATIONS

B. abortus	-	*Brucella abortus*
WAHIS	-	World Animal Health Information Database
OIE	-	World Organization for Animal Health (OIE)
WHO	-	World Health Organization
MRT	-	Milk Ring Test
CFT	-	Complement Fixation Test
i-ELISA	-	Indirect Enzyme-Linked Immunosorbent Assay
RB51	-	Brucella abortus Strain RB51 Live attenuated Vaccine
DVS	-	Department of Veterinary Services
IBM SPSS Statistics 26	-	Software of International Business Machines Corporation, Statistical Package for the Social Sciences version 26
KAP	-	Knowledge, Attitude & Practice
STPM	-	Sijil Tinggi Pelajaran Malaysia
FMD	-	Foot and Mouth Disease

CHAPTER 1

INTRODUCTION

Brucellosis is a highly contagious zoonotic disease caused by bacteria of the genus Brucella. Brucellosis in cattle is a chronic infectious disease caused by the bacterium *Brucella abortus*. The condition is also commonly referred to as infectious abortion, contagious abortion, or Bang's disease (Animal and Plant Health Inspection Service, 2020)

This bacterium affects a wide range of animals, particularly cattle. It causes significant threats to both animal health and public health, which lead to economic losses due to reduced fertility, abortions, decreased milk production, and trade restrictions. In humans, it can cause undulant fever, chronic fatigue, joint pain, and other debilitating symptoms, making it a serious occupational hazard for individuals working closely with livestock (Arif et al., 2017)

Brucella are Gram-negative, non-spore-forming, non-motile coccobacilli and facultative intracellular bacteria. They cause chronic infection that often lasts a lifetime. There are four main species that commonly infect humans: *Brucella abortus, Brucella melitensis, Brucella canis,* and *Brucella suis*, while *Brucella inopinata* is a less common cause. Symptoms of brucellosis in humans typically include joint and muscle pain, as well as excessive sweating. The disease spreads from animals to humans through direct contact with infected animals, consumption of contaminated animal products, or inhalation of airborne bacteria. However, the Brucella bacteria species that can infect humans from cattle is primarily *Brucella abortus*. This species is the most common cause of bovine brucellosis, and it can be transmitted to humans through contact with infected cattle or their products (Arif et al., 2017).

There is limited information available on the prevalence of human brucellosis in Malaysia. However, past studies have reported a seroprevalence of human brucellosis ranging from 5.4% to 14.29% among veterinary workers and farmers. The herd-level brucellosis seroprevalence among the cattle population of Malaysia, at 21.5%, is slightly lower than in neighboring countries, such as Indonesia and Thailand, with rates of 27.4% and 24.1%, respectively. The cattle-level seroprevalence of 2.5% is also lower when compared to countries where the disease is endemic, such as Thailand (3.3%), Egypt (11%), Brazil (3.2%), and Nigeria (19.7%) *(*Anka et al., 2013*)*

Awareness of brucellosis among the general population is crucial because it is a zoonotic disease that can have a significant impact on both animal and human health, resulting in substantial economic losses and potential health complications. Lack of knowledge about the disease's transmission, symptoms, and prevention methods contributes to underreporting, delayed diagnosis, and the persistence of infection within herds. This low awareness level not only affects the effective control strategies but also increases the risk of zoonotic transmission to humans.

1.1 Research Problem Statement

Brucellosis is a well-known disease among medical and veterinary professionals, however, awareness among the public remains low. Farmers are a key group who play a significant role in controlling the transmission of brucellosis due to their close and frequent contact with livestock. Therefore, it is crucial for farmers to be aware of this disease, its modes of transmission, and prevention measures to help control its spread and protect both animals and

prevent the transmission of the disease to humans. Aside from that, there are still no published studies on the knowledge, attitude, and practice of Brucellosis among farmers in Kelantan or Malaysia. Understanding these factors is crucial for developing effective educational programs to enhance brucellosis control and safeguard the health of both animals and humans.

1.2 Research Questions

I. What is the level of knowledge, attitude, and practice level about brucellosis among the cattle farmers in Kelantan?

II. Is there a relationship between farmers' knowledge and their practices in preventing brucellosis?

III. Are sociodemographic factors (such as age, education level, income, farming experience, and training in animal husbandry) associate with the levels of knowledge, attitude, and practices regarding brucellosis among farmers in Kelantan?

1.3 Research Hypothesis

I. Farmers in Kelantan have low to moderate knowledge, attitude and practice level regarding brucellosis.

II. There is a significant association between the level of knowledge and the preventive practices of cattle farmers regarding brucellosis.

III. There is a significant association between sociodemographic factors (such as age, education level, income, farming experience and training in animal husbandry) and the levels of knowledge, attitude and practice regarding brucellosis among farmers.

1.4 Research Objective

General Objectives

To determine the knowledge, attitude, and practice regarding Brucellosis among cattle farmers in Kelantan.

Specific Objective

I. To assess the level of knowledge, attitude, and practice level about brucellosis among cattle farmers in Kelantan.

II. To determine the relationship between the level of knowledge and preventive practices among cattle farmers in Kelantan

III. To determine the association between sociodemographic factors and the levels of knowledge, attitude, and practices regarding brucellosis among farmers.

CHAPTER 2

LITERATURE REVIEWS

2.1 Brucellosis

Cattle brucellosis is a chronic, contagious disease caused by the bacterium Brucella abortus. Bang's illness, infectious abortion, and contagious abortion are other names for it (McMahan, 1944). Brucellosis is believed to have been recognized during the late Roman era, named for its similarity to the organism Brucella (later simply called Brucella), which was isolated from carbonized cheese. Historically, the disease has been linked to military campaigns, particularly in the Mediterranean region. It was first thoroughly described by Sir David Bruce. Hughes, and Zammit while conducting research in Malta, which is why it is sometimes referred to as 'Malta fever' when describing the typical fever caused by Brucella infection (Khan & Zahoor, 2018)

The primary way people become infected is by consuming contaminated water or food that has been contaminated with Brucella. When a cow rests in or walks through infectious debris, she may contract the infection through her skin or her teat canals. An infected bull inserting the organism in the vagina during service is the third potential method (Abera, 2024)

The disease is primarily transmitted by the infected cow during abortion or parturition. The aborted placenta, sometimes known as the "afterbirth," the fluid from the vagina after calving or an abortion, and the aborted fetus all contain germs. The purchase of infected animals,

which then spread the illness when they calve or abort, is the primary cause of most brucellosis outbreaks in herds that were previously uninfected (Khan, 2018.)

Even though bulls can get sick and occasionally spread the brucellosis germs through their semen, no one has been able to prove that this is how the disease is spread. It appears that the greatest risk arises from introducing infectious materials into the soil during breeding. A cow could get affected by the tainted dirt. There is little likelihood that the bull will spread the germs from one cow to another because it has been demonstrated that the organisms die within an hour of being injected into the bull's sheath (Anka *et al*., 2014)

An infected cow may have a newborn calf with skin teeming with Brucella germs. The microbes are also present in the calf's feces, which can contaminate the diets and water of other herd members (Zeb *et al*., 2025).

The germs exit the uterus and settle in the udder and related lymph nodes after an infected cow gives birth, either naturally or through abortion. Following their localization in the udder, they may be continuously released into the milk, where they could infect humans or other animals who consume it. Older calves may contract the disease from consuming contaminated milk, despite their high level of immunity. Milk from diseased cows is completely safe for humans and animals to consume if it is properly pasteurized. Based on the study on the inactivation of *Brucella abortus* in naturally contaminated milk by commercial pasteurization procedures, after naturally contaminated milk underwent batch pasteurization (63°C for 30 minutes) and high-temperature short-time (HTST) pasteurization (72°C for 15 seconds), all 10

BT guinea pigs tested negative both bacteriologically and serologically. This confirms that officially approved commercial pasteurization methods effectively render naturally Brucella-contaminated raw milk safe for human and animal consumption. (Van den Heever et al., 1982)

Brucellosis is recognized as one of the most significant zoonotic diseases worldwide, with over 500,000 human cases reported annually. Despite its widespread impact, brucellosis is often overlooked by health systems and is classified as a neglected zoonosis by both the World Health Organization (WHO) and the World Organization for Animal Health (OIE)(Godfroid, 2017). In animals, the disease leads to serious reproductive problems such as abortion, infertility, and reduced milk production. Brucellosis generally does not affect the overall health condition of the infected animal. The disease often first manifests through reproductive disturbances, typically the premature expulsion of a dead fetus (abortion) or the early birth of a weak or premature calf. Prior to abortion, common signs of impending parturition, such as swelling of the vulva and udder, as well as vaginal discharge, may be observed. The occurrence of a retained placenta following an otherwise normal calving is also considered suggestive of *Brucella* infection (Rehman et al., 2025)

In bulls, brucellosis can lead to inflammation and swelling of the testes, epididymis, and seminal vesicles, which may subsequently result in infertility or sterility. Humans typically become infected through the consumption of unpasteurized dairy products, undercooked meat, or by coming into direct contact with infected animals, placentas, or aborted fetuses. In humans, brucellosis presents with symptoms such as fever, fatigue, sweating, joint and muscle pain, headache, poor appetite, back pain, weight loss, and arthritis. Because these symptoms resemble

those of other common febrile illnesses like malaria and typhoid, the disease is frequently misdiagnosed, leading to mistreatment and underreporting. (Zhang et al., 2019).

2.2 *Brucella abortus*

The bacterium *Brucella abortus* can infect cattle, buffalo, sheep, goats, pigs, deer, and various wildlife species. *B. abortus* is classified into seven biovars, namely biovar 1, biovar 2, biovar 3, biovar 4, biovar 5, biovar 6, and biovar 9 (Khan & Zahoor, 2018). Clinical manifestations commonly include abortion, typically occurring between the fifth and eighth month of gestation, the presence of turbid fetal fluids during abortion, and metritis followed by infertility (Barkallah et al., 2014). No visible clinical signs are usually observed in the mammary glands; however, *Brucella* organisms may still be present in the milk of infected animals. In males, infection may cause inflammation of the testes (orchitis) and joints (arthritis) (Larsen, 2024)

In dairy cattle, brucellosis often results in reduced milk production. Although cows that have aborted may conceive again, their subsequent calving rates are generally low. Infected fetuses may be born alive and appear normal, but act as carriers of the pathogen; in most cases, however, the calf dies shortly after birth, and the placenta remains retained (Yanti et al., 2021)

Brucella organisms are commonly localized in the uterus, particularly in the endometrium and the intercotyledonary spaces. Within the placenta, the bacteria can be found in the villi, between the villi, and within dark or reddish placental membranes. *Brucella* can also be isolated from the lungs and abomasal fluid of aborted fetuses. In males, the bacteria may be recovered from the epididymis, vas deferens, vesicular glands, prostate, and bulbourethral glands.

In infected bulls, bacterial multiplication primarily occurs in the testes, especially within the seminiferous tubules. (Rovid, 2018)

Cattle are the primary hosts affected by *Brucella abortus*, which is also a causative agent of undulant fever, also known as Malta fever, in humans. The bacterium has additionally been detected in several other animal species, including horses, mules, goats, pigs, dogs, cats, chickens, bison, and elk.

2.3 Brucellosis awareness and knowledge in communities worldwide

A total of 79 original studies from 22 countries were reviewed to assess awareness levels of brucellosis in various populations. The combined (pooled) awareness level was found to be higher than the level of specific knowledge about the disease. When comparing different groups, there was no major difference in awareness between high-risk populations in Asia and Africa. Overall, livestock farmers had greater awareness and knowledge about brucellosis compared to dairy farmers and slaughterhouse workers. Additionally, awareness and knowledge levels were higher among people who were involved in bovine, caprine and ovine animal production or in caprine and ovine animal production than among people who were involved in only bovine animal production (Zhang et al., 2019).

While bovine brucellosis has been successfully eradicated in several high-income countries, including those in Europe, as well as Australia, Canada, Israel, Japan, and New Zealand, the disease remains uncontrolled in regions such as Africa, the Middle East, and Asia, where it is still considered endemic. In many low-income countries, the prevalence of brucellosis in both humans and animals is increasing. This increase is largely due to a lack of awareness, insufficient policies, and limited resources. According to the World Animal Health Information

Database (WAHIS), maintained by the OIE, numerous clinical cases have been reported in the Middle East, Africa, and Latin America; however, no official data are currently available for Pakistan (Arif et al., 2017).

2.4 Diagnosis of Brucellosis

Diagnosis of brucellosis can be established through a combination of clinical observation, bacteriological methods, molecular techniques, serological tests, and the milk ring test (MRT), which is applicable only to dairy cattle. Infected animals may exhibit clinical signs such as infertility, abortion, reduced milk production, and orchitis. (Maurya *et al*., 2024)

Confirmation of *Brucella* infection is accomplished through the isolation or detection of the organism from various clinical specimens. Samples may be obtained from aborted fetuses, such as abomasal fluid, lungs, spleen, and placenta; from aborting females, including vaginal swabs, placenta, amniotic fluid, and milk; and from males, particularly semen samples. All collected specimens must be clearly labeled and stored in air-tight, waterproof containers. To preserve sample integrity, they should be maintained at a cool temperature, preferably on ice, and transported to the diagnostic laboratory as soon as possible, ideally within 24 hours (Zainor, 2017)

Serological diagnosis of brucellosis involves both screening and confirmatory tests. The Rose Bengal Plate Test (RBPT) is commonly used as a field screening test, while the Complement Fixation Test (CFT) or indirect Enzyme-Linked Immunosorbent Assay (i-ELISA) are performed in laboratories for confirmation. Serum samples are obtained by collecting blood using plain tubes (red-cap tubes). The collected serum intended for confirmatory testing must be

properly labeled, placed in waterproof containers, and kept under cold conditions (approximately 4°C). Samples should be transported to the diagnostic laboratory promptly to ensure accurate results. (Khogali A, 2021)

The Milk Ring Test (MRT) is a serological screening test performed on milk samples from cattle, primarily used for field detection of brucellosis. . Collected milk samples should be stored in air-tight, waterproof containers and kept under cold conditions (on ice) during transport. To maintain sample integrity, the milk must be delivered to the diagnostic laboratory promptly, preferably within 24 hours (Mohamand et al., 2014)

2.5 Vaccination

All healthy female cattle and buffaloes aged four months and above that are confirmed to be non-pregnant (based on pregnancy diagnosis) should be vaccinated with the RB51 vaccine, or any other vaccine approved for use by the Department of Veterinary Services (DVS). The administration of the RB51 vaccine must follow the manufacturer's recommended guidelines. The vaccination program is implemented in conjunction with existing routine vaccination programs and is carried out by authorized veterinary officers (PBV) (Perkhidmatan et al)

2.6 Public Health Significant

If a farmer's cattle are infected with brucellosis, it can result in significant financial losses. One of the biggest problems is abortion, especially in pregnant cows during the last stage of pregnancy. Every time a cow aborts, the farmer loses a calf that could be worth RM1000 to RM2500, depending on the breed and market. (Statistik Penternakan 2022)

Brucellosis can also reduce milk production. It causes inflammation in the udder, resulting in lower milk yield. For example, if a cow normally gives 10 liters of milk but only gives 7 liters due to brucellosis, and milk is sold at RM3 per liter (Statistik Penternakan 2025*),* the farmer loses RM9 per day, or around RM270 per month for just one cow.

The disease also affects fertility, both male and female cattle can become infertile, making it harder to breed and grow the herd. This leads to long-term losses because fewer calves are born, and more time is needed to get cows pregnant again.

Meat cattle may cost about RM19/kg (Statistik Penternakan 2025*).* Culling cattle that have brucellosis or cattle that have died from this disease may cause loss of RM1500-RM3000 per cattle. Cattle that test positive for brucellosis must be culled or sold at a lower price.

There are also additional costs for disease control, including testing (such as the Rose Bengal Test or ELISA), quarantine, medication, and compensation for workers managing the situation. Additionally, farms with infected animals may be prohibited from selling live cattle, particularly for breeding purposes. This can result in the loss of tens of thousands of ringgits in sales. (El-Wahab, 2025)

CHAPTER 3

METHODOLOGY

3.1 Study area

The study was conducted across 10 districts in Kelantan, a state located in the northeastern region of Peninsular Malaysia. Kelantan has a tropical monsoon climate, typical for a location near the equator (Kelantan - Info Malaysia (IIM), *Leading Industrial, Commercial, Tourism & Information in Malaysia*, 2025). The state experiences a tropical monsoon climate, characterized by high annual rainfall of approximately 2,500 mm, consistently high humidity, and average temperatures ranging from 26 to 27 °C. The northeast monsoon, which occurs from November to March, brings particularly heavy rainfall and can cause flooding in lowland areas, affecting agricultural and livestock activities (Hilmi & Latif, 2018).

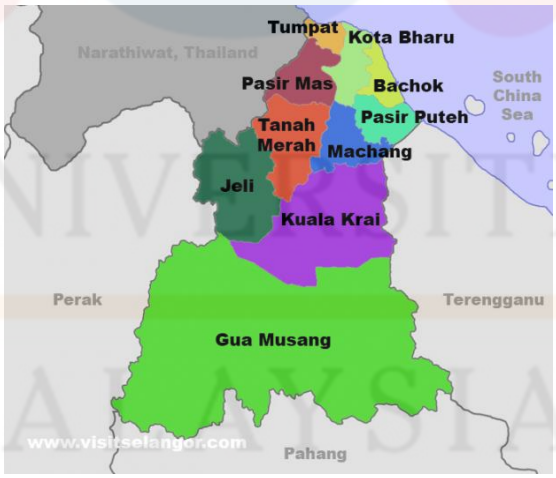

Figure 1: The location of Kelantan (VisitSelangor.com, 2021)

3.2 Study design

This study was conducted as a cross-sectional study, and data were collected from cattle farmers in Kelantan, between early July and the end of September, 2025.

3.3 Study population

The sample size was determined by using the formula stated below (Anwar, 2023), based on a 95% confidence level and a margin of error of 8%. The total sample size will be 147.

$$n = N \times \frac{\frac{Z^2 \times p \times (1 - p)}{e^2}}{\left[N - 1 + \frac{Z^2 \times p \times (1 - p)}{e^2}\right]}$$

Figure 2: Sample Size Formula

3.4 Selection criteria

The inclusion criteria for sampling were as follows: Cattle farmers who are actively involved in cattle farming (breeding, rearing, or management). Farmers residing or operating within Kelantan, Malaysia. Farmers must have been engaged in cattle farming for at least one month and had at least one animal prior to the study. A farmer who can understand and respond to the questionnaire in Bahasa Malaysia.

The exclusion criteria for sampling were as follows: Individuals who are not actively involved in cattle farming (retired or workers who are not directly involved in cattle

management). Farmers are operating outside Kelantan and are involved in cattle farming for less than 1 month and have never been engaged in at least 1 cattle. Farmers who have cognitive impairments that affect their ability to understand the survey.

3.5 Sampling method and procedure

Simple random sampling was used in this study by distributing the Google Form randomly on the social media platform. The link to the survey was disseminated randomly via several social media platforms, including Facebook, Instagram, and WhatsApp groups. There was also random interviewing with farmers at various farms, as well as a random event held in conjunction with the Kelantan Farmers, Breeders, and Fishermen Day (HPPNK) 2025, where data was manually entered. Information was gathered from cattle farmers in Kelantan from July 31 to October 31, 2025, spanning a three-month period. The participants were informed about the study's objective and the expected time commitment.

At the onset of the questionnaire, participants were informed about the study's context and objectives. Additionally, each participant received a consent form outlining their voluntary participation and information concerning the utilization of data obtained from the questionnaires. Furthermore, participants were assured that their responses would be kept entirely confidential and used exclusively for academic purposes.

3.6 Data collection tools

New online self-administered questionnaires were developed and validated by a supervisor. This was used to collect quantitative data on cattle farmers' knowledge, practices, and attitudes towards brucellosis. A structured Google Form questionnaire was used and distributed online from early July to the end of September, 2025. In addition, printed questionnaires were

prepared and distributed whenever we unexpectedly visited a farmer's farm or attended a program that involved a farmer. The question format is structured with mostly closed-ended questions, divided into four main sections: demographic information, knowledge, attitude, and practice. The language used in the question was only in Bahasa Malaysia, and the question will be simple, clear, and appropriate. Survey respondents must select their district of residence in Section A to ensure that only residents of Kelantan provide answers. Sections B, C, and D were where knowledge, attitude, and practice data were gathered, respectively.

3.6.1 Section A

Focuses on collecting demographic information, which includes age group, gender, district, education level, years of experience in cattle farming, type of farming, and the number of cattle on the farm.

3.6.2 Section B

Focus on assessing the extent to which farmers understand the causes and transmission of brucellosis, the signs and symptoms in cattle, the zoonotic potential, and preventive measures. consists of closed-ended questions, each correct answer receives 1 point, and each incorrect answer gets 0. This helps determine the level of awareness or misinformation among farmers.

3.6.3 Section C

Focused on the attitude toward Brucellosis. To understand farmers' perception, beliefs, and willingness to act regarding brucellosis prevention and control. The statement is measured using a 5-point Likert scale (Strongly Agree

→ Strongly Disagree). This section identifies whether the farmer's mindset supports control strategies.

3.6.4 Section D

Focused on practices related to Brucellosis. The purpose is to assess the actions or behaviors that farmers currently practice preventing or manage brucellosis. Questions focus on real-life behavior such as vaccination and testing history, quarantine practices, use of protective equipment, disease reporting habits, and source of information. The answers are typically yes or no, or frequency-based (Always/ Sometimes/ Never). This helps determine whether good practices are being followed.

3.7 Data Analysis

The score of KAP questions involved a scoring system to evaluate the level of knowledge, attitude, and practice presented by the respondents.

3.7.1. Knowledge Questions

- Score of 1 for a correct answer
- Score of 0 for an incorrect answer or “I don’t know” response.

3.7.2 Attitude Questions

- Score of 1 for “Strongly Disagree.”
- Score of 2 for “Disagree.”
- Score of 3 for “Neutral.”
- Score of 4 for “Agree.”
- Score of 5 for “Strongly Agree.”

3.7.3 Practice Questions

- Score of 1 for “Never.”
- Score of 2 for “Rarely.”
- Score of 3 for “Often.”
- Score of 4 for “Always.”

The sum of the points received for each response determines the overall score for each section. Based on Bloom's cutoff threshold, the KAP levels will be classified as "Good," "Moderate," or "Poor." If the total score falls between 80% and 100%, it is categorized as "Good." Meanwhile, if the results fall between 60% and 70%, they are considered "Moderate." Finally, fewer than 60% will be categorized as "Poor."

Descriptive analysis was used to examine the information gathered from the questionnaire. IBM SPSS Statistics version 26 was used to conduct statistical tests with a p-value < 0.05. To describe categorical and numerical variables, these include computing frequencies, percentages, means, medians, and standard deviations. A variety of statistical tests, including the Pearson correlation and chi-square tests, were employed. The Pearson correlation test was used to examine the strength and direction of the relationship between the levels of knowledge, attitudes, and practices (KAP) among respondents. This test will help determine whether, for example, higher knowledge is associated with more positive attitudes or better practices. The chi-square test was used to assess the association between demographic variables (such as age, gender, education level, type of farming, and number of cattle in the farm) and the categorized KAP levels

(low, moderate, or high). This test helps determine whether certain demographic groups exhibit significantly different levels of knowledge, attitudes, or practices.

3.8 Ethical Considerations

The Human Ethics Application, along with a sample of the questionnaire, was submitted to the Human Ethics Committee of Universiti Malaysia Kelantan for review and approval before the questionnaire was distributed to participants. The approval code is UMK/FPV/HUMAN/EXT/003/2025.

3.9 Study Questionnaire

The questionnaire was developed following extensive literature review related to brucellosis and farmers' knowledge, attitudes and practices toward brucellosis. The items in the questionnaire were generated based on information and guidelines for the prevention, control, and diagnosis of brucellosis in livestock. The content of the items included in the questionnaire was validated by a panel of experts in veterinary medicine. The final questionnaire consisted of 4 sections of closed-ended questions with specific response options.

3.9.1 Section 1: Demographic information

In this section, information was collected about the respondents, including questions regarding age, gender, state, educational level, types of farming, and the number of cattle on the farm.

3.9.2 Section 2: Knowledge question

This section consisted of nine statements that assessed the respondents' knowledge about brucellosis. Participants responded to these statements by selecting from multiple-choice options, which included “yes”, “no”, or “I don’t know”. Incorrect (No) or uncertain (I don’t know) responses received a score of 0, while 1 point was assigned for choosing the correct answer (Yes). The anticipated maximum total score was 9.

3.9.3 Section 3: Attitude Statements

Consists of eleven statements about the respondent’s attitude towards brucellosis. This section utilized a 5-point Likert scale. Response options ranged from "Strongly Agree” to “Strongly Disagree”. Respondents selected the option that best represented their agreement or disagreement with each statement. A correct statement with options “Strongly Agree”, “Agree”, “Neutral”, “Disagree”, and "Strongly Disagree" was scored 5, 4, 3, 2, and 1, respectively. The expected maximum total score was 11.

3.9.4 Section 4: Practice statements

This section included twelve statements about the respondents' practices concerning farmer practices. This section comprises a semi-structured questionnaire that includes both open-ended and multiple-choice questions. Some questions use a dichotomous format of “Yes” or “No” to obtain a clear response, while others include additional options, such as “Not sure” and “Sometimes,” to capture more diverse opinions and experiences from the respondents. Certain questions also offered multiple

answer choices, allowing respondents to select more than one applicable response. This design allowed both quantitative analysis of responses and flexibility in capturing variations in farmers' knowledge, attitude, and practices.

3.9.5 Pilot Study

Prior to the main study, a pilot test was conducted for the first 15 respondents to evaluate the clarity, relevance, and reliability of the questionnaire. The internal consistency of the instrument was assessed using Cronbach's alpha, ensuring that the items reliably measured the constructs of knowledge, attitudes, and practices regarding brucellosis among cattle farmers.

3.10 Data Analysis

The initial data collected through the Google Form was initially transferred to Microsoft Excel. Subsequent analysis of this data was performed using the Statistical Package for the Social Sciences (SPSS) version 26.0, with a significance level set at $\alpha < 0.05$. This involved calculating frequencies, percentages, means, medians, and standard deviations to describe categorical and numerical variables. Statistical tests, including the Chi-square test and Pearson correlation test, were used. The chi-square test was used to determine the association between demographic variables and knowledge, attitude, and practice (KAP) level, while the Pearson correlation test was used to evaluate the correlations between knowledge, attitudes, and practices. Proportions were calculated to determine the proportion of cattle farmers with different levels of KAP.

The total score for each section was calculated by adding up the points earned for each response. KAP levels were categorized as “Good,” “Moderate,” or “Poor” based on Bloom’s cut-off point. The overall score was classified as “Good” if the score was ≥ 80%. Meanwhile, scores were defined as “Moderate” if they fell between 50% and 79%. Lastly, scores of 40% were classified as “Poor.”

CHAPTER 4

RESULT

4.1 Respondents Socio-Demographic

A total of 35 respondents' data from cattle farmers in Kelantan were collected during this study period. As depicted in Table 1 below, the majority of respondents were males (n = 31, 88.6%). A predominant percentage of respondents fell within the age of 18 to 29 years old (n=18, 48.6%), followed by those in the age ranges of 30 to 39 (n=8, 22.9%), 40 to 49 (n=5, 14.3%), 50-59 (n=1, 2.9%) and more than 60 years old (n=1, 2.9%). Most of the respondents have their farms located in Bachok (n=22, 62.9%), followed by Pasir Puteh (n=5, 14.3%), and the least are from Gua Musang, Jeli, and Tumpat, with no respondents. Most respondents have secondary school education as their highest educational level (n=18, 51.4%), followed by those with STPM, matrices, foundation, diploma, or degree qualifications (n=16, 45.7%). Others pursued a master's degree (n = 1, 2.4%), and no respondents were collected at the primary level. The types of farming reported by respondents are mostly meat cattle (n = 32, 91.4%), followed by mixed farming of dairy and meat (n = 3, 8.6%). The number of cattle on each respondent's farm is mostly in the range of 1 to 10 (n=17, 48.6%), followed by 21 to 30 (n=7, 20%), more than 50 (n=6, 17.1%), and the lowest number, 11 to 20 (n=5, 14.3%).

Table 1: Respondent's Demographic

	Variables	Frequency	Percentage (%)
Gender	Female	4	11.4
	Male	31	88.6
Age	<18	3	8.6
	18-29	17	48.6
	30-39	8	22.9
	40-49	5	14.3
	50-59	1	2.9
	>60	1	2.9
Farm Location	Gua Musang	0	0
	Kuala Krai	1	2.9
	Jeli	0	0
	Machang	3	8.6
	Tanah Merah	1	2.9
	Pasir Puteh	5	14.3
	Pasir Mas	1	2.9

	Bachok	22	62.9
	Kota Bharu	2	5.7
	Tumpat	0	0
Education Level	Primary	0	0
	Secondary	18	51.4
	STPM/Matrics/Foundation/ Diploma/ any other courses	16	45.7
	Master	1	2.9
Type of cattle farming	Dairy	0	0
	Meat	32	91.4
	Mix (Dairy & Meat)	3	8.6
Number of cattle on the farm	1-10	17	48.6
	11-20	5	14.3
	21-30	7	20

31-40	0	0
41-50	0	0
>50	6	17.1

4.2 Respondent's Knowledge Towards Brucellosis in Cattle

As presented in Table 2, the findings reveal that a remarkable 71.4% (n = 25) of the 35 respondents had previously heard of brucellosis prior to this survey, while the remaining 28.6% (n = 10) had no prior awareness of the disease. Furthermore, 51.4% (n = 18) demonstrated a clear understanding of brucellosis as an infectious zoonotic disease, whereas 48.6% (n = 17) expressed uncertainty. Most respondents, 62.9% (n = 22), were aware of the diagnostic tests available for detecting brucellosis in cattle, compared to 37.1% (n = 14) who were not. Similarly, 51.4% (n = 18) acknowledged that brucellosis can be prevented through vaccination, while 48.6% (n = 17) were unaware of this preventive measure.

In addition, 71.4% (n=25) of respondents correctly identified that testing for brucellosis in newly arrived cattle should be conducted during the quarantine period, before the animals are introduced into the farm, whereas 28.5% (n=10) did not recognize this requirement. Following an abortion event in infected cattle, the same proportion, 71.4% (n=25), knew that the affected animals must undergo brucellosis testing, while 28.5% (n=10) remained uncertain. Finally, before cattle were used for artificial insemination, 68.6% (n = 24) of respondents understood that the animals must be certified free from brucellosis, whereas 31.4% (n = 11) were unaware of this essential prerequisite.

Table 2: Respondents' Knowledge Towards Brucellosis in Cattle

	Statements	Responses n (%)	
		Yes	No
1	Have you ever heard of brucellosis before?	71.4 (25)	28.6 (10)
2	Can Brucellosis infect humans?	51.4 (18)	48.6 (17)
3	Do you know the signs of brucellosis in cattle?	57.1 (20)	42.9 (15)
4	Are there any tests to detect brucellosis in cattle?	62.9 (22)	37.1 (14)
5	Can brucellosis be prevented through vaccination?	51.4 (18)	48.6 (17)
6	When should brucellosis testing be done on new cattle brought into the farm?	71.4 (25)	28.5 (10)
7	After a cow has aborted, should it be tested for brucellosis?	71.4 (25)	28.5 (10)
8	Before breeding cattle through artificial insemination, is it necessary to ensure they are free from brucellosis?	68.6 (24)	31.4 (11)

Table 3: Comparison of Demographic Characteristics and KAP Scores of Knowledge

	Variables	Good (%)	Moderate (%)	Poor (%)	P value
Gender	Female	25	50	25	0.595
	Male	37.1	22.9	28.6	
Age	<18	0	0	100	0.105
	18-29	41.2	35.5	23.5	
	30-39	37.5	37.5	25	
	40-49	80	0	20	
	50-59	0	0	100	
	>60	0	0	100	
Farm Location	Gua Musang	0	0	0	0.771
	Kuala Krai	0	100	0	
	Jeli	0	0	0	

	Machang	33.3	33.3	33.3	
	Tanah Merah	100	0	0	
	Pasir Puteh	20	40	40	
	Pasir Mas	100	0	0	
	Bachok	45.5	22.7	31.8	
	Kota Bharu	0	50	50	
	Tumpat	0	0	0	
Education Level	Primary	0	0	0	0.132
	Secondary	27.8	22.2	50	
	STPM/Matrics/Foundation/ Diploma/ any other courses	50	37.5	12.5	
	Master	100	0	0	

Type of cattle farming	Dairy	0	0	0	0.440
	Meat	37.5	28.1	34.4	
	Mix (Dairy & Meat)	66.7	33.3	0	
Number of cattle on the farm	1-10	23.5	35.3	41.2	
	11-20	40	40	20	
	21-30	85.7	14.3	0	
	31-40	0	0	0	
	41-50	0	0	0	
	>50	33.3	16.7	50	

4.3 Respondents' Attitude toward Brucellosis in Cattle Farmers

Table 4 shows Respondents' attitudes toward Brucellosis in Cattle Farmers. Most respondents strongly agreed (34.3%) and agreed (37.1%) that brucellosis is a serious disease. Only a small number disagreed (8.6%) and strongly disagreed (2.6%). This indicates that farmers generally recognize brucellosis as a significant health concern. A large proportion (25.7%) or a

substantial proportion (40.0%) agreed or strongly agreed that brucellosis impacts their income. Only 5.7% strongly disagreed, and 11.4% disagreed. This suggests that most farmers are aware of the economic implications of the disease. Most respondents either agreed (37.1%) or strongly agreed (34.3%) on the importance of testing. Very few disagreed (11.4%) or strongly disagreed (5.7%). This shows strong support for diagnostic testing. A majority agreed (28.6%) or strongly agreed (40.0%), while only 5.7% strongly disagreed. This reflects high willingness among farmers to vaccinate their cattle.

Most respondents strongly agreed (34.3%) or agreed (28.6%) that more education is needed. Only 5.7% strongly disagreed, and 20.0% disagreed. This suggests that farmers want more information and awareness programs. The majority agreed (31.4%) or strongly agreed (34.3%) with this statement. Only 8.6% strongly disagreed. This indicates that farmers prioritize early diagnostic steps in addressing reproductive problems. A strong majority supported this (34.3% strongly agree; 31.4% agree). Only 2.6% strongly disagreed. This indicates high awareness of biosecurity practices. Most farmers strongly agreed (40.0%) or agreed (37.1%). Only a small portion disagreed (11.4%) or strongly disagreed (5.7%). This shows willingness to cooperate with disease control measures. Most respondents agreed (34.3%) or strongly agreed (34.3%). Only about 8.6% strongly disagreed. This reflects a good understanding of safe disposal practices. A large number strongly agreed (31.4%) or agreed (34.3%). Only 2.9% disagreed strongly. This suggests that farmers recognize the role of hygiene in disease control. Most respondents strongly agreed (34.3%) or agreed (29.2%). Only 2.9% strongly disagreed. This indicates strong awareness of visitor biosecurity practices.

Table 4: Respondents 'Attitude Towards Brucellosis in Cattle

	Statements	Responses n (%)				
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	I believe brucellosis is a serious disease	2.6(1)	8.6(3)	17.1(6)	37.1(13)	34.3(12)
2	I believe brucellosis can affect my income	5.7 (2)	14.3(5)	17.1(6)	25.7(9)	40(14)
3	I believe testing brucellosis in cattle is important	5.7(2)	14.3(5)	8.6(3)	37.1(13)	34.3(12)
4	I am willing to vaccinate my cattle to prevent brucellosis	5.7(2)	17.1(6)	17.1(6)	28.6(10)	31.4(11)
5	I believe veterinary officers should provide more education to farmers about brucellosis	5.7(2)	20(7)	8.6(3)	28.6(10)	37.1(13)
6	I believe testing brucellosis after an abortion is an important step	8.6(3)	8.6(3)	20(7)	31.4(11)	31.4(11)

7	I think it is important to conduct brucellosis testing before introducing new cattle to the farm	2.6(1)	14.3(5)	14.3(5)	34.3(12)	34.3(12)
8	I think it is necessary to report aborted cases to the veterinary authorities	5.7(2)	11.4(4)	14.3(5)	37.1(13)	31.4(11)
9	I believe proper disposal of cattle carcasses by burial or burning is important to prevent the spread of brucellosis	8.6(3)	11.4(4)	14.3(5)	31.4(11)	34.3(12)
10	I think cleaning the cattle pan daily is important	14.3(5)	11.4(4)	8.6(3)	34.3(12)	31.4(11)
11	I think all visitors to the farm should follow biosecurity measures (wash boots, wear protective clothing)	14.3(5)	17.1(6)	11.4(4)	22.9(8)	34.3(12)

Table 5: Comparison of Demographic Characteristics and KAP Scores of Attitudes

	Variables	Good (%)	Moderate (%)	Poor (%)	P value
Gender	Female	25	50	25	0.981
	Male	22.6	45.1	32.3	
Age	<18	0	33.3	66.6	0.649
	18-29	29.4	52.9	17.7	
	30-39	25	37.5	37.5	
	40-49	20	60	20	
	50-59	0	0	100	
	>60	0	0	100	
Farm Location	Gua Musang	0	0	0	0.199
	Kuala Krai	0	100	0	
	Jeli	0	0	0	

	Machang	66.6	0	33.3	
	Tanah Merah	0	0	100	
	Pasir Puteh	0	60	40	
	Pasir Mas	0	100	0	
	Bachok	27.3	45.4	27.3	
	Kota Bharu		50	50	
	Tumpat	0	0	0	
Education Level	Primary	0	0	0	0.626
	Secondary	16.7	50	33.3	
	STPM/Matrics/Foundation/ Diploma/ any other courses	31.3	43.8	25	
	Master	0	0	100	

Type of cattle farming	Dairy	0	0	0	0.273
	Meat	18.75	46.9	34.4	
	Mix (Dairy & Meat)	66.6	33.3	0	
Number of cattle on the farm	1-10	64.7	17.6	17.6	0.676
	11-20	20	20	60	
	21-30	85.7	14.3	0	
	31-40	0	0	0	
	41-50	0	0	0	
	>50	33.3	33.3	33.3	

4.4 Respondent's Practices towards Brucellosis in Cattle

Based on the respondents' attitudes towards brucellosis in cattle, the majority (71.4%, n = 25) reported that they always vaccinate their cattle to prevent the disease, while 28.6% (n = 10) never do so. In terms of testing history, 42.9% (n=15) stated that their cattle have always been tested for brucellosis, whereas more than half (54.3%, n=19) indicated that their animals have never undergone testing. When introducing new animals, 71.4% (n=25) consistently isolate them before mixing with the existing herd, while smaller proportions rarely (20%, n=7) or never (8.6%, n=3) practice isolation. For the use of personal protective equipment, 68.6% (n=24) reported always wearing gloves, boots, and a face mask when handling placenta, blood, or mucus from cows that have calved or miscarried, while 14.3% (n=5) rarely and 17.1% (n=6) never use such protection. Similarly, 68.6% (n=24) of farmers stated that they always report abortion cases to the veterinary officer, compared to 14.3% (n=5) who rarely and 17.1% (n=6) who never report these cases. Regarding testing before artificial insemination, only 28.6% (n=10) always conduct brucellosis testing, another 28.6% (n=10) rarely do so, and 42.9% (n=15) never perform the test. Finally, for routine brucellosis testing on farms, 25.7% (n=9) indicated that they always carry out testing, while 37.1% (n=13) rarely conduct such procedures, and an equal 37.1% (n=13) never conduct such procedures.

For actions taken when abortion cases occur on the farm, more than half of the respondents (54.3%, n=19) reported that they would call and arrange for a veterinary inspection. Meanwhile, 37.1% (n=13) stated that they would separate the aborted cow from the rest of the herd. A smaller proportion, 14.3% (n=5), indicated that they would collect samples such as blood, placentas, or milk for testing purposes. Only 2.9% (n=1) admitted to disposing of the fetus and

placenta without reporting the case. Additionally, 17.1% (n=6) reported that they did not take any action when abortion events occurred on their farm. For carcass disposal practices, most respondents (82.4%, n = 28) reported burying carcasses in the ground with lime, which is considered a proper method of disposal. A smaller proportion (11.8%, n=4) stated that they burn or incinerate carcasses. Only 2.9% (n=1) disclosed that they dispose of carcasses into a river or drain, while another 2.9% (n=1) mentioned leaving carcasses in an open area. Regarding pen hygiene, 74.3% (n=26) of respondents reported cleaning the cattle pen every day. A further 17.1% (n=6) of cattle farmers clean the pen several times a week, while 5.7% (n=2) perform cleaning once a week. Meanwhile, 2.9% (n=1) stated that they rarely clean the cattle pen.

Table 6: Respondents 'Practice towards Brucellosis in Cattle

	Statements	Responses n (%)		
		Always	Rarely	Never
1	Do you give vaccines to your cattle to prevent brucellosis	71.4 (25)	0	28.6(10)
2	Have your cattle ever been tested for brucellosis before?	42.9(15)	0	54.3(19)
3	Do you always isolate new cattle before introducing	71.4(25)	20(7)	8.6(3)

	them to existing cattle?			
4	Do you use gloves, boots, and a face mask when handling the placenta, blood, or mucus from cows that have given birth or had a miscarriage?	68.6(24)	14.3(5)	17.1(6)
5	Do you report cases of abortion to the veterinary officer?	68.6(24)	14.3(5)	17.1(6)
6	Do you conduct brucellosis testing before performing artificial insemination?	28.6(10)	28.6(10)	42.9(15)
8	How often do you test your cattle for brucellosis on your farm?	25.7(9)	37.1(13)	37.1(13)

	Statements	Responses n (%)				
		Separate the aborted cattle	Call and make a veterinary inspection	Take a sample (blood/placenta/milk) for the test	Dispose of the fetus and placenta without reporting it	Did not do anything
9	What is your action when there are aborted cases on your farm?	37.1 (13)	54.3 (19)	14.3 (5)	2.9 (1)	17.1 (6)

	Statements	Responses n (%)

		Clean the farm regularly	Disposing of carcasses by burying or burning	Control the entry of visitors/vehicles	Not implementing any biosecurity
10	What is the primary way you implement biosecurity on your farm?	62.9 (22)	34.3 (12)	31.4 (11)	11.4 (4)

	Statements	Responses n (%)			
		Bury them in the ground with lime	Burn/incinerator	Dispose of them in a river/drain	Leave them in an open area
11	How do you dispose of carcasses on the farm?	82.4 (28)	11.8 (4)	2.9 (1)	2.9 (1)

	Statements	Responses n (%)			
		Every day	Several times a week	Once a week	Rarely
12	How often do you clean the cattle pan?	74.3 (26)	17.1 (6)	5.7 (2)	2.9 (1)

Table 7: Comparison of Demographic Characteristics and KAP Scores of Practices

	Variables	Good (%)	Moderate (%)	Poor (%)	P value
Gender	Female	25	50	25	0.405
	Male	58.1	22.6	19.4	
Age	<18	0	33.3	66.6	0.063
	18-29	64.7	23.5	11.8	
	30-39	37.5	25	37.5	
	40-49	100	0	0	

	50-59	0	100	0	
	>60	0	100	0	
Farm Location	Gua Musang	0	0	0	0.760
	Kuala Krai	100	0	0	
	Jeli	0	0	0	
	Machang	33.3	0	66.6	
	Tanah Merah	100	0	0	
	Pasir Puteh	40	40	20	
	Pasir Mas	100	0	0	
	Bachok	54.5	27.3	18.2	
	Kota Bharu	50	50	0	
	Tumpat	0	0	0	

Education Level	Primary	0	0	0	0.314
	Secondary	44.4	22.2	33.3	
	STPM/Matrics/Foundation/ Diploma/ any other courses	62.5	31.3	6.3	
	Master	100	0	0	
Type of cattle farming	Dairy	0	0	0	0.729
	Meat	56.35	25	18.75	
	Mix (Dairy & Meat)	33.3	33.3	33.3	
Number of cattle on the farm	1-10	11.8	41.2	47	0.053
	11-20	40	60	0	
	21-30	28.6	57.1	14.3	
	31-40	0	0	0	
	41-50	0	0	0	
	>50	33.3	66.6	0	

4.5 Association of Demographic Characteristics and KAP Scores

The relationship between demographic characteristics and the KAP score of respondents is shown in Table 3, Table 5, and Table 7. None of the demographic variables was found to be statistically significant.

4.6 Correlation between KAP Scores

Table 8 shows the correlation between knowledge, attitude, and practice scores. The findings indicate a significant positive linear correlation between knowledge and attitude ($r = 0.379$, $p = 0.025$), suggesting that farmers with higher knowledge of brucellosis tend to have more positive attitudes toward its prevention and control. There is also a strong and significant positive correlation between knowledge and practice ($r = 0.674$, $p < 0.001$), indicating that increased knowledge is strongly associated with better preventive practices among farmers. Thus, second hypothesis is accepted which is there is a positive relationship between the level of knowledge and the preventive practices of cattle farmers regarding brucellosis. However, the correlation between attitude and practice ($r = 0.281$, $p = 0.102$) is positive but not statistically significant, suggesting that although better attitudes may be associated with improved practices, this relationship is weak and insufficient to confirm a reliable relationship in this sample.

Table 8: Correlation between scores of Knowledge, Attitude, and Practice

Variable	Pearson correlation coefficient (r)	p-value
Knowledge-Attitude	0.379	0.025
Knowledge-Practice	0.674	<0.001
Attitude-Practice	0.281	0.102

P<0.05 is statistically significant

4.7 Summary of Overall Level of Knowledge, Attitude, and Practice

The results showed that only 2% (n = 1) of the respondents achieved a good level of knowledge, with scores ranging from 80–100%. More than half of the respondents (57.1%, n = 20) fell within the moderate range (60–79%). Meanwhile, 40% (n = 14) demonstrated poor knowledge, scoring below 60%, as shown in Table 9.

Table 9: Summary of Overall Level of Knowledge, Attitude, and Practice

Level	Range mark (%)	Frequency	Percentage (%)
Good	80-100	1	2
Moderate	60-79	20	57.1
Poor	<60	14	40.0

CHAPTER 5

DISCUSSION

This study was conducted among 35 cattle farmers in Kelantan, aiming to evaluate the Knowledge, Attitudes, and Practices (KAP) regarding Brucellosis among cattle farmers in Kelantan. While numerous studies globally have explored the KAP of Brucellosis among cattle farmers, there remains a gap in understanding the specific knowledge, attitude, and practices of Kelantan cattle farmers in this context.

Although sociodemographic factors did not show a statistically significant association with knowledge scores, this may be due to the relatively small sample size, which can limit the ability to detect significant relationships. Despite this, certain trends offer meaningful interpretation. Farmers within the 40–49 age group appeared to demonstrate stronger knowledge, likely due to longer exposure to cattle farming, accumulated experience, and repeated encounters with disease-related issues. Experience is often a crucial determinant of knowledge in livestock management, especially in endemic areas. Education also appeared to influence knowledge, with more educated farmers generally showing better understanding of brucellosis. This aligns with the literature suggesting that farmers with higher education are more receptive to new information, more willing to adopt recommended practices, and more likely to be exposed to training opportunities. (Alghafeer et al., 2024)

Conversely, farmers with lower educational backgrounds may rely more heavily on traditional knowledge or be less inclined to change established routines, thereby reducing their opportunities to acquire updated disease-related information (IOP conference series, 2021). Similar findings were reported in studies where farmers relied mainly on traditional experience

rather than formal training, resulting in an incomplete understanding of zoonotic risks (Kansiime et al., 2014). In Malaysia, more emphasis has historically been placed on diseases such as FMD, hemorrhagic septicemia, and mastitis, which has limited farmers' opportunities to acquire brucellosis-specific information (DVS Malaysia, 2019).

The finding that only 40% of cattle farmers possess good knowledge of brucellosis has significant implications for animal health, public health, and disease control efforts. Limited knowledge means many farmers may fail to recognize clinical signs or understand the transmission pathways of brucellosis, leading to delays in reporting and treatment. Studies have shown that inadequate farmer knowledge contributes to persistent herd infection and poor biosecurity practices. (Awais et al., 2024)

Regarding attitude, younger farmers tended to exhibit more favorable attitudes toward brucellosis prevention. This could be attributed to their higher engagement with digital platforms and online information sources. Younger individuals often access health, agriculture, and disease-related content through social media, making them more aware of recommended preventive measures and current issues. This suggests that digital media can be an effective channel for disseminating brucellosis education, especially for younger farming communities. This can be related to the 2024 Digital Yearly Report, which states that individuals aged 25 to 34 were identified as the most active Internet users, utilizing platforms like Facebook, Instagram, and TikTok to access information (Statista, 2024). This suggests that younger farmers tend to

have more positive attitudes, likely due to greater exposure to digital information platforms and their active access to agricultural knowledge online.

The finding that only 54.3% of respondents demonstrated a good attitude level toward brucellosis prevention indicates that almost half of the farmers may still undervalue or overlook essential disease-control measures. A suboptimal attitude can significantly reduce farmers' motivation to adopt safe practices such as proper disposal of aborted materials, quarantine of new animals, routine screening, or timely reporting of reproductive problems. Farmers with weaker attitudes toward biosecurity are less likely to comply with recommended preventive behaviors, which in turn increases the risk of disease transmission within and between farms. (Hlaing et al., 2024)

Farmers' practices showed a clearer relationship with the size of their cattle herd. Larger herds typically require more structured management systems, including stricter biosecurity routines, regulated animal movement, and improved record-keeping. As herd size increases, farmers may also become more aware of the economic risks associated with disease outbreaks, motivating them to adopt better preventive practices. Previous studies, such as those from Bangladesh, similarly reported that larger herds tend to have better biosecurity scores, supporting the idea that farm scale influences management behavior (Anica Bushra et al., 2024). This highlights the need to strengthen support for small-scale farmers, who often lack access to resources, infrastructure, and training necessary to implement recommended preventive measures. Small-scale farmers commonly lack proper farm infrastructure (isolation pens, fencing,

testing facilities) and have limited access to veterinary services. Financial limitations restrict the ability to invest in routine diagnostic testing. Larger farms, on the other hand, tend to adopt better disease-prevention practices due to greater economic investment in livestock and stricter management systems (Wang & Hu, 2023). This supports the pattern seen in Kelantan, where herd size influenced practice levels.

The majority of cattle farmers in Kelantan demonstrate low to moderate levels of knowledge, attitudes, and practices concerning brucellosis, supporting the proposed hypothesis. A positive correlation exists between farmers' knowledge of brucellosis and their implementation of preventive practices, confirming the corresponding hypothesis.

CHAPTER 6

CONCLUSION

In conclusion, this study demonstrated a moderate level of knowledge, attitudes, and practices regarding brucellosis among cattle farmers in Malaysia. The findings highlight important gaps and misconceptions related to the disease, which can inform the development of targeted educational programs and awareness initiatives aimed at improving farmers' understanding and preventive behaviors. Moreover, veterinary authorities and field officers can use these insights to address specific challenges identified in the study, provide accurate information, and strengthen disease control strategies at the farm level. Ultimately, these findings have the potential to enhance the effectiveness of brucellosis prevention efforts and contribute to better herd health and overall livestock productivity.

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Faculty of Veterinary Medicine

Ruj. Kami (*Our Ref.*) : UMK.A06.800-1/2/9 (03)
Tarikh (*Date*) : 30th NOVEMBER 2025

ASSOC. PROF. DR. NOR FADHILAH BINTI KAMARUZZAMAN
Principal Investigator
Faculty of Veterinary Medicine
University Malaysia Kelantan

Dear Assoc. Prof.,

APPROVAL OF INSTITUTIONAL HUMAN CARE AND USE COMMITTEE TO CONDUCT RESEARCH INVOLVING HUMAN

We are pleased to inform you that your application for approval to conduct research from Institutional Human Care and Use Committee, Faculty of Veterinary Medicine, Universiti Malaysia Kelantan has been approved with the following code:

Approval Code	***UMK/FPV/HUMAN/EXT/0003/2025***
Title	***Knowledge, Attitude and Practice Regarding Brucellosis Among Cattle Farmers in Kelantan***
Student Principal Investigator:	**Nur'Ain 'Aisyah Binti Shahrom – D21A0133**

You are advised to always follow "3R" (REDUCE, REFINE, & REPLACE) and all human ethics and human welfare principles to reduce suffering in human.

Thank you.

"BERKHIDMAT UNTUK NEGARA"

Yours sincerely,

(DR. ABUBAKAR DAN MAIGORO)
Chairman
Institutional Human Care and Use Committee

Ira/Kelulusan Etika Penglibatan Manusia Dalam Penyelidikan/MyDrive

Section 1 of 7

Soal Selidik: **Tahap Pengetahuan, Sikap dan Amalan (KAP) Penternak terhadap Penyakit Brusellosis di Kelantan, Malaysia.**

Soal selidik ini dijalankan sebagai sebahagian daripada kajian untuk menilai tahap **pengetahuan**, **sikap**, dan **amalan (KAP)** penternak terhadap penyakit **Brusellosis** pada lembu ternakan.

Brusellosis merupakan penyakit berjangkit yang boleh menjejaskan kesihatan haiwan dan manusia, serta memberi kesan kepada hasil dan pendapatan penternak. Maklumat yang diperoleh daripada kajian ini akan digunakan untuk tujuan akademik dan diharapkan dapat meningkatkan kesedaran serta pengetahuan berkaitan pengurusan penyakit ini dalam kalangan penternak.

Segala maklumat yang diberikan adalah sulit dan hanya digunakan untuk tujuan penyelidikan sahaja. Maklumat anda sebagai responden akan dirahsiakan sepenuhnya dan hanya akan digunakan secara anonim (tanpa nama) untuk tujuan kajian ini sahaja.

Kami amat menghargai kerjasama dan masa anda dalam menjawab soal selidik ini.
Sila jawab setiap soalan dengan jujur dan berdasarkan pengalaman sebenar anda sebagai penternak.

Soalan-soalan ini akan mengambil masa anda selama 5 minit sahaja.

After section 1 Continue to next section

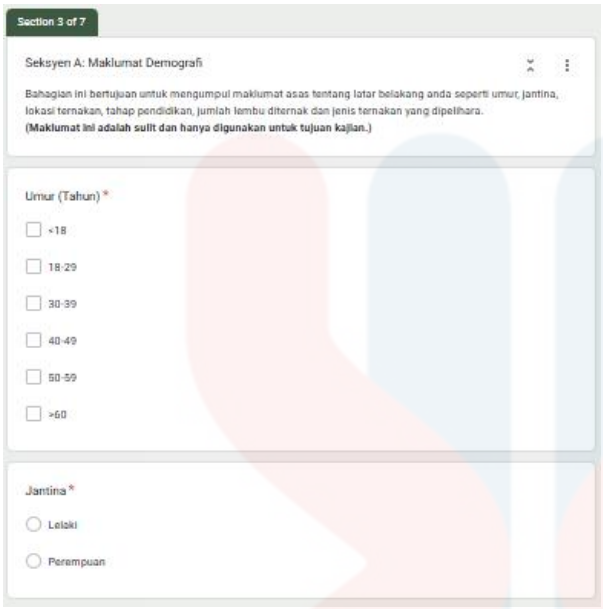
Section 2 of 7

Untitled Section

Description (optional)

Adakah anda bersetuju untuk menjadi responden bagi kajian ini ? *

☐ Ya



Section 3 of 7

Seksyen A: Maklumat Demografi

Bahagian ini bertujuan untuk mengumpul maklumat asas tentang latar belakang anda seperti umur, jantina, lokasi ternakan, tahap pendidikan, jumlah lembu diternak dan jenis ternakan yang dipelihara.
(Maklumat ini adalah sulit dan hanya digunakan untuk tujuan kajian.)

Umur (Tahun) *

- [ ] <18
- [ ] 18-29
- [ ] 30-39
- [ ] 40-49
- [ ] 50-59
- [ ] >60

Jantina *

- ( ) Lelaki
- ( ) Perempuan

Daerah lokasi ladang *

- [ ] Gua musang
- [ ] Kuala Krai
- [ ] Jeli
- [ ] Machang
- [ ] Taman Merah
- [ ] Pasir Puteh
- [ ] Pasir Mas
- [ ] Bachok
- [ ] Kota Bharu
- [ ] Tumpat

Tahap pendidikan penternak *

- [ ] Sekolah Rendah
- [ ] Sekolah Menengah
- [ ] Pengajian Tinggi (contoh: sijil, diploma, ijazah atau lebih tinggi)
- [ ] Other: .....

Jenis Penternakan *

- [ ] Lembu Tenusu
- [ ] Lembu Pedaging
- [ ] Campuran (Tenusu dan Pedaging)

Bilangan lembu di ladang (ekor) *

- [ ] 1-10
- [ ] 11-20
- [ ] 21-30
- [ ] 31-40
- [ ] 41-50
- [ ] >50

After section 3 Continue to next section

Section 4 of 7

Seksyen B: Pengetahuan tentang penyakit Brusellosis

Bahagian ini mengandungi soalan untuk menilai tahap pengetahuan anda mengenai penyakit brusellosis — termasuk cara jangkitan, tanda-tanda klinikal, kesan kepada ternakan dan manusia, serta langkah pencegahan. **(Tiada jawapan betul atau salah, jawapan yang diberikan adalah untuk memahami tahap pengetahuan anda.)**

Pernahkah anda mengetahui tentang penyakit brusellosis sebelum ini ? *

- [ ] Ya
- [ ] Tidak
- [ ] Tidak pasti

Adakah penyakit brusellosis boleh menjangkiti manusia ? *

- [ ] Ya
- [ ] Tidak
- [ ] Tidak pasti

Adakah anda tahu tanda-tanda penyakit brusellosis pada lembu ? *

- [ ] Ya
- [ ] Tidak
- [ ] Tidak Pasti

Adakah terdapat ujian untuk mengesan penyakit brusellosis pada lembu ? *

- [ ] Ya
- [ ] Tidak
- [ ] Tidak pasti

Bila sepatutnya ujian penyakit bruselosis dilakukan pada lembu baharu yang dibawa masuk ke ladang ? *

- [ ] Semasa kuarantin, sebelum masuk ladang
- [ ] Hanya selepas bercampur dengan lembu lain
- [ ] Tidak perlu diuji

Selepas berlaku keguguran, adakah lembu tersebut perlu diuji untuk penyakit bruselosis ? *

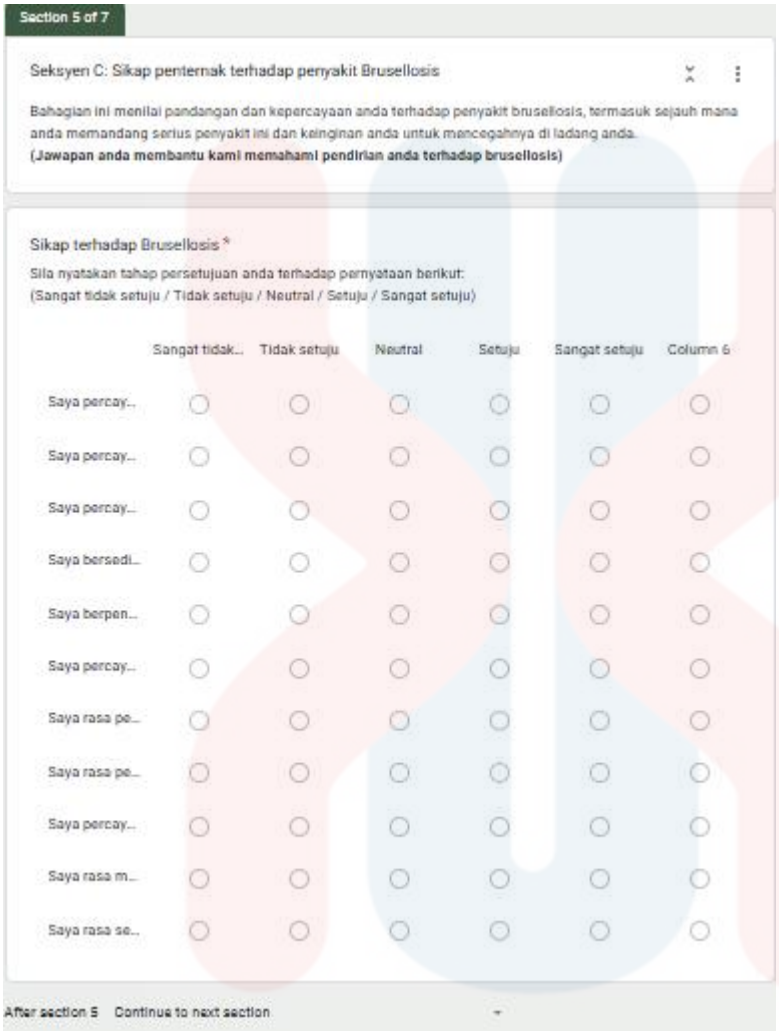
- ( ) Ya
- ( ) Tidak
- ( ) Tidak pasti

Sebelum lembu dibiakkan melalui permainan beradas, adakah perlu memastikan lembu bebas daripada bruselosis? *

- ( ) Ya
- ( ) Tidak
- ( ) Tidak pasti

Antara ujian berikut, yang manakah tuan/puan tahu gunakan untuk bruselosis ? *

- [ ] Rose Bengal Test (RBT)
- [ ] ELISA / CFT
- [ ] Milk Ring Test (MRT)
- [ ] PCR
- [ ] Tidak tahu



Section 5 of 7

Seksyen C: Sikap penternak terhadap penyakit Brusellosis

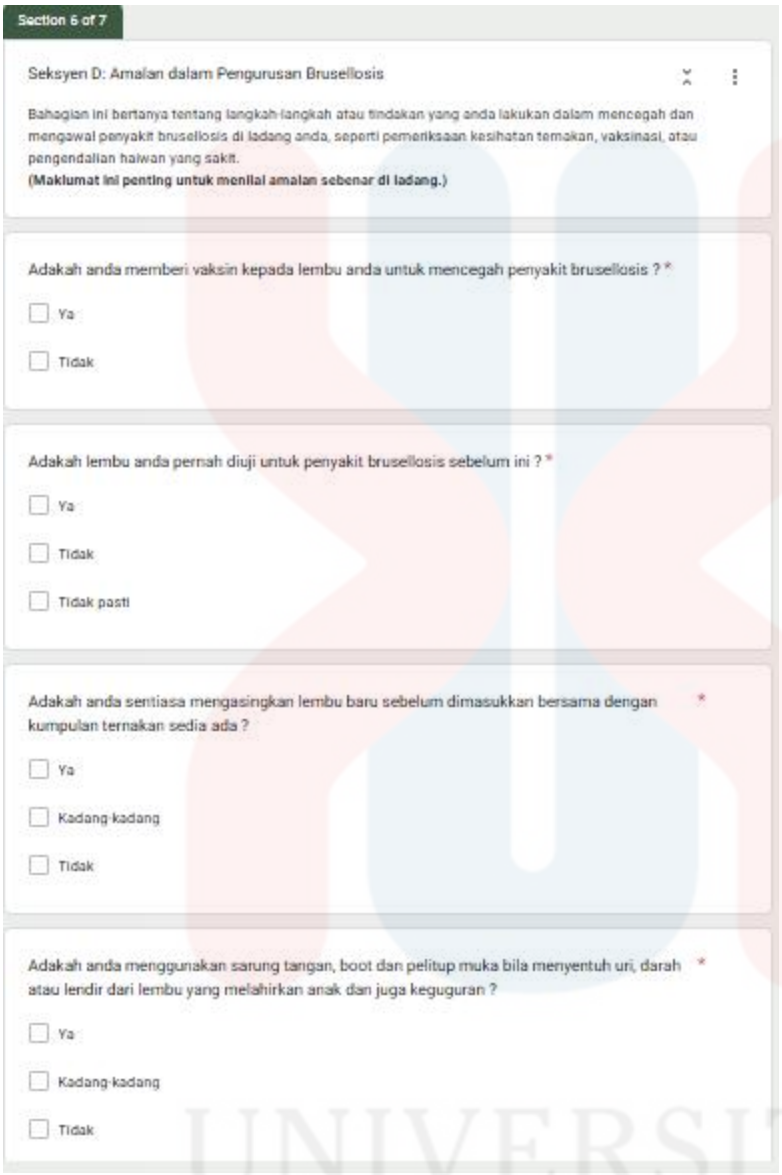
Bahagian ini menilai pandangan dan kepercayaan anda terhadap penyakit brusellosis, termasuk sejauh mana anda memandang serius penyakit ini dan keinginan anda untuk mencegahnya di ladang anda.
(Jawapan anda membantu kami memahami pendirian anda terhadap brusellosis)

Sikap terhadap Brusellosis *

Sila nyatakan tahap persetujuan anda terhadap pernyataan berikut:
(Sangat tidak setuju / Tidak setuju / Neutral / Setuju / Sangat setuju)

	Sangat tidak...	Tidak setuju	Neutral	Setuju	Sangat setuju	Column 6
Saya percay...	○	○	○	○	○	○
Saya percay...	○	○	○	○	○	○
Saya percay...	○	○	○	○	○	○
Saya bersedi...	○	○	○	○	○	○
Saya berpen...	○	○	○	○	○	○
Saya percay...	○	○	○	○	○	○
Saya rasa pe...	○	○	○	○	○	○
Saya rasa pe...	○	○	○	○	○	○
Saya percay...	○	○	○	○	○	○
Saya rasa m...	○	○	○	○	○	○
Saya rasa se...	○	○	○	○	○	○

After section 5 Continue to next section



Section 6 of 7

Seksyen D: Amalan dalam Pengurusan Brusellosis

Bahagian ini bertanya tentang langkah-langkah atau tindakan yang anda lakukan dalam mencegah dan mengawal penyakit brusellosis di ladang anda, seperti pemeriksaan kesihatan ternakan, vaksinasi, atau pengendalian haiwan yang sakit.
(Maklumat ini penting untuk menilai amalan sebenar di ladang.)

Adakah anda memberi vaksin kepada lembu anda untuk mencegah penyakit brusellosis ? *

- [ ] Ya
- [ ] Tidak

Adakah lembu anda pernah diuji untuk penyakit brusellosis sebelum ini ? *

- [ ] Ya
- [ ] Tidak
- [ ] Tidak pasti

Adakah anda sentiasa mengasingkan lembu baru sebelum dimasukkan bersama dengan kumpulan ternakan sedia ada ? *

- [ ] Ya
- [ ] Kadang-kadang
- [ ] Tidak

Adakah anda menggunakan sarung tangan, boot dan pelitup muka bila menyentuh uri, darah atau lendir dari lembu yang melahirkan anak dan juga keguguran ? *

- [ ] Ya
- [ ] Kadang-kadang
- [ ] Tidak

Adakah anda melaporkan kes lembu keguguran anak kepada pegawai veterinar ? *

- [ ] Ya
- [ ] Kadang-kadang
- [ ] Tidak

Dimanakah anda mendapat tahu informasi tentang penyakit brusellosis ? *

- ( ) Pegawai veterinar
- ( ) Rakan ladang
- ( ) Internet/TV
- ( ) Saya tidak mendapat maklumat

Adakah anda membuat pemeriksaan penyakit bruselosis sebelum menjalankan permainan beradas ?

- ( ) Ya selalu
- ( ) Kadang-kadang
- ( ) Tidak pernah

Sejauh mana kekerapan anda melakukan ujian penyakit bruselosis pada lembu di ladang ?

- ( ) Setiap 3-6 bulan
- ( ) Setiap tahun
- ( ) Hanya bila ada masalah (contoh: keguguran)
- ( ) Tidak pernah

Apakah tindakan anda apabila berlaku keguguran di ladang ?

- [ ] Asingkan lembu yang gugur
- [ ] Hubungi/jalankan pemeriksaan veterinar
- [ ] Ambil sampel (darah/uri/susu) untuk ujian
- [ ] Buang janin dan uri tanpa laporan
- [ ] Tidak buat apa apa

Apakah cara utama anda melaksanakan biosekuriti di ladang ?

- [ ] Membersihkan kandang secara berkala
- [ ] Melupuskan bangkai secara tanam dan bakar
- [ ] Mengawal kemasukan pelawat/kenderaan
- [ ] Tidak melaksanakan apa-apa amalan biosekuriti

Bagaimanakah anda melupuskan bangkai di ladang ?

- ◯ Tanam dalam tanah dengan kapur
- ◯ Bakar/Incinerator
- ◯ Buang ke sungai/parit
- ◯ Biarkan di kawasan terbuka
- ◯ Other: .....

Seberapa kerap anda membersihkan kandang lembu ?

- ◯ Setiap hari
- ◯ Beberapa kali seminggu
- ◯ Seminggu sekali
- ◯ Jarang

After section 6 Continue to next section

Section 7 of 7

Terima kasih

Kerjasama anda sangat dihargai.


LADANG TERNAKAN
(SEKSYEN 01)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