**Deanship of Graduate Studies**

**Al-Quds University**

# Brucellosis Knowledge, Attitude and Practice among Local Dairy Producers and Consumers in Hebron City

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# Brucellosis Knowledge, Attitude and Practice among Local Dairy Producers and Consumers in Hebron City

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## Thesis Approval

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**Jerusalem- Palestine**

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# Dedication

To my father and mother the most precious things in existence, I pray to Allah to give you health and wellness, thank you for everything

To my dear wife, I appreciate your effort and your labor with me in this achievement, thank you very much

To my children, my butterflies, the most beautiful things in my life, I love you so much.

To my brothers and sisters, you are my supporters and pillars; I thank you for your support.

**Declaration:**

I Certify that this thesis submitted for the degree of Master is the result of my own research, except where otherwise acknowledged, and that this thesis (or any part of the same) has not been submitted for a higher degree to any other university or institution.

Student's Name: Iyad Zyad  Sadi Abuirmeila

Signature: 

Date: 15/12/2024

# Acknowledgments

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All thanks to my supervisor Dr. Khaldoun Bader, all the respect and appreciation**,** You have never given up on me or denied me any information or guidance, I am honored you have been my supervisor for this thesis to obtain a master's degree.

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## Abstract

**Background:** Dairy products consumers and producers play an important role in preventing brucellosis among families, so special attention should be given to these two groups including their knowledge, attitude and practice reflected to the disease in how to prevent brucellosis, to enable them planning for the control measures known to be effective against the spread of the *Brucella* species such as proper boiling of milk and its products.

**Aim:** To evaluate brucellosis KAP level among consumers and community dairy products producers in the city of Hebron.

**Material and Methods:** This study was carried out in Hebron targeting adult residents who are milk products consumers and who are attending at the MOH primary health care clinics as well as community dairy milk products producers in the city. This research comprised two studies: across-sectional study focusing on dairy product consumers and a qualitative study centered on dairy milk producers, Data was collected in this study using two questionnaires; the first is a quantitative researcher-assisted questionnaire filled out by dairy products consumers targeting their demographics and KAP level for brucellosis and its prevention, and the second questionnaire was a qualitative questionnaire that targeted community dairy products producers which contained three main questions with prop questions (sub questions for more details) in-between which was conducted through face-to-face interviews with the participants ,data were analyzed and processed through SPSS, descriptive statistics was obtained and correlations and associations were identified with KAP level and regression analysis was done to find final associations with KAP.

**Results:** In the quantitative part of the study a total of 370 subjects were sampled and filled the questionnaire in 14 clinics, and in the qualitative part seven interviews were conducted with dairy milk products producers, In the quantitative part 64% of respondents were above the age of 40 years, 52% of them were males , 88.9% were married and 77.6% have income below 3000 shekels,23.8% reported history of previous brucellosis infection in the family, 10.5% only reported having herds in their surroundings, and 47.8% have chronic diseases such as Hypertension or Diabetes Mellitus, The KAP level knowledge score was 69%, attitude score was 4.21, and practice score was 84%.

In the qualitative part, seven interviews were done and results showed that the age of respondents was between 30-70 years old, 62%(5 out of 8 producers) have high school education, 75%(6 out of 8 producers) of those interviewed had this work inherited from their ancestors, only 25% (2 out of 8 producers) had learned how to produce safe products ,and 50% (4 out of 8 producers) of them don't have work License from the MOH. Regarding the production process, we found that regular methods to produce dairy products don't include boiling milk, i.e. the milk doesn't reach 70°C, only 30°C, and the manufacturers rely on vaccinated herds, although 75% (6 out of 8 producers) of those interviewed said that boiling milk and cheese is very important.

**Conclusions:**

This is a one-of-a-kind study of the knowledge and attitude and practice of participants in the community using qualitative and quantitative tools to measure KAP level and to study risk factors affecting KAP level, socioeconomic determinants, and general knowledge, practice and attitude.

**Recommendations:**

Increase community awareness for prevention and control of Brucellosis, and consumption of pasteurized milk and dairy products. Increase coordination between Ministry of Health and Ministry of Agriculture / Veterinary services concerning brucellosis prevention and control.

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## List of Abbreviations

| | |
|---|---|
| *et al.* | et allii (and others) |
| KAP | knowledge, Attitude, Practice |
| EU/EEA | European Union /European Economic Area |
| PBCP | Palestinian Brucellosis Control Program |
| ≥ | Greater or equal |
| USA | United States of America |
| CDC | Center for Disease Control and Prevention |
| WHO | World Health Organization |
| UNDP | United Nations Development Program |
| H | Hour |
| cm | Centimeter |
| % | Percent |
| g | Gram |
| HACCP | Hazard Analysis Critical Control Point |
| *B. melitensis* | *Brucella melitensis* |
| *B. abortus* | *Brucella abortus* |
| *B. suis* | *Brucella suis* |

| | |
|---|---|
| *B. canis* | *Brucella canis* |
| °C | Degree Celsius |
| ELISA | Enzyme-Linked Immunosorbent Assay |
| PCR | Polymerase Chain Reaction |
| DNA | Deoxyribonucleic acid |
| FAO | Food and Agricultural Organization |
| OIE | Office International des Epizooties |
| Mm | Millimeter |
| RB | Rose Bengal |
| USDA | U.S. Department of Agriculture |
| FDA | Food and Drug Administration |
| IV | Intravenously |
| IM | Intramuscularly |
| Kg | Kilogram |
| N | Sample size |
| PPE | Personal protective equipments |

# Chapter One:

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## Introduction

### 1.1 Background:

Brucellosis, also called 'Undulant fever,' 'Mediterranean fever,' or 'Malta fever', is a bacterial zoonotic infection caused by a gram negative bacteria *Brucella* which is small aerobic intracellular *coccobacilli* transmitted to humans from infected animals (mainly sheep, goats, and camels) by ingestion of animal products like unpasteurized milk or cheese, or by contact with infected tissue such as placenta or fluids.

The disease is a common zoonosis with a worldwide occurrence and could be a crucial public health concern in many developing countries (Pappas *et al.*, 2005).

Endemic areas for brucellosis are distributed worldwide and include areas such as the Mediterranean basin, Near East, Central Asia, China, Indian subcontinent, Sub-Saharan Africa, and parts of Mexico and Central and South America (Georgios Pappas *et al.*, 2006; Seleem, Boyle and Sriranganathan, 2010).

Estimations put the numbers of new occurrences at 500,000 cases reported annually worldwide with a population of about 2.4 billion people being at risk with many factors affecting its increasing prevalence including international tourism and migration (Greenfield *et al.*, 2002; G Pappas *et al.*, 2006).

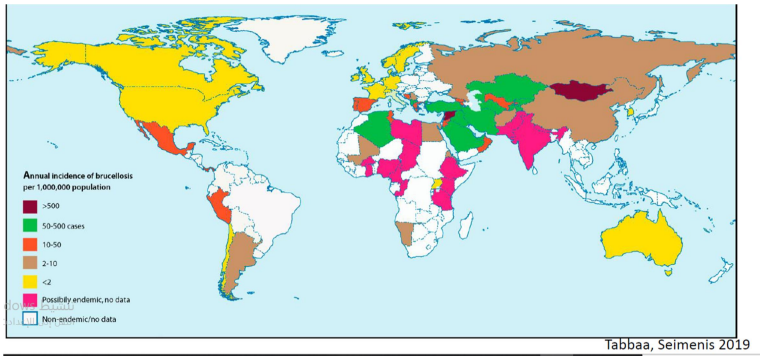


**Figure 1: Annual Incidence of Brucellosis per 1000000 population, -(Tabbaa , Seimenis 2019)**

There are many Brucella species, however the ones that cause human disease include *B. melitensis* (isolated from small ruminants like sheep and goats, also as camels), *B. abortus* (isolated from cattle), *B. suis* (isolated from swine), and *B. canis* (isolated from dogs). Most human cases worldwide are caused by *B. melitensis*. (Pappas *et al.*, 2005).It has been reported that the bacterial organism that causes Brucellosis can survive up to two days in milk at 8°C, up to three weeks in frozen meat, and up to a few months in cheese, and that Brucella in infected animal excretions may remain viable for more than 40 days if the soil is humid, however the bacteria is sensitive to heat, radiation, disinfectants, and pasteurization (Corbel, 1997)(El-Sayed and Awad, 2018).

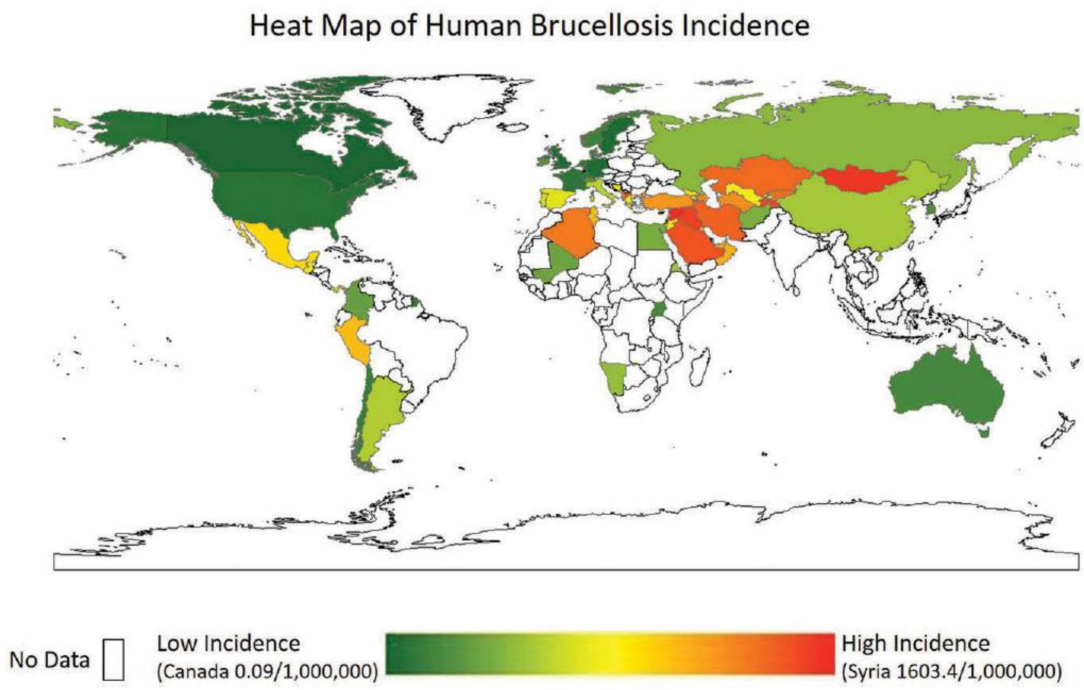


**Figure 2: Heat map of human incidence (per 1,000,000 individuals). White indicates no data. (Hull and Schumaker, 2018)**

The incubation period in humans ranges from two to four weeks (Mantur, Amarnath and Shinde, 2007); and usually presents with the onset of fever, malaise, night sweats and arthralgia (Pappas *et al.*, 2005; Bosilkovski *et al.*, 2010), Physical examination may be nonspecific and signs may include hepatomegaly, splenomegaly, and/or lymphadenopathy. Lab tests may show elevated transaminases, anemia, leukopenia, or leukocytosis with relative lymphocytosis, and thrombocytopenia (Al-Eissa *et al.*, 1993; Karakukcu *et al.*, 2004)

Complications of human infection can include osteoarticular disease (which occurs in up to 70% of patients with brucellosis), genitourinary complications 2-20% including orchitis, cardiovascular complications including endocarditis( less than 2%) hematologic complications including anemia (20-53%) and neurologic complications including meningitis (0.5-25%) (Geyik *et al.*, 2002; Shaalan *et al.*, 2002; Bosilkovski *et al.*, 2004)(Jin *et al.*, 2023).

Significant risk factors for brucellosis include occupation ,contact with aborted animals, consumption of raw meat, unpasteurized milk, and raw cheese (Narimisa, Razavi and Masjedian Jazi, 2024). In a study done in Pakistan risk factors were age, male gender, urban residence, unsafe practices during parturition of animals, raw milk consumption, contact with animals, and contact with aborted animals (Hassan *et al.*, 2022)

Brucellosis diagnosis is usually achieved through standard tube agglutination test or by culture of the organism (from blood, body fluids, or tissue), or by antibody detection of a four-fold or more rise in Brucella antibody titer between acute and convalescent-phase serum specimens obtained ≥two weeks apart. Detection of Brucella DNA from clinical specimens by polymerase chain reaction can be used for diagnosis of brucellosis. (Andonopoulos *et al.*, 1986; Al Dahouk *et al.*, 2003; Mantecón *et al.*, 2008; Yagupsky, Morata and Colmenero, 2019)

Human infection prevention has to be carried out through animal infection prevention and control as well as activities targeting humans. Disease control in animals is mainly dependent on vaccination which reduces the number of bacteria produced by the infected herds (Zamri-Saad and Kamarudin, 2016). This is added to the strategy of test and slaughter of infected animal, In 1998, WHO suggested general strategies for control and eradication of animal brucellosis which included prevention of animal infection and monitoring herds, generating brucellosis-free herds and zones, and applying vast vaccination programs to decrease the disease prevalence (‘Brucellosis Control Program II 2007’).

However to prevent human infection, in addition to animal infection prevention and control , measures should be taken including milk pasteurization ,public education to improve KAP on the disease ,the pasteurization of dairy products and preventing consumption of unpasteurized milk , and dairy products as well as raw or undercooked meat and animal products.

Human exposure is often prevented by personal hygiene and using personal protective equipment (PPE), animal vaccination , boiling milk, safe production of dairy products and implementation of safety measures to prevent contamination, inhalation, or ingestion of

infectious organisms while handling animals. Moreover, special precautions are needed for handling an aborted fetus or its membranes and fluids (Golshani and Buozari, 2017).

Failure to control the disease at the livestock level can result from inadequate attention to livestock health, poor quality of veterinary services, unavailability of economic resources, irregular animal vaccination; and on the human side, failure factors can include improper eating habits, consumption of dairy products, and socioeconomic status (Zhonghua Liu Xing Bing Xue Za Zhi 2000, Ragan V, Vroegindewey G, Babcock S 2013.).

Producers of dairy products play an important role in caring for families and preventing their infection when they prepare food and consume it, and their illiteracy, ignorance, and faulty behaviors usually decrease KAP level for brucellosis within the community, so special care for such producers should be provided including their education about the disease control measures.

This study aimed to assess the knowledge, attitudes and practice of consumers and community dairy product producers and the control measures they implement for brucellosis prevention in Hebron City, Palestine.

## 1.2 Study justification:

Brucellosis is a major endemic disease in Palestine, especially in Hebron city which considered one of the highest cities have Brucella incidence in the World. In 1998 the incidence rate was reported to be at 32.4 per 100,000 in Palestine. In 2019 incidence reached 10.5 per 100.000. The main etiological agent is *Brucella melitensis* which is found mainly among sheep and goats (Ministry of Health, 2019).

The endemicity of the disease and the reported incidence rate has resulted in an incentive to control it. In 1998 a national control program was initiated jointly with the WHO, the UNDP and other donors. The program called for regulations to control the human spread of Brucellosis, through the implementation of preventive measures, improve health education, and strengthening the surveillance system, as well as support for epidemiological investigations and provision of the information necessary to control the spread. It also called for improving coordination between zoonotic committee, and strengthening laboratory services to support surveillance activities and preventive services,

and defining a case definition and case management, and networking of cases. With regard to control of animal brucellosis, mass vaccination was advised, taking into account the FAO/WHO/OIE Guidelines for regional brucellosis control program for the Middle/East (Amman,Jordan,14-17 February 1993) .The animal vaccination campaign began with mass vaccinations in 1999 and was repeated every two years until 2008, with vaccination coverage fluctuating between 25% to 95% depending on the year ('Brucellosis Control Program II 2007').

As a result, there was a significant reduction in the sheep and goat infection prevalence from 18% in the year 1998 to 4.8% in 2005 ('Brucellosis Control Program II , 2007').

The Ministry of Health provides lab tests for diagnosis and also treatment for patients through primary healthcare clinics. Based on the Ministry of Health data, between 2000-2020 a total of 7935 patients were diagnosed with brucellosis representing an average of 9.4 cases per 100000 people. This represented a significant 3.4 folds reduction from the 32.4/100000 reported in 1998 as shown **in Figure 3**.However, regardless of this observed significant decrease in human incidence following the program initiation, a notable increase and resurgence of the incidence rate started in 2013 and peaked in 2016 with a rate of 26.2/100000 (*Annual Health Report, Palestine 2020- MOH*).

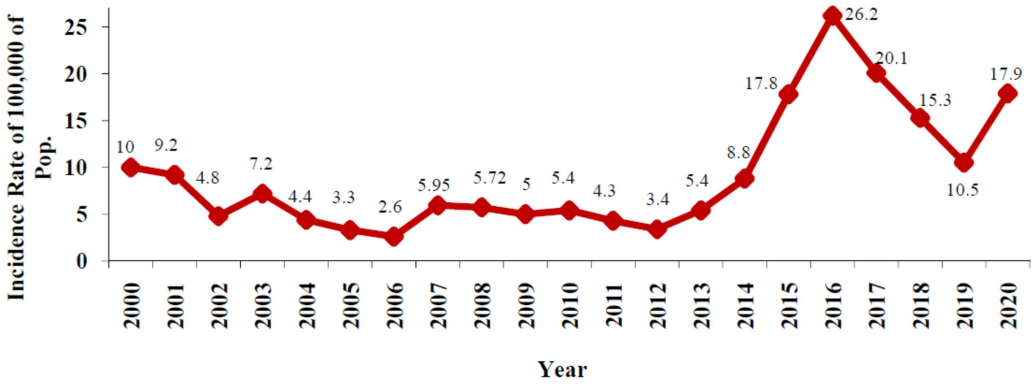


**Figure 3: Distribution of Incidence Rate of Brucellosis per 100,000 Pop., Palestine 2000- 2020**

Hebron was the most endemic governorate with an average annual incidence for the years 2000-2020 of 45.6 cases per 100,000 **(Figure 4)**, harboring about 29% of the total sheep and goats in the West Bank as published by the Palestinian Ministry of Agriculture (Amro *et al.*, 2021).

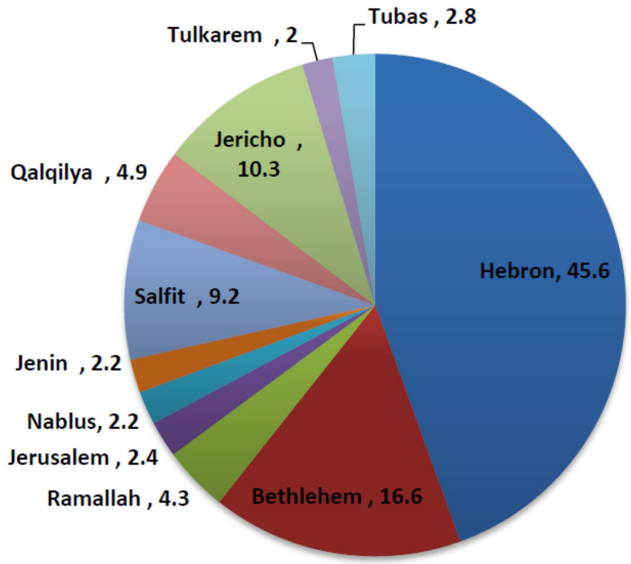


**Figure 4: Prevalence of human brucellosis in the West Bank from 2000 to 2020(MOH)**

As an endemic disease in Palestine brucellosis has severe health and economic impacts on Palestinians. In 1994 the direct loss suffered by livestock was estimated at more than $10 million.(Husseini and Ramlawi, 2004)

Since the initiation of the national control program in 1998 there have rarely been evaluations of the program or any of its components or indicators such as rates of animal vaccination, sheep abortion, distribution of risk factors, as well as KAP or its change for consumers and community dairy product producers.

## 1.3 Problem statement:

The Palestinian Brucellosis Control Program (PBCP) ('Brucellosis Control Program II 2007'), noted that to increase public awareness for brucellosis prevention, a KAP study should be conducted targeting consumers and farmers. For farmers an evaluation was performed by Awwad et.al. and published previously (Awwad, *et al.*, 2017) however for consumers, except for the study conducted by Ramlawi during the early stages of the program (Husseini and Ramlawi, 2004), no additional evaluation has been made since then

to measure the KAP level for consumers nor for community milk product producers, so there is a need for such a study.

Since Hebron has the highest incidence rate of the disease, in this study I evaluated consumers' knowledge, attitudes and practices toward the disease control and preventive measures (such as appropriate boiling or pasteurizing of milk, avoiding the consumption of raw meat, and washing hands) in Hebron which may guide effective control measures in the future taking into account consumers as key players in the success of control programs.

## 1.4 Aim:

This study aimed to evaluate the KAP Brucellosis level among consumers and dairy product producers in Hebron City.

## 1.5 Objectives:

### 1.5.1 Overall objectives:

1.5.1.1 To evaluate Brucellosis occurrence, and the level of knowledge, attitude, and practice for milk product consumers.

1.5.1.2 To identify factors associated with consumers' KAP.

1.5.1.3 To evaluate knowledge, attitude, and practice for community dairy milk products producers for Brucellosis and its prevention.

### 1.5.2 Specific objectives

1.5.2.1 To assess dairy product consumers' knowledge, attitude, and practice towards brucellosis and its prevention.

1.5.2.2 To assess KAP for community dairy milk products producers towards brucellosis and its prevention.

1.5.2.3 To identify factors affecting KAP level such as sociodemographic factors and education level.

1.5.2.4 To identify local control measures undertaken by the consumers to control brucellosis.

## 1.6 Expected outcome:

Identifying the level of KAP in the community including local dairy producers and consumers will help in identifying weak points, and formulating effective measures for disease prevention & control. This can lead to a decrease in the incidence of the disease in the early future, and control the main sources for infection. Findings of this study will help in evaluating whether the brucellosis control program goal in Palestine of increasing awareness has been met. It can also help to guide any modifications and educational activities needed.

# Chapter Two:

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# Literature Review:

## 2.1 Definition of Brucellosis

Brucellosis is a disease of zoonotic nature that is transmitted from animals to humans. The disease is caused by gram-negative bacteria of the genus *Brucella* which have a worldwide distribution and are responsible for huge economic losses and considerable human morbidity in endemic areas (Shaalan et al., 2002; Bosilkovski et al., 2004).

Expansion of animal industries and urbanization, and the lack of hygienic measures in animal husbandry and in food handling, global commerce and trade, international travel, animal-to-human interactions, and destruction of ecological systems contribute to the ongoing threat of emerging and re-emerging infectious diseases including brucellosis , causing it to remain a public health hazard (WHO, 2020)(Liu *et al.*, 2024).

## 2.2 Etiology

The disease is caused by gram-negative aerobic facultative intracellular coccobacillus bacteria of the genus Brucella. It has many species at present, and eight species are recognized: *B. abortus* (affecting mainly cattle), *B. melitensis* (sheep and goats*), B. suis* (swine), *B. neotomae* (desert rats), *B. ovis* (sheep), *B. canis* (dogs), *B. ceti* (cetaceans) and *B. pinnipedialis* (pinnipeds). All are pathogenic to humans except *B. ovis* and *B. neotomae* (Blasco and Molina-Flores, 2011).

The genome structure of *Brucella* is composed of two chromosomes without plasmids making it unique in Bacteriaceae (Muhammad and Zahoor, 2018).

Human Brucellosis caused by *B. melitensis* is the most commonly reported zoonosis worldwide owing to its severe pathogenicity (Coelho *et al.*, 2008), and that it is typically associated with exposure to or consumption of dairy products. Following in human brucellosis frequency are infections resulting from contamination with *B. abortus* and/or *B. suis* (Galińska and Zagórski, 2013).

## 2.3 Transmission of Brucellosis

Humans usually become infected through consumption of unpasteurized milk and other dairy products such as cheese, butter etc. (Hinić *et al.*, 2008; Aminzadeh *et al.*, 2011). Humans may contract Brucella infection either by direct contact with infected animals or indirectly through the consumption of contaminated unpasteurized raw milk or milk-based products such as unpasteurized cheeses, Labneh, Macheed, ice cream, or butter, as infected animals excrete pathogenic organisms in their milk **(**Tantillo *et al.*, 2001 **)**. In some cases the transmission can be air born. Other sources of infection can include contact, handling, and environmental contamination with infected animal tissues or an aborted fetus and its fluid. The disease can also be an occupational hazard for veterinarians, farmers, and slaughter house workers as well as laboratory workers. Human-to-human transmission is very rare(WHO, 2020)

## 2.4 Impact of Brucellosis

The economic losses attributed to brucellosis include losses in animals because of abortion, reduced milk production, testing and slaughtering of infected animals, loss of manpower, medical costs, and government cost for research and eradication programs (Dubie *et al.*, 2014)

The Food and Agricultural Organization (FAO), the W.H.O. and the “Office International des Epizooties” (OIE) consider brucellosis one of the most widely spread zoonotic diseases in animals all over the world. The disease is considered a “re-emerging” zoonosis leading to economic loss and considerable human morbidity (Schelling *et al.*, 2003).

The disease has huge socioeconomic cost starting as acute infection and may have chronic complications(O’Callaghan, 2020) The acute and chronic symptoms of the disease in

humans can result in a significant loss of workdays and a decline in the socioeconomic status of infected persons and their families from the associated loss of income.(Franc *et al.*, 2018)

In terms of the impact on poor people, brucellosis is ranked as the highest and tenth in a study of 76 animal diseases and syndromes(Ghanbari *et al.*, 2020)

In a study in India the annual median losses from the disease human brucellosis was estimated to be 10.4 million USD (Singh *et al.*, 2018). And the disease is responsible for an estimated economic loss of 344 billion USD to the livestock industry(Berhanu and Pal, 2021).

## 2.5 Prevention, Control, and Treatment

There is no treatment for Brucellosis in animals however it can be prevented and mainly controlled by vaccination (Brucellosis - the University of Wisconsin Animal Sciences 2002).

There are several available popular vaccines against animal brucellosis such as live attenuated *Brucella abortus* strain 19 (S19 vaccine) is the first effective and most extensively used vaccine for the prevention of brucellosis in cattle. Live attenuated *Brucella melitensis* strain Rev.1 (Rev.1 vaccine) is the most effective vaccine against caprine and ovine brucellosis(Heidary et al., 2022) The *B. abortus* RB51 vaccine is a spontaneous rough attenuated mutant of *B. abortus* used in cattle also (Hou, Liu and Peng, 2019). The only way to control human brucellosis is to control the animal disease and stop passage to man as none of the available vaccines are perfect; still vaccines cause abortion in animals (O'Callaghan, 2020).

It should be noted that vaccination alone is not sufficient for success in the prevention and control of brucellosis (Ghanbari *et al.*, 2020).

Hygienic precautions to limit exposure and raising awareness through educational campaigns about avoiding unpasteurized milk products, food-safety measures such as milk pasteurization, and promoting the effective heating of dairy products and other potentially contaminated foods are very important, as well as occupational hygiene and laboratory safety (WHO, 2020),(Corbel, 1997).

Human therapy aims to control symptoms and reduce complications and relapses. Usually, a combination of therapeutic regimes is used for example doxycycline and streptomycin, combining doxycycline and rifampin, or for children rifampin with cotrimoxazole or gentamicin. Surgery could also be needed for a few complicated cases (Solera, 2000).

According to the Palestinian Ministry of Health policy, most patients are treated with a mixed therapy of streptomycin and tetracycline for 4–6 weeks, or tetracycline and rifampicin for six weeks. Rifampicin is prescribed for six weeks for pregnant women and a mixture of trimethoprim and sulfamethoxazole for six weeks for infants (Preventive Medicine and Department, 2010).

## 2.6 Knowledge, Attitude, and Practice

KAP could be an important determinant in preventing and controlling the disease's spread. Therefore it was studied in many parts of the world.

In Saudi Arabia, Bilal et al. studied the knowledge, attitude, and practice (KAP) of a Saudi community toward brucellosis. The study has shown common practices related to the spread of the disease including raw milk consumption, close animal contact, and also the slaughtering and disposal of wastes without safety measures. The study also noted that identified risk factors of illiteracy, ignorance, and faulty behaviors indicated the importance of health education in the community to raise KAP standards for brucellosis (Bilal *et al.*, 1991). A study of KAP relating to brucellosis in smallholder dairy farmers in two provinces in Pakistan showed that the majority of participants had heard of animal brucellosis (70%) but almost all farmers (97%) were not aware of the modes of transmission of brucellosis. Relating to risk, the majority (66%) of the farmers' families were reported to consume raw milk and its products, live in shared housing with animals (49%), and not cover hand cuts during contact with animals (74%). The study supports the need for an educational awareness program to ensure improved practices (Arif *et al.*, 2017).

A meta-analysis carried out by Zhand et al for seventy-nine original articles reporting on brucellosis awareness levels of populations from 22 countries, showed that the awareness level of brucellosis was 55.5% and awareness regarding its zoonotic nature, mode of

transmission, and features in humans and animals were as low as 37.6%, 35.9%, 41.6%, and 28.4% respectively (Zhang *et al.*, 2019)

Some of the dairy-based foods produced and consumed by the Palestinian population include Labneh, Baladi cheese, Howirneh, Makheed, Laban, and Gameed. Many studies have reported these products being prepared from unpasteurized milk and consumed raw, In a cross-sectional survey conducted among Israel Arabs assessing knowledge, attitude and practice it was found that nearly 41% of respondents reported consuming cheese from non-regulated sources and 16.1% of respondents reported purchasing milk from non-regulated sources(Baron-Epel *et al.*, 2018).

A study of KAP levels among livestock owners in the West Bank showed that only 37.3% correctly answered about the transmission of brucellosis by drinking raw milk, eating unpasteurized cheese, eating raw meat, liver, spleen and kidney or by contact with an aborted fetus and placenta fluid (Awwad, Awwad, Farraj, Essawi, Adwan, Manasra, Baraitareanu, M. Gurau, *et al.*, 2017).

A KAP study of brucellosis in livestock owners in Jordan showed that 100% of the interviewed livestock keepers were aware of brucellosis: 87% indicated a high risk of infection if unpasteurized milk is consumed and 75% indicated a high risk if unpasteurized dairy products are consumed. Awareness of the risk of infection through direct contact with fetal membranes or via physical contact with infected livestock is considerably lower, 19% and 13%, respectively.(Musallam, Abo-Shehada and Guitian, 2015)

Labneh (strained yogurt) is yogurt strained resulting in a thicker consistency than normal unstrained yogurt. Like many types, Labneh is often made from milk by boiling off some water content, or by adding extra materials and/or powdered milk. Wikipedia contributors

Labneh (strained yogurt) can be contaminated during the different stages of preparation, storage, and processing starting with the raw materials usually unpasteurized milk, and ending with the final product.

Traditional white cheese/Baladi cheese is a fresh, unpasteurized cheese made with a mixture of goat, cow or sheep's milk, sometimes with mahleb added and it's a major ingredient in the traditional Palestinian dessert Knafeh (Wikipedia contributors,). During

cheese making, it may be contaminated and bacteria may be trapped in the cloth and thus concentrated in the cheese where it may survive and be a source of infection.

Laban Rayeb (Yogurt) is usually made from fresh unpasteurized milk which is placed in a pot and kept in a warm room for 12-24 hours in summer and 2-3 days in winter. When the weather is too cold the milk is warmed to improve milk curdling until the cream rises and the skimmed milk coagulates.(Kucukoner and Kilinicceker, 2009)

Laban Makheed or buttermilk is a fermented dairy drink. Traditionally, it was the liquid left behind after churning butter out of cultured cream. (Wikipedia contributors,)

The use of proper hygienic standards is essential in the preparation of foods; one of the ways used to reduce the risk of foodborne diseases is by the implementation of Hazard Analysis Critical Control Point (HACCP) and quality assurance programs during food production.

## 2.7 Brucellosis Epidemiology

The WHO reports an annual rate of human Brucellosis of 1-78 cases per 100,000 individuals in the Middle East, with *B. melitensis* as the most frequent causative agent (WHO, 1997; Thakur, Kumar and Thapliyal, 2002).

In Malta, between 1992 and 1994 an outbreak of *B. melitensis* was reported to be linked to the use of unpasteurized milk in cheese-making (Organization, 1995). In Spain in 1996, an outbreak occurred in Castilla-La Mancha , and was related to the consumption of unpasteurized cheese in community-made dairy products (Castell Monsalve *et al.*, 1996). In Palestine (Al-Eissa, 1999) reported that an increase in the incidence rate of human and animal Brucellosis is attributed to uncontrolled transportation of infected animals, and consumption of unpasteurized milk and milk products.

Later in 2014 unpasteurized cheese made by community dairy products producers was reported to be associated with an outbreak in Palestine.(Megged *et al.*, 2016).and in 2004 a study conducted in Palestine by(Husseini and Ramlawi, 2004) showed that consumption of contaminated milk ,dairy products, and meat or direct contact with animals during lambing, milking, herding, or slaughtering are risk factors for infection. Recent trends studied by Amro et al. in human brucellosis in Palestine showed that there was a dramatic

increase in human brucellosis linked to the impaired control and surveillance of the disease, advising mass vaccination, regular screenings, raising public health awareness, and monitoring of milk and homemade dairy products (Amro *et al.*, 2021).

REPORTED CASES OF HUMAN BRUCELLOSIS IN SELECTED MEDITERRANEAN AND MIDDLE EAST COUNTRIES OVER TEN YEARS*

| COUNTRY | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Algeria | 8032 | 7812 | 7733 | 5056 | 6378 | 8445 | 4445 | 5298 | 4170 | 6132 | **63501** |
| Cyprus | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Egypt | 5209 | 5212 | 5120 | 5300 | 3969 | 3641 | 3790 | 4447 | 3951 | 3756 | **44395** |
| Grece | 331 | 284 | 153 | 339 | 114 | 97 | 100 | 123 | 159 | 135 | **1835** |
| France | 39 | 30 | 14 | 21 | 23 | 20 | 11 | 21 | 9 | ** | **188** |
| Italy | 632 | 318 | 179 | 163 | 167 | 171 | 166 | 184 | 137 | 14 | **2131** |
| Jordan | 132 | 132 | 217 | 111 | 130 | 129 | 155 | 96 | 158 | 273 | **1533** |
| Lebanon | 175 | 240 | 265 | 157 | 333 | 303 | 134 | 134 | 189 | 252 | **2182** |
| Oman | 113 | 69 | 88 | ** | 70 | 154 | 126 | 148 | 192 | 217 | **1177** |
| Portugal | 170 | 95 | 75 | 81 | 81 | 86 | 85 | 47 | 35 | 62 | **817** |
| Palestine Territory | 126 | 94 | 221 | 199 | 195 | 206 | 179 | 148 | 244 | 401 | **2013** |
| Qatar | 26 | 35 | ** | 22 | 42 | 25 | 31 | 24 | 53 | 0 | **258** |
| Spain | 328 | 324 | 246 | 160 | 152 | 106 | 100 | 83 | 103 | 79 | **1681** |
| Syria | 26739 | 29341 | 39838 | 25315 | 19213 | 3520 | 2860 | 1452 | 9273 | 10994 | **168545** |
| Tunisia | 284 | 460 | 514 | 285 | 265 | 371 | 368 | 278 | 140 | 409 | **3374** |
| Turkey | 14644 | 10790 | 11803 | 9818 | 9324 | 7658 | 7177 | 6759 | 7225 | 4475 | **89673** |
| GRAND TOTAL | | | | | | | | | | | **383305** |

*OIE data base: *zoonoses in humans* and EFSA-EU–EFSA Journal 2015; 13: 4329. ** Data not available

**Table 1:Reported cases of human brucellosis in selected Mediterranean and Middle East countries over 10 years**

The CDC has estimated the global incidence of human brucellosis to be 1.6–2.1 million new cases per year, which is three to four times higher than the previous estimate of 500,000 new cases per year, in 82.3% (144/175) of countries worldwide, and 43.2% (3.2 billion/7.4 billion) of world population were considered at risk and the global average risk for acquiring human brucellosis was ≈500 new cases/1 million people(Laine *et al.*, 2023).

Several studies were conducted to assess brucellosis contamination level in milk and cheese samples worldwide. A Kenyan study indicated a considerable variation in the level of contamination by the organism in milk that ranges from 0% in milk sold in small units and originating from intensive production systems to over 10% in bulk milk samples originating from extensive production systems.(Arimi *et al.*, 2005)

In a Turkish study, 14.2% of ewes' milk cheese samples tested were found contaminated with *B. melitensis* whereas no Brucella species was detected in any of the raw milk and cheese samples from cattle (Kasimoğlu, 2002).

An Iranian study found a total of 397 *B. abortus* isolates in milk samples collected from 1,056 cows in 1990.(Zowghi, Ebadi and Yarahmadi, 2008),Whereas In Italy, A total of 46 cheese samples produced with sheep and goat milk were assessed, and *Brucella* spp. was detected in 46% of them, especially in cheese made from sheep milk (Tantillo *et al.*, 2001).

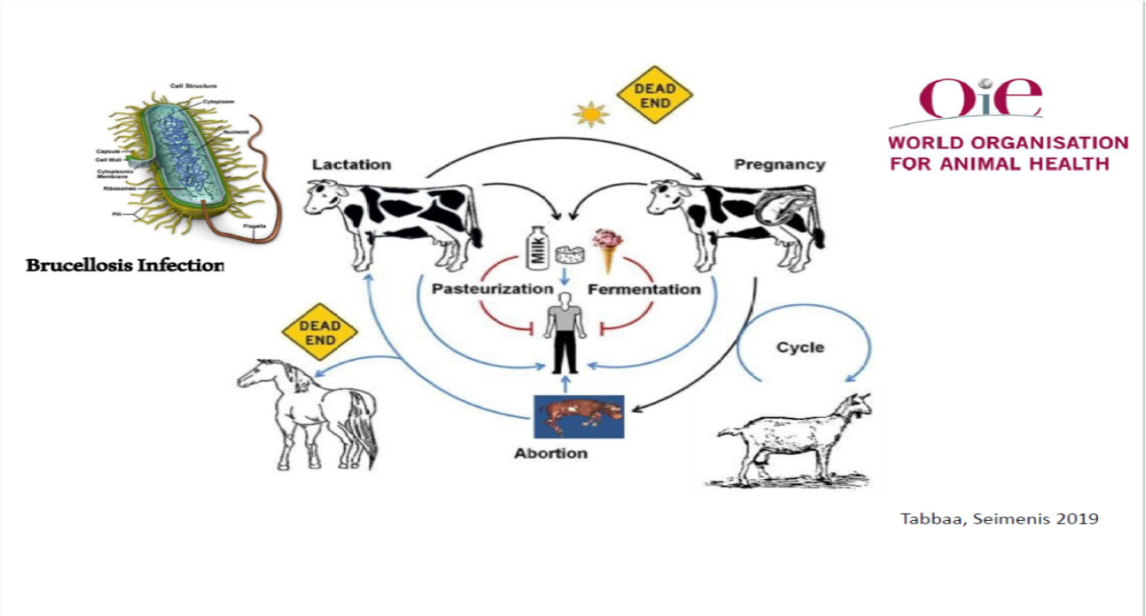


**Figure 5: Transmission cycle of Brucella (Tabbaa,Seimenis 2019).**

An Egyptian study for knowledge, attitudes and practices (KAPs) and risk factors of brucellosis in the Nile Delta, showed that participants who have animals especially small ruminates were at a higher risk of getting Brucella spp. infection than others and risk factors identified were consumption of unpasteurized milk, having consumed dairy products in the last 3 months before the study, consumption of yoghurt or home-made cheeses and involvement in contact with animals.(Abd El-Wahab *et al.*, 2019).

## 2.8 Risk Factors

### 2.8.1 Age

Many studies have shown that age might be a risk factor for infection although all age groups can be infected

In a study of slaughterhouse workers in the Lahore District it was observed that the seropositivity rate was highest among those who were in the age range of 51 to 60 years followed by those in the age group of 41 to 50 years and this was attributed to brucellosis being an occupational disease and so individuals in this age were at a greater risk because of prolonged years of exposure (Mukhtar and Kokab, 2008). In another study in the microregion of Araguaína, Tocantins Ramos et al. 2007 reported a significant association between age group and seropositivity for this disease, with individuals above 40 years of age being more infected (Ramos *et al.*, 2007). The same was found in Malaysia where a study of seroprevalence of brucellosis among suspected cases found that people in the age range of 20 to 45 years had higher seroprevalence compared to other groups with 70% of the infected being more than 40 years old (Jama'ayah, Heu and Norazah, 2011).

### 2.8.2 Sex

Even though *Brucella* affects both males and females with no sex wise differences when males and females are equally exposed to the potential risk factors, studies reported that males are more commonly affected than females. In a study done in Malaysia seropositivity in males was as common as 90% compared to 10% in females (Jama'ayah, Heu and Norazah, 2011). In India a seroepidemiological survey of human brucellosis in and around Ludhiana, observed that all seropositive cases were men(Yohannes and Gill, 2011). Various other studies conducted by other researchers also found that males were more commonly affected than females. This is due to the fact that males are more commonly employed in the field of animal husbandry or are exposed to infected animals and their secretions.

### 2.8.3 Level of Education

Regarding educational level, it was shown that low literacy is one of the risk factors for brucellosis because people with low literacy are not aware of the zoonotic nature of the disease and they don't follow any hygienic practices after handling animals and their products. In a study of the prevalence *Brucella* antibody species among butchers, slaughterers and others in Iran, an association was found between low literacy and seropositivity (Karimi *et al.*, 2004). In another study of KAP in Pakistan among smallholder dairy farmers in two provinces, the respondents with no formal education and those who had not heard of the disease displayed greater risky behavior (Arif *et al.*, 2017).

### 2.8.4 Socioeconomic Status

In Saudi Arabia it was noted that seroprevalence of brucellosis antibodies was highest (24.4%) among people of low socioeconomic status when compared to people (6.3%) of high socioeconomic status (Al-Sekait, 1999).

The geographical distribution of human brucellosis is closely related to the endemicity of animal infection, the methods of animal husbandry, human food habits, the standard of hygiene, and other socioeconomic activities (Alausa, 1980).

In a study in Sri Lanka it was revealed that farmers' socioeconomics, such as ethnicity and poverty, and animal movement patterns, such as grazing practices are significantly associated with epidemiology of brucellosis in the dry zone of Sri Lanka (Kothalawala *et al.*, 2017).

### 2.8.5 Occupation

Many studies have reported Brucellosis to be an occupational risk for certain groups.

In Lebanon it was reported that workers in occupations dealing with animals had a 2.4-times higher risk of acquiring the infection than those in occupation not dealing with animals, with the highest risk occupation revealed to be the veterinarians (50% seroprevalence) followed by farmers who had a seroprevalence of 23.9% and butchers had 9.2% seroprevalence rate (Araj and Azzam, 1996).

In a systematic review and meta-analysis by Pereira et al. five different job-related groups were considered greatly exposed to the disease: rural workers, slaughterhouse workers, veterinarians and veterinary assistants, laboratory workers and hunters (Pereira *et al.*, 2020).

A study reviewed potential hazards of occupational brucellosis in developing countries and found that close contact with animal waste, veterinary services, laboratories, and keeping, trading, or processing animal products are the main risk factors of occupational brucellosis (Dadar *et al.*, 2023).

### 2.8.6 Preparation and Consumption of Animal Products

Brucella infection can also be transmitted to humans through the consumption of raw milk or non-heat treated dairy products (Stadtländer, 2008).

A KAP study of brucellosis in livestock owners in Jordan showed that 87% had a high risk of infection if unpasteurized milk is consumed and 75% high risk if unpasteurized dairy products are consumed (Musallam, Abo-Shehada and Guitian, 2015).

In the Middle East in a systematic review of brucellosis it was found that human cases are likely to arise from subpopulations occupationally exposed to ruminants or from the consumption of unpasteurized dairy products (Musallam *et al.*, 2016). In Israel there was a unique *B. melitensis* outbreak linking human cases with commercially sold unregulated camel milk which was attributed to unregulated animal trade (Bardenstein *et al.*, 2021).

# Chapter Three:

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## Conceptual Framework

My conceptual framework for the study of brucellosis KAP level in dairy milk products producers and consumers consists of

- Previous experience with the disease
- Educational activities which may include illiteracy, high school education, and university education
- Faulty beliefs and its affection on brucellosis KAP level as those who believe that taste of milk is the most important so they don't boil milk and those who say that if one gets to be sick he will be sick so no need to boil milk.
- Food habits such as ingesting raw milk or raw meat or local dairy products
- Sociodemographic factors such as age, sex, income and social status.
- Occupational Factors

In general conceptual framework factors are divided into modifiable factors such as lifestyle, or food habits, education, and personal beliefs and non-modifiable factors such as age, sex and previous history of brucellosis.

Having a history of brucellosis in the family could play major role as one becomes familiar with the disease and its basic concepts of infection, transmission and prevention.

Education status plays a major role in the prevention of diseases in general including brucellosis, such as knowing terms of hygiene and how to be healthy and so on, so illiteracy is considered a culprit for hazardous behaviors, and illiterate people are more exposed to dangerous lifestyles and faulty beliefs which my enhance disease spread and complications. On the other hand educated people take more safety precautions regarding infections, know how to protect themselves, and know preventive measures such as hand washing and personal hygiene.

Safe food precautions include milk boiling, and thorough meat cooking,cleaning vegetables and fruits, and food habits such as eating unpasteurized white cheese or drinking makheed or fresh milk are all considered risky habits.

Faulty and cultural beliefs and misconceptions also play a major role as some believe that everything is fate and that they have no choice, so anyone who gets sick will ineffably be sick, this is partially true but one must take protection and prevention measures. Culture also plays a role, such as producing dairy products from unpasteurized milk or ingesting colostrum milk as it is healthier and has profound benefits.

Sociodemographic factors such as income demonstrate that people with high incomes have a better chance of preventing diseases and the ability to get safe products regardless of the cost of the products.

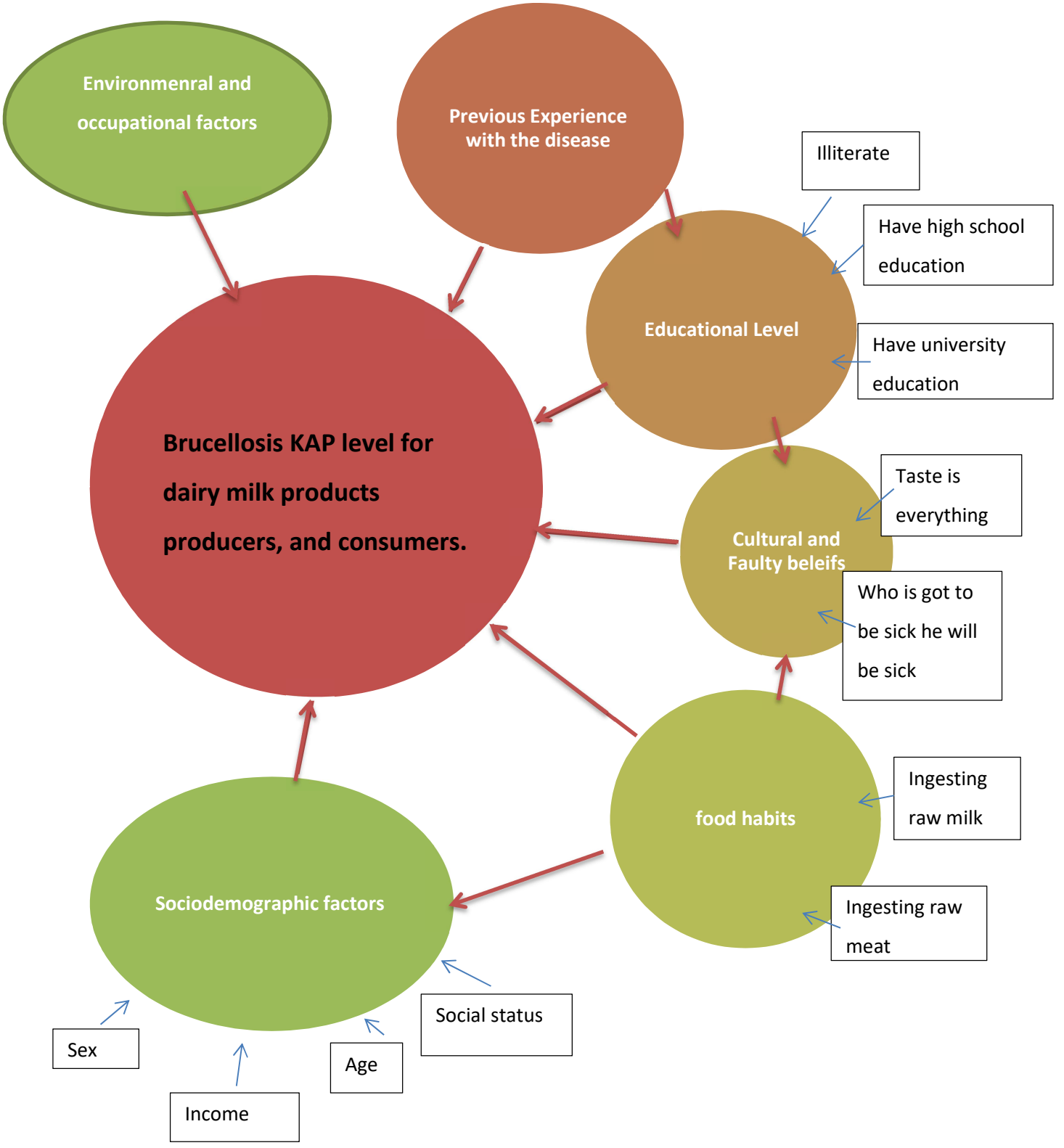


**Figure 6: Study Conceptual Framework**

# Chapter Four:

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# Study Methodology:

## 4.1 Study type:

The study composed of two sections; the first was a cross-sectional quantitative study targeting adult dairy consumers and the second was a qualitative section targeting dairy producers.

## 4.2 Setting:

This study was conducted in Hebron which is located in the southern West Bank, 30 kilometers south of Jerusalem and 930 meters above sea level. The city is the largest in the West Bank, and the second largest after Gaza in the Palestinian authority-controlled areas. It has a population of over 215,000 Palestinians (2016), (Neumann 2018).

Dairy consumer targeted for the study were from the ministry of health primary health care clinics(as described below) and local dairy producers were identified through the revision of previous patients' files of infected cases investigation forms by MOH clinics. A total of 14 primary health care clinics are distributed throughout the city. All of these clinics were used for filling the quantitative questionnaire for consumers.

## 4.3 Study Population:

The targeted study population composed of:

Adult Hebron City residents who are attending the primary health care clinics in the city for any reasons other than Brucellosis treatment and diagnosis and are dairy consumers.

## 4.4 Study Sample, Size, and Sampling Method:

Consumer sampling and recruitment:

Data obtained through Ministry of Health showed a monthly average for the past month of 9686 adult patients visiting Hebron's 14 primary health care clinics. A sample of 370 patients was recruited for the study. The sample size was calculated using the "Steven K.Thompson" Equation which is $n=N*P(1-P)/[(N-1)(d^{2/}z^2)+p(1-P)$ ,where n =sample size ,N=total population size, P= expected proportion of the population with the attribute=0.50 ,d=error factor=0.05, z=Z Score(confidence Level =95% =1.96}(Hossan and Alhasnawi, 2023).

$n=9686*0.50(1-0.50)/[(9686-1)*(0.05)^2/(1.96)^2 + 0.50(1-0.50)$ =>

= 9686*0.25 / 6.29 + .25

=370

The study subjects were selected randomly to participate from the adult patients attending the clinics on the day of sampling and who agree to participate. The sampling days were based on work days of each clinic, since each clinic works on limited days per week due to the current political situation. Each participant was asked to fill in a KAP questionnaire which was researcher-assisted to identify participant KAP and associated characteristics.

The sample was proportionally distributed to the clinics according to their patients' proportion from the total monthly average, as shown in Table 2 Al-rama clinic see around 1223 patient per month sample would be 12.6% (1223/9686*100) equal 46 sample and so on for all clinics , Alsalam 55 sample , Em-dalia 50 sample , Almanshar 48 , Alrodwan 17 , Alharam 14 , Ein Sara 18 , Karantina 107 ( small clinics-less than 10 samples- were

summed to al karantina sample because of political closure which are khalet aldar ,alsalaymeh,qelqes,tal rmydeh,masharqa )

**Table 2 Sample Size Distribution for Clinics**

| clinic | Sample size |
|---|---|
| Al-Rama | 46 |
| Al-Salam | 55 |
| Em-Aldalia | 50 |
| Al-Manshar | 48 |
| Al-Rodwan | 17 |
| Al-Haram | 14 |
| Ein-Sara | 18 |
| Al-Karantina | 107 |

4.4.1.1 Inclusion Criteria:

- Agree to participate
- Adult attending the PHC
- Attendance for any reasons other than brucellosis infection and treatment

4.4.1.2 Exclusion criteria :

- Refuse to participate
- Children (below 18 years old )
- Previously infected with Brucella
- Farmers and those who care for sheep or cattle.
- Any physical or mental or psychological condition preventing participation

4.4.2 Local dairy producers identification and recruitment:

All brucellosis patients recorded at the Ministry of Health Hebron primary health clinics within the last year were targeted and reviewed to identify local dairy producers. This was done since the infection investigation form requires the attending physician to ask questions about possible sources of infection including sources of milk and milk products consumed at home.

4.4.3 All local dairy producers identified through the investigation forms were obtained through the snowball sampling technique, and it is estimated that a total of 8 producers were identified and interviewed; a questionnaire was filled in for these producers including qualitative questions.

## 4.5 Data Collection Tools and Questionnaires

4.5.1 Questionnaire:

Two forms of questionnaires were used in the study one targeting the consumers and the other targeting the local dairy producers.

4.5.1.1 Consumers questionnaire : Attached at Appendix 2

An Arabic language format questionnaire was developed based on previous questionnaires and literature reviewed targeting dairy consumers to measure their knowledge, attitude, and practice. The questionnaire included questions about their personal history and their demographic characteristics and then questions to evaluate knowledge, attitude, and practice, of relevance to brucellosis and its prevention and control, and it was a researcher-assisted questionnaire. Each consumer declared his or her acceptance to participate.

4.5.1.2 Local Dairy producers: Attached at Appendix 1

The 2nd questionnaire was an Arabic language format qualitative questionnaire that contained three main questions with prop questions in-between conducted through face to face interviews with the local dairy producers.

## 4.6Tools Validation:

Questionnaire validation was assured by submitting the questionnaire to three experts in the research field for evaluation and wording inspection. After modification based on the experts' evaluation, pilot testing was done by presenting the questionnaire to 30 consumers and data was processed and analyzed on the SPSS program for its Cronbach alpha statistic. Further evaluation and modification was made to the questionnaire and then pilot testing was repeated on an additional 20 participants. A final Cronbach alpha was calculated as 86% for the Knowledge part, 61% for the Practice part, and 81% for the Attitude part.

The qualitative questionnaire for local dairy producers was reviewed with a qualitative research methodology expert at Al-Quds University School of Public Health and modified accordingly.

### 4.7 Ethical Consideration

The study proposal was submitted to Al-Quds University School of Public Health research committee for discussion and approval. After the proposal approval by the School of Infectious Disease Control and Prevention master's program committee, it was submitted to the school ethical committee for evaluation and ethical approval. An informed consent for participation was submitted for each candidate to read and sign for free will of participation before filling the questionnaire. Considerations of anonymity of the study subject's, and the confidentiality of their data were taken into account when processing the data. Following that Ministry of Health permission was secured to recruit and fill the questionnaire for its targeted adult patients and for the brucellosis patients investigation form review.

# Chapter Five:

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# Results:

## 5.1.Dairy Consumers Results:

### 5.1.1. General Results

This chapter highlights the finding on the knowledge, attitudes and practices of dairy consumers and local dairy producers towards brucellosis control in Hebron City. In the quantitative part a total of 370 subjects were sampled and filled out the questionnaire in 14 clinics, and in qualitative part seven interviews were conducted with local dairy producers. Clinics involved in the study are Al-Karantina (Al-salaymeh, Almasharqa, Tal-Rmeideh, Qelqes, Khalet Aldar), Al-Manshar, Al-Rudwan ,Al-Salam, Em-Aldalia,Al-Haram and Ein Sara. The results are grouped under the following subsections: Socio-demographic characteristics, family history of brucellosis infection, history of chronic diseases and then the levels of knowledge, Attitude and Practice items.

### 5.1.2. Socio-demographic characteristics of the respondents:

The socio-demographic characteristics of the respondents are presented in Table 3. The majority of respondents (64%) were above the age of 40 years. Males represented 52.7% and the majority of participants were married (88.9%).

With regard to income, educational level and occupation, the majority ( 77.6% ) have income below 3000 shekels; most of respondents have some kind of formal education as (28.1%) had primary education only, (25.1%) had high school education and (31.6%) had

university education, and (72.4%) of the married spouse had education above elementary level (middle school 23.2% , high school 26.2% , university 23%).

Participants' employment was distributed as skilled employee (35.9%) , unskilled employee (18.4%) , and unemployed (45.7%) .

**Table 3: Socio-demographic composition of study population (n=370)**

| Parameter | Category | Number of respondents | Percentage |
|---|---|---|---|
| Age (years ) | 18-24 | 32 | 8.5% |
| | 25-39 | 99 | 26.7% |
| | Above 40 years | 237 | 64 % |
| Gender | Male | 195 | 52.7% |
| | Female | 175 | 47.3% |
| Marital status | Married | 329 | 88.9% |
| | Single | 36 | 9.7% |
| | Divorced | 1 | 0.3% |
| | Widowed | 4 | 1.1% |
| Income | <3000 shekels | 287 | 77.6% |
| | 3000-6000 shekels | 66 | 17.8% |
| | >6000 shekels | 17 | 4.6% |
| Educational Level of participant | Illiterate | 3 | 0.8% |
| | Elementary school | 53 | 14.3% |
| | Primary school | 104 | 28.1% |
| | High school | 93 | 25.1% |
| | University | 117 | 31.6% |
| Education Level of spouse for those who are currently married (n=329) | Illiterate | 4 | 1.1% |
| | Elementary school | 60 | 16.2% |
| | Primary school | 86 | 23.2% |
| | High school | 97 | 26.2% |
| | University | 85 | 23.0% |
| *Job description | Skilled Employee | 133 | 35.9% |
| | Unskilled Employee | 68 | 18.4% |
| | Unemployed | 169 | 45.7% |

### 5.1.3. History of brucellosis disease:

Table 4 shows that 88 participants (23.8%) reported that family members had previous infection history with brucellosis. Of these infected individuals 59 (67% of infected) were 1$^{st}$ degree relative and 29 (33% of infected) were 2$^{nd}$ degree relatives. The remaining participants (n=282) did not report any infected relative or did not know if there were any.

**Table 4 : Relatives infected by Brucellosis in the Study (n=88)**

| History of Brucellosis | frequency | Percent |
|---|---|---|
| Yes, 1st degree relative | 59 | 67% |
| Yes, 2nd degree relative | 29 | 33% |
| Total | 88 | 100.0% |

* The remaining participants (n=282) did not report any infected relative or did not know if there is any

Of those who reported an infected relative in the family 66 (75%) also reported knowledge of the source of infection whether it was milk or cheese or other dairy products. Also 82 of those participants reported measures had been taken to prevent recurrency of infection.

**Table 5: Relative knows the source of Brucellosis in the Study (n=88)**

| | Frequency | Percent |
|---|---|---|
| Know the source of Brucellosis | 66 | 75% |
| Measures taken to prevent infection | 82 | 93% |

### 5.1.4. Livestock Ownership:

As shown in Table 6 a total of 39 participants (10.5%) have herds in their surroundings, 17 of those participants have a role in raising and caring for these herds, 21 have a farm near their house, 10 participants has the farm beneath the house and 7 breeders have a farm away from the house.

26 of the breeders reported that their herds are vaccinated against Brucella infection, and only 13 breeders reported that their herds had brucellosis before.

**Table 6: Livestock ownership (total respondents 370)**

| | Frequency | Percent | | n | % |
|---|---|---|---|---|---|
| Have livestock in their surroundings | 39/370 | 10.5% | Respondent reported that he/she has a role in raising or caring for herds | 17 | 43% |
| | | | Respondent reported that herds are vaccinated against Brucella | 26 | 66% |
| | | | Respondent reported that their herds had brucellosis before | 13 | 33% |
| | | | Have a farm near the house | 21 | 53% |
| | | | Have a farm beneath the house | 10 | 25% |
| | | | Have a farm away from the house | 7 | 18% |

### 5.1.5. History of chronic diseases:

Of the total participants 177 (47.8%) reported being diagnosed with a chronic disease. The most prevalent diseases reported were diabetes, hypertension and coronary heart disease with percentages of (24.3) , (25.7) , and (13.8) respectively as shown in table 7. Some participants reported more than one condition.

**Table 7: History of chronic diseases**

| | N (%) | Disease | N | % |
|---|---|---|---|---|
| Yes | 177 (47.8%) | Diabetes | 90 | 24.3 |
| | | Hypertension | 95 | 25.7 |
| | | Coronary Heart Disease | 51 | 13.8 |
| | | Cancer | 8 | 2.2 |
| | | Others | 46 | 12.4 |
| No | 193 (52.2%) | | | |

*Sum of Total percentages not equal to 100% as some participants had more than one condition

### 5.1.6. Levels of Knowledge, Attitude, and Practice:

#### 5.1.6.1 Knowledge

Knowledge towards brucellosis disease was assessed using 40 yes/no questions for the 370 respondents (Cronbach's alpha 0.88), 1 coded as correct and 0 as incorrect. Table 8 and Figure 9 show that the mean knowledge score was (69%) with a standard deviation of 0.143, median of (70%) and minimal score (3%) and Max score (100%), average score of the knowledge was calculated as the correctly answered question of each subject were summed and divided by a total of 40 possible correct answers (40 items) then the total scores for all participants were averaged.

**Table 8 : Knowledge Score**

| | |
|---|---|
| Mean | .6895 |
| Median | .7000 |
| Mode | .68 |
| Std. Deviation | .14373 |
| Minimum | .03 |
| Maximum | 1.00 |

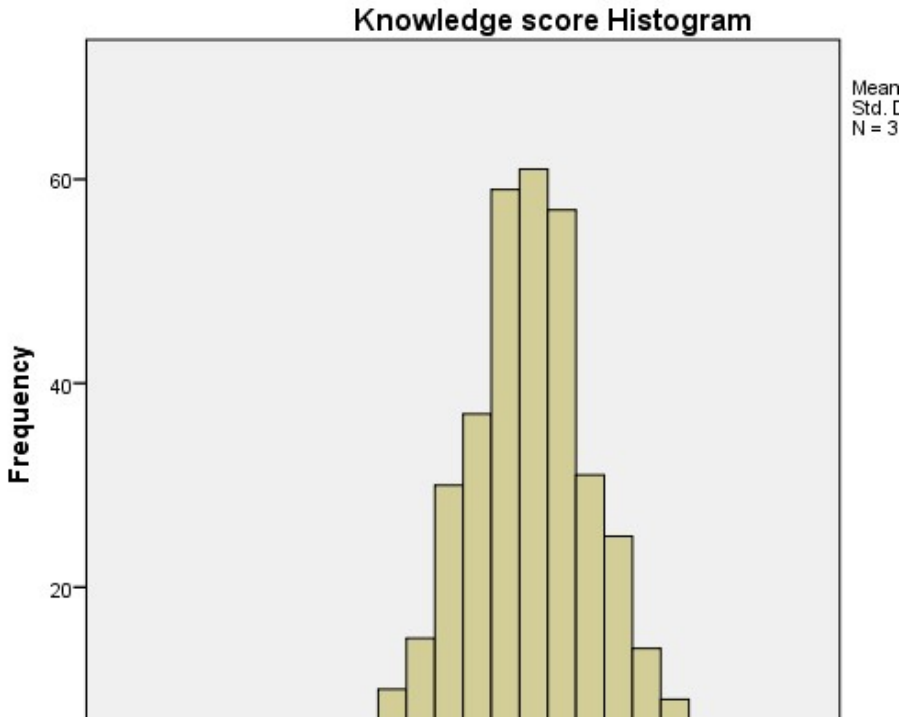


**Figure 7: Knowledge Score Histogram**

Appendix 1 shows the distribution of the total 39 knowledge items. The knowledge items were divided into 4 fields of knowledge. The sections 5.1.6.1.1 to5.16.1.4 below describe the item distribution by field.

#### 5.1.6.1.1 Previously heard about the Disease and susceptibility

Table 9 shows that among all respondents recruited for this study (95%) have heard about brucellosis, only (33%) have ever read about the disease, (94%) answered that human may get infected, (78%) responded that sheep are susceptible whereas only (40%) and (22%) agreed that cows and camels respectively are susceptible to infection.

**Table 9: Previous knowledge about the disease and susceptibility**

| Knowledge Item | Answers % (N) Yes | No | Total |
|---|---|---|---|
| 1. Have you ever heard about Brucellosis? | 95% (352) | 5% ( 18 ) | 100% (370) |
| 2. Have you ever seen any educational materials or brochures about Brucellosis? | 33% (122) | 67% ( 248) | 100% (370) |
| 3. Are humans susceptible to brucellosis infection? | 94% (349) | 6% (21 ) | 100% (370) |
| 4. Are sheep are susceptible to brucellosis infection? | 78% (287) | 22% (83) | 100% (370) |
| 5. Are cows are susceptible to brucellosis infection? | 40% (148) | 60% (222) | 100% (370) |
| 6. Are camels are susceptible to brucellosis infection? | 22% (79) | 78% (291) | 100% (370) |
| 7. Are people who raise livestock more likely to get brucellosis? | 79.7%(295) | 20.3%(75) | 100% (370) |
| | 63.1% | 36.9% | 100% |

#### 5.1.6.1.2 Transmission

For questions regarding Knowledge about the mode of transmission of Brucellosis only (24%) knew that contaminated water can transmit the disease and (20%) reported that contaminated fruits or vegetables may cause the disease. Furthermore a low percentage of (14%) reported knowledge that the disease can be airborne, (17%) knew that it can be transmitted through breastfeeding from an infected mother, and (19%) by transplacental transmission. However a high percentage of (93%) reported contaminated dairy products, meat or remnants of animals can transmit the disease.

When asked if this disease can be transmitted from animals to humans (92%) answered yes. For possible animal transmission (92%) said sheep, (51%) said cows and only (24%) said camels. When asked which animal products may transmit brucellosis (94%) said milk, (95%) said cheese, (44%) agreed on raw meat and only (39%) recognized direct exposure to animal secretions as a source of transmission.

**Table 10: Transmission**

| Knowledge Item | Answers % (N) | | |
|---|---|---|---|
| | Yes | No | Total |
| 1. Can drinking contaminated water transfer brucellosis to humans? | 24% (89) | 76% (281) | 100% (370) |
| 2. Can eating unwashed fruits and vegetables transfer brucellosis to humans? | 20% (74) | 80% (296) | 100% (370) |
| 3. Can breastfeeding transfer brucellosis to humans? | 17% (61) | 83 % (309) | 100% (370) |
| 4. Air may transfer brucellosis to humans? | 14% (53) | 86% (317) | 100% (370) |
| 5. Can infected mother transfer brucellosis to her fetus during pregnancy? | 19% (70) | 81% (300) | 100% (370) |
| 6. Can dairy products, other animal products, meat or animal remnants transfer brucellosis to humans? | 93% (344) | 7% (26) | 100% (370) |
| | 31.2% | 68.8% | 100% |

### 5.1.61.3 Clinical signs and consequences of the disease on humans

Regarding clinical features (93%) reported that there are symptoms for the disease. (91%) said that fever is a clinical feature of brucellosis, and (78%), (75%), and (77%) reported abdominal pain, joint pain and sweating as clinical signs, respectively.

Of the total respondents (76%) agreed that brucellosis is a risky disease for humans, (38%) agreed that it may affect fertility, (67%) agreed that it may affect pregnancy (may cause abortion), and (91%) said that brucellosis may cause disability and limited work ability.

**Table 11: Clinical signs and consequences of the disease in humans**

| Knowledge Item | Answers % (N) Yes | No | Total |
|---|---|---|---|
| 1. Do you think there are symptoms in infected people? | 93% (344) | 7% (26) | 100%(370) |
| 2. Is fever a feature of brucellosis in humans? | 91% (335) | 9 % (35) | 100%(370) |
| 3. Is joints pain a feature of brucellosis in humans? | 78% (290) | 22% (80) | 100% (370) |
| 4. Is abdominal pain a feature of brucellosis in humans? | 75% (277) | 25% (93) | 100% (370) |
| 5. Is sweating a feature of brucellosis in humans? | 77% (284) | 23% (86) | 100% (370) |
| 6. Is brucellosis a risky disease in humans? | 76% (281) | 24% (89) | 100% (370) |
| 7. Can brucellosis affect the fertility of the infected person? | 38% (140) | 62% (230) | 100 % (370) |
| 8. Can brucellosis affect pregnancy (cause abortion) in infected women? | 67% (249) | 33% (121) | 100% (370) |
| 9. Can brucellosis affect your ability to work? | 91% (338) | 9% (32) | 100% (370) |
| | 76.2% | 23.8% | 100% |

5.1.6.1.4 **Disease control and prevention**

Regarding knowledge about disease control (98%) said that boiling milk may protect against the disease, (97%) said vaccination of livestock, (97%) agreed that washing hands with soap and water when handling livestock or animal products can protect against the disease, (94%) agreed on proper disposal of livestock waste, (96%) said that cleaning the environment is considered a method of preventing brucellosis, and (96%) said proper meat cooking, (91%) said that one should destroy infected herds, and (96%) considered that reporting infected herds is a method of preventing brucellosis.

**Table 12: Disease control and prevention**

| Knowledge Item | Answers % (N) Yes | No | Total |
|---|---|---|---|
| 1. Is boiling and/or pasteurizing milk before consumption considered a method of preventing brucellosis? | 98% (362) | 2% (8 ) | 100% (370) |
| 2. Is vaccinating livestock is considered a method of preventing Brucellosis? | 97% (358) | 3% (12 ) | 100% (370) |
| 3. Is washing hands with water and soap immediately after handling livestock or animal products considered a method of preventing brucellosis? | 97% (357) | 3% (13) | 100% (370) |
| 4. Is proper disposal of livestock animal remnants or wastes considered a method of preventing brucellosis? | 94% (349) | 6% (21 ) | 100% (370) |
| 5. Is cleaning the environment considered a method of preventing brucellosis? | 96% (354) | 4% (16) | 100% (370) |
| 6. Is proper meat cooking considered a method of preventing brucellosis? | 96% (354) | 4% (16) | 100% (370) |
| 7. Is destroying infected herds and not using its products is considered a method of preventing brucellosis? | 91% (336) | 9% (34 ) | 100% (370) |
| 8. Is reporting infected herds considered a method of preventing brucellosis? | 96% (356) | 4% (14) | 100% (370) |
| | 95.6% | 4.4% | 100% |

5.1.6.2 **Attitude**

A total of 40 items (Appendix 2) were used to assess the attitudes of the respondents towards the disease (Cronbach's alpha 0.81). A scale of 1–5 was used to measure each item, with 1 representing very low score indicating negative attitude , and 5 representing full score positive attitude. The mean Attitude score was 4.21 (corresponding to a score of 85 out of 100). The items were categorized into 7 fields. Sections 5.1.6.2.1 to 5.1.6.2.7 and Tables 14 to 19 below show the distribution of scores for each item.

To calculate the average attitude score the correctly answered question of each subject were summed and divided by a total of 38 possible correct answers (38 items) then the total scores for all participants were averaged, attitude scores for participants are shown in Table 13, with a minimum score of 2.84, a maximum score of 4.82, a mean score of 4.21, and a median score of 4.34.

**Table 13: Summary of all Attitude items Score**

| | |
|---|---|
| Mean | 4.2169 |
| Median | 4.3421 |
| Mode | 4.37 |
| Std. Deviation | .33408 |
| Minimum | 2.84 |
| Maximum | 4.82 |

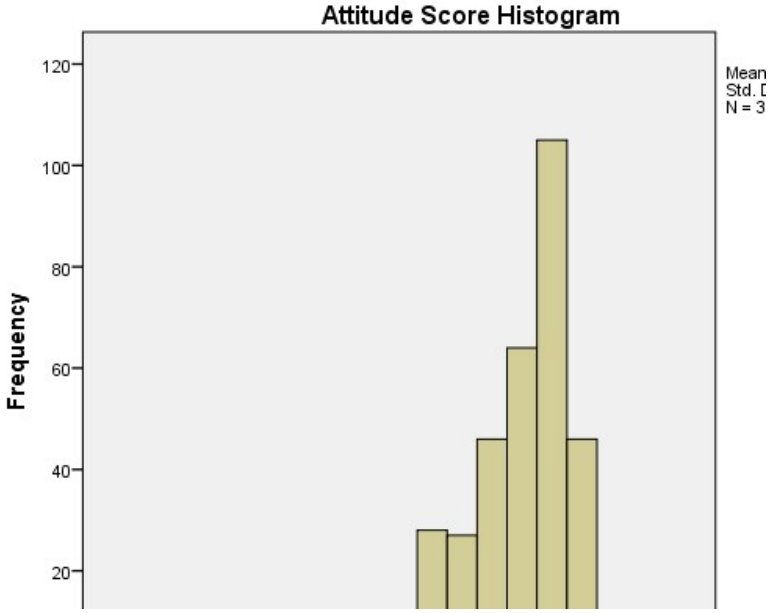


**Figure 8:Attitude Score Histogram**

#### 5.1.6.2.1 Livestock infection

As shown in Table 14 people were asked about their attitude towards presence of an infected animal in a herd. A total of (91%) agreed that infected animals should not be consumed, (92.7%) agreed that one should consult a veterinarian when there is infected livestock, (91.1%) stated that infected livestock should not be treated by ourselves, (93.7%) agreed that infected livestock should not be sold in the market, but only a low percentage of (32.7%) agreed that infected livestock should be isolated from the herd and destroyed.

**Table 14: Attitude towards Livestock infection**

| Attitude Item | Mean | SD | (scores 5–4)% |
|---|---|---|---|
| 1. If livestock is infected with brucellosis, we do not slaughter and consume it | 4.02 | .622 | 91 |
| 2. If livestock is infected with brucellosis, we show it to the veterinarian | 4.73 | .733 | 92.7 |
| 3. If livestock is infected with brucellosis, we do not treat it ourselves | 4.00 | .533 | 91.1 |
| 4. If livestock is infected with brucellosis, we do not sell it to the market | 4.10 | .531 | 93.7 |
| 5. If livestock is infected with brucellosis, we isolate it from the herd and slaughter and destroy the infected livestock. | 3.00 | 1.390 | 32.7 |
| | 3.97 | 0.761 | |
| On a scale of 1–5 marks, 1 represents- very low score, and 5 represents- full score | | | |

#### 5.1.6.2.2 Boiling unpasteurized milk

Table 15 shows that a large proportion of (97.6%) agreed that boiling milk kills microbes. People who said that cheese or unpasteurized milk must be boiled (irrespective of the time needed for the procedure) were about 90% of participants, while only (80%) of respondents prefer to boil cheese or unpasteurized milk rather than consuming it fresh, (85.9%) disagree that reduction of quality and nutritional value should be used as an excuse for not boiling milk or cheese and also (84.4%) refused the excuse of flavor change. For the excuse of milk source trustworthiness (78.4%) of respondents said that this should not hinder boiling it, and (84.1%) disagree that boiling milk is not suitable for making other dairy products, so it should always be boiled.

**Table 15: Attitude towards the need to boil unpasteurized milk**

| Attitude Item | Mean | SD | (scores 5–4)% |
|---|---|---|---|
| 1. Do you agree that it is acceptable not to boil unpasteurized milk or cheese due to lack of time *marks inversed | 4.51 | .878 | 90 |
| 2. I don't boil unpasteurized milk or cheese because I like to consume fresh products*marks inversed | 4.23 | 1.231 | 80 |
| 3. I don't boil unpasteurized milk or cheese because boiling reduces the quality of its nutrients*marks inversed | 4.42 | .954 | 85.9 |
| 4. I don't boil unpasteurized milk or cheese because boiling will affect the taste and flavor*marks inversed | 4.37 | 1.042 | 84.4 |
| 5. I don't boil unpasteurized milk or cheese because I trust the source of the milk*marks inversed | 4.17 | 1.265 | 78.4 |
| 6. I don't boil unpasteurized milk or cheese because boiled milk is not suitable for making other dairy products*marks inversed | 4.39 | .986 | 84.1 |
| 7. Boling milk kills microbes causing disease | 4.87 | .515 | 97.6 |
| | 4.42 | 0.981 | |
| * On a scale of 1–5, for questions 1 through 6 marks were inversed in analysis where 1 is highly (agree) negative attitude and 5 is highly ( disagree) positive attitude | | | |

#### 5.1.6.2.3 Proper milk management if livestock infected

As shown in Table 16, (93%) of the respondents did not agree to use milk without any processing especially if the livestock was infected, and (93.8%) disagree that milk should be sold directly to the market. However, only low percentages of (32.2%) and (25.2%) agreed that if an animal is infected its milk should be boiled at 70 °C or disposed of, respectively.

**Table 16: Attitude towards Proper milk management if livestock is infected**

| Attitude Item | Mean | SD | (scores 5–4)% |
|---|---|---|---|
| 1. If an animal has brucellosis, I don't use its milk without any processing | 4.09 | .669 | 93 |
| 2. If an animal has brucellosis, I boil its milk until 70°C before using it | 2.83 | 1.407 | 32.2 |
| 3. If an animal has brucellosis, I would not sell the milk directly to the market | 4.12 | .575 | 93.8 |
| 4. If an animal has brucellosis, I will get rid of the milk | 2.01 | 1.443 | 25.2 |
| | 3.26 | 1.023 | |
| On a scale of 1–5 marks,1 strongly disagree and 5 highly agree attitude | | | |

#### 5.1.6.2.4 Attitude toward Reporting infected livestock to a specialist

**Table 17: Reporting infected livestock to Specialist "why is an infected animal not reported?"**

| Attitude Item | Mean | SD | (scores 5–4)% |
|---|---|---|---|
| 1. I don't report infected livestock as it is not our responsibility to report livestock infected with *Brucella**marks inversed | 4.48 | .748 | 93.2 |
| 2. I don't report infected livestock so that there are no obstacles during the sale of the affected animal if I'm a breeder*marks inversed | 4.30 | 1.033 | 86.2 |
| 3. I don't report infected livestock to avoid troubles from government departments*marks inversed | 4.31 | 1.019 | 86.8 |
| 4. I don't report infected livestock because there is no risk of infection in animals*marks inversed | 4.48 | .790 | 93.5 |
| | 4.39 | 0.897 | |
| * On a scale of 1–5, for questions 1 through 4 marks were inversed in analysis where 1 is highly (agree) negative attitude and 5 is highly (disagree) positive attitude | | | |

Table 17 shows the responses for the questions related to reasons and attitudes for not reporting an infected animal to a specialist. Of the total respondents (93.2%) refused the excuse that it's not their responsibility to report livestock infected with *Brucella*, (86.2%)

refused the excuse not to report infected livestock because of fear of not being able to sell the animal especially as a breeder, (86.6%) refused the excuse of not reporting because of concerns of government troubles and (93.5%) refused the excuse of not reporting because livestock infection is not risky.

#### 5.1.6.2.5 Attitude towards Proper disposal of infected animals waste

Table 18 shows attitude results regarding the proper way to dispose of infected animal waste (91.1%) said that we should not feed the animal waste to dogs; only (32.9%) agreed that it shouldn't be buried, (83%) refused the practice of throwing it in the garbage and (91.7%) said we should not throw it in the sewage system.

**Table 18: Proper disposal of animal waste**

| Attitude Item | Mean | SD | (scores 5–4)% |
|---|---|---|---|
| 1. Disagree that the proper way to get rid of animal abortus or wastes is feeding it to dogs *marks inversed | 4.08 | .620 | 91.1 |
| 2. Disagree that the proper way to get rid of animal abortus or wastes is by burying *marks inversed | 2.28 | 1.520 | 32.9 |
| 3. Disagree that the proper way to get rid of animal abortus or wastes is by throwing it in the garbage*marks inversed | 3.86 | 1.032 | 83 |
| 4. Disagree that the proper way to get rid of animal abortus or wastes is by throwing it in a water stream (sewage system)*marks inversed | 4.10 | .665 | 91.7 |
| | 3.58 | 0.959 | |
| * On a scale of 1–5 marks, for questions 1 through 4 marks were inversed in analysis where 1 is highly (agree) negative attitude and 5 highly ( disagree) positive attitude | | | |

#### 5.1.6.2.6 Role of Authorities towards Brucellosis

**Table 19: Role of Authorities towards Brucellosis**

| Attitude Item | Mean | SD | (scores 5–4)% |
|---|---|---|---|
| 1. The role of authorities towards brucellosis control is to provide necessary treatment for infected people | 4.90 | .425 | 98.7 |
| 2. The role of authorities towards brucellosis control is to educate people about the disease | 4.89 | .444 | 98.1 |
| 3. The role of authorities towards brucellosis control is to provide PPEs | 4.86 | .503 | 97 |
| 4. The role of authorities towards brucellosis control is to do regular health checkups on dairy producers | 4.86 | .574 | 96.8 |
| 5. The role of authorities towards brucellosis control is to give work authorizations for dairy producers | 4.86 | .519 | 97.1 |
| | 4.87 | 0.493 | |
| On a scale of 1–5, 1 represents- very low score (strongly disagree) , and 5 represents- full score (strongly agree) | | | |

As shown in Table 19 we asked participants about the role of Authorities towards preventing brucellosis. The table shows that (98.7%) agreed that it is the authorities' responsibility to provide necessary treatment for infected humans, (98.1%) agreed that it is authorities' responsibility to provide enough education to the community, (97%) agreed that authorities should provide PPEs to those who handle livestock, (96.8%) agreed with that authorities should do regular health checkups and (97.1%) agreed that it is the responsibility of authorities to manage licensing and work authorizations for those who produce dairy products.

#### 5.1.6.2.7 Attitude towards correct Criteria followed when buying dairy products

Table 20 shows responses to the criteria that should be followed when purchasing dairy products. About (98.9%) agreed that hygiene is important, (63.8%) disagreed that cost is important, (97%) said quality is important, (95.4%) reported that the source of dairy products is a criterion, and (64.6%) disagreed that the distance of the store from the customer's house plays a role. About (93.3%) said that trusting of the seller should not be relied on when buying products and (93.3%) agreed that store's license for production and sale should be one of criteria we follow when buying dairy products.

**Table 20: Criteria followed when buying dairy products**

| **Table 19 : Criteria's followed when buying dairy products** | | | |
|---|---|---|---|
| **Attitude Item** | Mean | SD | (scores 5–4)% |
| 1. Hygiene is one of criteria I follow when buying dairy products | 4.94 | .331 | 98.9 |
| 2. I disagree that cost is one of criteria I follow when buying dairy products*marks inversed | 3.18 | 1.239 | 63.8 |
| 3. Quality is one of criteria I follow when buying dairy products | 4.88 | .460 | 97 |
| 4. The source of products is one of criteria I follow when buying dairy products | 4.84 | .555 | 95.4 |
| 5. I disagree that the proximity of the store to my house is one of criteria I follow when buying dairy products*marks inversed | 3.23 | 1.211 | 64.6 |
| 6. Trusting the seller is one of criteria I follow when buying dairy products | 4.76 | .747 | 93.3 |
| 7. The store's license for production and sale is one of criteria I follow when buying dairy products | 4.88 | .481 | 93.3 |
| | 4.38 | 0.717 | |
| On a scale of 1–5, 1 represents- very low score (strongly disagree), and 5 represents- full score (strongly agree) | | | |

### 5.1.6.3 Practice

A total of 28 yes/no questions about the practices of the 370 respondents were used to measure practice (Appendix 3). The participant's answers were coded as 1 representing correct practice and 0 as incorrect practice. The results were divided into four sections 5.16.3.1 to 5.1.6.3.4 shown in table 22 to table 25. The 28 questions yielded a Cronbach's alpha constancy indicator of 65%.

To calculate the average practice score the correctly answered question of each subject were summed and divided by a total of 19 possible correct answers (19 items) then the total scores for all participants were averaged. Practice scores are shown in Table 21; the mean practice score is (84%) , the median is (84%) , the minimal score is (37%) and the maximum score is (100%).

**Table 21: Summary of all Practice items score**

| | |
|---|---|
| Mean | .8400 |
| Median | .8421 |
| Std. Deviation | .09138 |
| Minimum | .37 |
| Maximum | 1.00 |

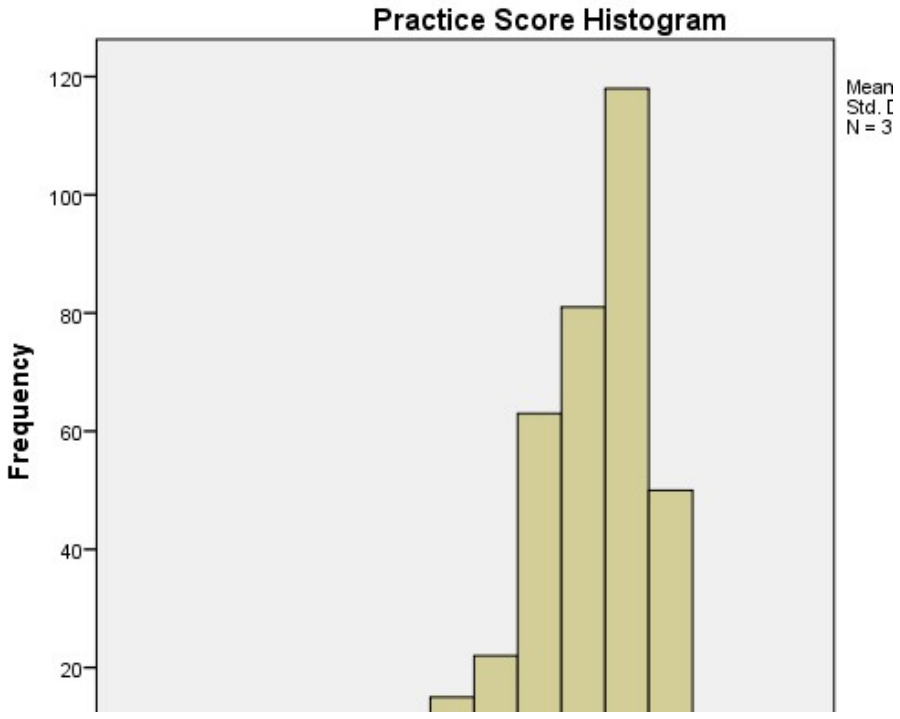


**Figure 9: Practice Score Histogram**

#### 5.1.6.3.1 Personal protective procedures for handling livestock

When we asked about protective procedures regarding any handling of animals or their products, respondents showed high commitment as (95%) wear gloves for protection, (94%) wear protective cloths, (97%) will wash hands with soap and water and 94% will use an alcohol rub.

**Table 22: Personal protective procedures for handling livestock**

| Practice Items | Answers % (N) | | |
|---|---|---|---|
| | Yes | No | Total |
| 1. I wear gloves when handling animals/livestock or with its products. | 95% (350) | 5% (20 ) | 100% (370) |
| 2. I wear protective clothing when handling animals/livestock or their products. | 94% (346) | 6% (24) | 100% (370) |
| 3. I wash my hands with soap and water when handling animals/livestock or their products. | 97% (358) | 3% (12) | 100% (370) |
| 4. I use alcohol-based sanitizers when handling animals/livestock or their products. | 94% (347) | 6% (23) | 100% (370) |
| | 95% | 5% | ١٠٠ |

#### 5.1.6.3.2 Source of dairy products

As shown in Table 23 only (15%) reported self-manufacture of dairy products, (70%) purchase milk and dairy products from several sources and only (28.9%) reported relying on regulated/licensed sources for their dairy products.

**Table 23: Source of dairy products**

| Practice Items | Answers % (N) | | |
|---|---|---|---|
| | Yes | No | Total |
| 1. I manufacture dairy products myself. | 15% (54) | 85% (316) | 100% (370) |
| 2. I buy milk and dairy products from several sources. | 70% (260) | 30% (110) | 100% (370) |
| 3. I buy dairy milk products from regulated sources | 28.9% (107 ) | 71.1% (263) | 100% (370) |
| | 38% | 62% | 100% |

Table 24 shows the distribution of the unregulated sources used by the subjects in buying dairy products. About (70%) (n=260) buy from multiple source including non-regulated ones. The majority (67%) of those who use multiple sources buy from local producers, (9.7%) from homemade sources, (4.9%) from a peddler and (6.5%) directly from a farm.

**Table 24 : Sources of unregulated purchase**

| | | | |
|---|---|---|---|
| 1. I buy milk and dairy products from several sources. | 70% (260) | 30% (110) | 100% (370) |
| 2. I get dairy milk products from a farm. | 6.5% (24 ) | 93.5% (346) | 100% (370) |
| 3. I get dairy milk products from a peddler. | 4.9% (18 ) | 95.1% (352) | 100% (370) |
| 4. I get dairy milk products from a homemade source. | 9.7% (36) | 90.3% (334) | 100% (370) |
| 5. I get dairy milk products from a local dairy producer. | 67% (248) | 33% (122) | 100% (370) |
| | 31.6% | 68.4% | ١٠٠ |

#### 5.1.6.3.3 Boiling milk and other dairy products

Of the 370 respondents, (96%) said that they boil milk and (97%) keep boiling milk for a few minutes after foam appears. (76%) boil white cheese before eating it and (94%) keep it boiling for a few minutes after it reaches boiling temperature.

**Table 25: Boiling milk and other dairy products**

| **Practice Items** | Answers % (N) | | |
|---|---|---|---|
| | Yes | No | Total |
| 1. I boil unpasteurized milk. | 96% ( 354 ) | 4% (16) | 100% (370) |
| 2. I keep milk boiling for a few minutes after foam appears. | 97% (345) | 3% (9) | 96% (354) |
| 3. I boil white cheese before eating it. | 76% (282) | 24% (88) | 100% (370) |
| 4. I keep cheese boiling for a few minutes after it starts boiling. | 94% (265) | 6% (17) | 76% (282) |
| | 90.8% | 9.2% | 100% |

#### 5.1.6.3.4 Manure and its management

As shown in Table 26, (98%) said that we should wash hands if dealing with animals during abortion or milking or during birth, (21%) use manure, and when we asked about what protection should be available when handling manure (90%) responded that they

wear gloves, (93%) wash their hands with soap and water, (89%) said that they should wear personal protective equipment and (90%) said that one should sanitize their hands with alcohol.

**Table 26: Practices towards Manure and its management**

| Practice Items | Answers % (N) | | |
|---|---|---|---|
| | Yes | No | Total |
| 1. I wash my hands if I deal with animals/livestock (during childbirth, abortion, milking, etc.). | 98% (361 ) | 2% (9) | 100% (370) |
| 2. I use manure as fertilizer or for Taboon. | 21% (76) | 79% (294) | 100% (370) |
| 3. I wear gloves if I deal with manure. | 90% (69) | 10% (7) | 100% (76) |
| 4. I wash my hands with soap and water if I deal with manure. | 93% (71) | 7% (5) | 100% (76) |
| 5. I wear PPEs if I deal with manure. | 89% (68) | 11% (8) | 100% (76) |
| 6. I use hand sanitizer or an alcohol hand rub if I deal with manure. | 90% (69) | 10% (7) | 100% (76) |
| | 96% | 4% | 100% |

### 5.1.7 Bivariate Analysis

#### 5.1.7.1 Variables associated with knowledge

Table 27 shows the results of the bivariate analysis between the dependent variable knowledge score and the other independent variables. The results were grouped into two sections, where in the first section the association was measured with the quantitative variables through the correlation coefficient and in the second section the association was measured by difference between means of qualitative variable groups. As shown in the first section of Table 27, a significant correlation was detected between the knowledge score and the quantitative variable of age ($r= 0.226$, $p= <0.0001$) of the participant. The correlation was positive and ranged in strength between weak to intermediate.

The second section shows the correlation with the qualitative variables of sex, marital status, educational level for both the participant and the spouse, income, job status, chronic diseases, history of brucellosis in the family, history of livestock ownership, knowledge of brucellosis or educational material about the disease, agreement with the presence of clinical features for the disease, knowledge of transmission, and knowledge of serious illness and complications such as affecting fertility, pregnancy or personal daily activities.

**Table 27 A+B: Bivariate Analysis between Knowledge and other Independent Variables**

| Table 27- A | | | | | |
|---|---|---|---|---|---|
| Quantitative Variable | | Number | Mean | Correlation (r) | P-value |
| Age | | 370 | | 0.226 | <0.0001 |
| Qualitative Variable | | Number | Mean | Standard deviation | P-value |
| Sex | Male | 195 | 0.70 | 0.130 | 0.253 |
| | Female | 175 | 0.68 | 0.156 | |
| Marital status | Single | 36 | 0.63 | 0.169 | 0.04 |
| | Married | 329 | 0.69 | 0.139 | |
| | Divorced/widowed | 5 | 0.74 | 0.132 | |
| Educational level of respondent | illiterate | 3 | 0.56 | 0.076 | 0.02 |
| | Elementary | 53 | 0.72 | 0.137 | |
| | Middle school | 104 | 0.69 | 0.159 | |
| | High school | 93 | 0.65 | 0.122 | |
| | University | 117 | 0.69 | 0.143 | |
| Education Level of spouse | illiterate | 4 | 0.75 | 0.192 | 0.06 |
| | Elementary | 60 | 0.69 | 0.147 | |
| | Middle school | 86 | 0.71 | 0.123 | |
| | High school | 97 | 0.66 | 0.143 | |
| | University | 85 | 0.70 | 0.141 | |
| Income | <3000 shekels | 287 | 0.68 | 0.147 | 0.94 |
| | 3000-6000 shekels | 66 | 0.69 | 0.136 | |
| | >6000 shekels | 17 | 0.68 | 0.117 | |
| Job status | Working and Skilled (education based) | 133 | 0.71 | 0.116 | 0.01 |
| | Working and Unskilled | 68 | 0.70 | 0.131 | |
| | No job | 169 | 0.66 | 0.164 | |
| Chronic diseases | No Chronic Diseases | 193 | 0.67 | 0.148 | 0.01 |
| | Have Chronic Diseases | 177 | 0.70 | 0.135 | |
| History of brucellosis in the family | I don't know, no one infected | 282 | 0.68 | 0.150 | 0.11 |
| | 1st degree relative | 59 | 0.72 | 0.112 | |
| | 2nd degree relative | 29 | 0.70 | 0.119 | |
| Ownership of livestock | No | 330 | 0.68 | 0.146 | 0.15 |
| | Yes | 39 | 0.72 | 0.112 | |
| Heard of brucellosis before | Yes | 352 | 0.70 | 0.131 | <0.0001 |
| | No | 18 | 0.44 | 0.164 | |
| Seen educational material about brucellosis before | Yes | 122 | 0.67 | 0.152 | <0.0001 |
| | No | 248 | 0.72 | 0.115 | |

| Table 27- B | | | | | |
|---|---|---|---|---|---|
| Qualitative Variable | | Number | Mean | Standard deviation | P-value |
| Expressing agreement with presence of clinical features for brucellosis | Yes | 344 | 0.70 | 0.123 | <0.0001 |
| | No | 26 | 0.46 | 0.192 | |
| Can brucellosis transmit from animals to humans | Yes | 340 | 0.71 | 0.176 | <0.0001 |
| | No | 30 | 0.44 | 0.117 | |
| Can cause serious illness in humans | Yes | 281 | 0.71 | 0.124 | <0.0001 |
| | No | 89 | 0.60 | 0.164 | |
| Brucellosis affect fertility in humans | Yes | 140 | 0.74 | 0.127 | <0.0001 |
| | No | 230 | 0.65 | 0.145 | |
| Brucellosis may affect pregnancy in humans | Yes | 249 | 0.73 | 0.118 | <0.0001 |
| | No | 121 | 0.60 | 0.157 | |
| Brucellosis affect daily activity in humans | Yes | 338 | 0.71 | 0.125 | <0.0001 |
| | No | 32 | 0.49 | 0.180 | |

As the table shows, with regard to the sociodemographic factors only the variables of social status (p=0.04), educational level ( p=0.02), job status (p=0.01), and presence of chronic diseases (p=0.01) were significantly correlated with knowledge. Skilled working people had the highest score and the non-working people (i.e. housewives and retirees) had the lowest score (p=0.01). The knowledge score was higher for those who are divorced or widowed (p=0.04) as well as for those who have chronic diseases (p=0.01) such as hypertension, diabetes, cancers.

With regard to general knowledge, the variables "Heard of Brucellosis Before" (p<0.0001) and "Seen Educational Material about Brucellosis Before" (p<0.0001) were significantly correlated with knowledge level which is higher in those who had previously heard of the disease or seen educational material. Knowledge of clinical features and transmission was higher in those agreed with the presence of clinical features for the disease (p<0.0001) and knew that the disease can be transmitted from animals to humans (p<0.0001), causing serious illness or complications. The Table also shows significant correlation between knowledge and those who said that the disease can cause serious illness with a higher score (p<0.0001), and those who said that the disease can affect fertility, pregnancy or daily activities also have a higher knowledge score (p<0.0001).

### 5.1.7.2 Variables correlated with Attitude

Table 28 shows the results of the bivariate analysis between the dependent variable attitude score and the other independent variables. The results were grouped into two sections, where in the first section the correlation was measured with the quantitative variables through the correlation coefficient and in the second section the correlation with the qualitative variables was measured by the difference between means of qualitative variable groups.

**Table 28 A+B: Bivariate Analysis between Attitude and other Independent Variables**

| Table 28- A | | | | | |
|---|---|---|---|---|---|
| Quantitative Variable | | Number | Mean | Correlation (r) | P-value |
| Practice | | 370 | | 0.425 | <0.0001 |
| knowledge | | 370 | | 0.278 | <0.0001 |
| Age | | 370 | | 0.356 | <0.0001 |
| Qualitative Variable | | Number | Mean | Standard deviation | P-value |
| Sex | Male | 195 | 4.31 | 0.275 | <0.0001 |
| | Female | 175 | 4.12 | 0.363 | |
| Marital status | Single | 36 | 3.97 | 0.400 | <0.0001 |
| | Married | 329 | 4.25 | 0.316 | |
| | Divorced/widowed | 5 | 4.13 | 0.300 | |
| Educational level of respondent | illiterate | 3 | 4.12 | 0.055 | 0.76 |
| | Elementary | 53 | 4.25 | 0.253 | |
| | Middle school | 104 | 4.22 | 0.348 | |
| | High school | 93 | 4.23 | 0.334 | |
| | University | 117 | 4.19 | 0.359 | |
| Education level of spouse | illiterate | 4 | 4.02 | 0.348 | 0.001 |
| | Elementary | 60 | 4.21 | 0.288 | |
| | Middle school | 86 | 4.27 | 0.289 | |
| | High school | 97 | 4.25 | 0.313 | |
| | University | 85 | 4.24 | 0.370 | |
| Income | <3000 shekels | 287 | 4.25 | 0.312 | 0.002 |
| | 3000-6000 shekels | 66 | 4.10 | 0.405 | |
| | >6000 shekels | 17 | 4.13 | 0.287 | |
| Job status | Working and Skilled (education based) | 133 | 4.29 | 0.252 | <0.0001 |
| | Working and Unskilled | 68 | 4.33 | 0.252 | |
| | No job | 169 | 4.11 | 0.386 | |
| Presence of chronic diseases | No Chronic Diseases | 193 | 4.15 | 0.368 | <0.0001 |
| | Have Chronic Diseases | 177 | 4.29 | 0.277 | |

| Table 28 - B | | | | | |
|---|---|---|---|---|---|
| Qualitative Variable | | Number | Mean | Standard deviation | P-value |
| History of brucellosis in the family | I don't know, no one infected | 282 | 4.22 | 0.338 | 0.25 |
| | 1st degree relative | 59 | 4.23 | 0.302 | |
| | 2nd degree relative | 29 | 4.12 | 0.351 | |
| Ownership of livestock | No | 330 | 4.22 | 0.336 | 0.42 |
| | Yes | 39 | 4.18 | 0.319 | |
| Previously heard about brucellosis | Yes | 352 | 4.23 | 0.324 | 0.003 |
| | No | 18 | 3.99 | 0.439 | |
| Seen educational material about brucellosis before | Yes | 122 | 4.17 | 0.363 | 0.05 |
| | No | 248 | 4.24 | 0.317 | |
| Expressing agreement with presence of clinical features for brucellosis | Yes | 344 | 4.23 | 0.321 | 0.001 |
| | No | 26 | 3.99 | 0.424 | |
| Can brucellosis transmitted from animals to humans | Yes | 340 | 4.23 | 0.314 | <0.0001 |
| | No | 30 | 4.01 | 0.466 | |
| Can Brucellosis cause serious illness to humans | Yes | 281 | 4.24 | 0.326 | 0.01 |
| | No | 89 | 4.14 | 0.350 | |
| Brucellosis may affect fertility in humans | Yes | 140 | 4.24 | 0.357 | 0.26 |
| | No | 230 | 4.20 | 0.319 | |
| Brucellosis may affect pregnancy in humans | Yes | 249 | 4.26 | 0.309 | <0.0001 |
| | No | 121 | 4.11 | 0.362 | |
| Brucellosis may affect daily activities in humans | Yes | 338 | 4.23 | 0.321 | 0.01 |
| | No | 32 | 4.07 | 0.431 | |

As shown in the first section of Table 28, a significant correlation was detected between the attitude score and the quantitative variables of practice (r= 0.425, p= <0.0001) and age (r= 0.356, p= <0.0001) and knowledge (r=0.278, P=<0.0001) of the participant. The correlation was positive and intermediate in strength.

The second section shows the correlation with the qualitative variables of sex, marital status, educational level for the participant and for his/her spouse, income, job status, presence of chronic diseases, if there was history of brucellosis infection in the family, history of livestock ownership, whether the participant had previously heard about brucellosis or had seen any educational material about the disease, agreement with the presence of clinical features for the disease and its ability to cause serious illness and

complications such as those affecting fertility, pregnancy, personal daily activities. A correlation was detected between the attitude score and sex (p <0.0001), social status (p <0.0001), educational level of the spouse (p=0.001), income (p =0.002 ), job status of the participant(p <0.0001), being previously exposed to educational material on the disease (p=0.05) and presence of chronic diseases (p <0.0001) whereby males, those who are married ,people with lower income (p=0.002) and those who have chronic diseases (p<0.0001) such as hypertension ,diabetes or cancers had a higher attitude score compared to the other groups in each of the variables . A correlation was also detected with the variables of previous knowledge about brucellosis (p=0.003), agreement that the disease expresses clinical features in humans (p=0.001), agreement with the fact that disease can be transmitted to humans from animals (p<0.0001), agreement that the disease can cause serious illness in humans (p=0.01), that it can be a risk for pregnancy continuity (p<0.0001), and that it can hamper daily activities (p=0.01).

#### 5.1.7.3 Correlation with practice

Table 29 shows the results of the bivariate analysis between the dependent variable practice score and the other independent variables. The results were grouped into two sections, where in the first section the correlation was measured with the quantitative variables through the correlation coefficient and in the second section the correlation was measured by the difference between means of qualitative variable groups.

**Table 29 A+B: Bivariate Analysis between Practice and other Independent Variables**

| Table 29 - A | | | | | |
|---|---|---|---|---|---|
| Quantitative Variable | | Number | Mean | Correlation (r) | P-value |
| Attitude | | 370 | | 0.425 | <0.0001 |
| Knowledge | | 370 | | 0.355 | <0.0001 |
| Age | | 370 | | 0.225 | <0.0001 |
| Qualitative Variable | | Number | Mean | Standard deviation | P-value |
| Sex | Male | 195 | 0.85 | 0.089 | 0.233 |
| | Female | 175 | 0.83 | 0.093 | |
| Marital status | Single | 36 | 0.76 | 0.122 | <0.0001 |
| | Married | 329 | 0.85 | 0.084 | |
| | Divorced/widowed | 5 | 0.85 | 0.023 | |
| Educational level | illiterate | 3 | 0.73 | 0.053 | 0.21 |
| | Elementary | 53 | 0.83 | 0.089 | |
| | Middle school | 104 | 0.85 | 0.093 | |
| | High school | 93 | 0.84 | 0.083 | |
| | University | 117 | 0.83 | 0.097 | |

| Table 29 - B | | | | | |
|---|---|---|---|---|---|
| Qualitative Variable | | Number | Mean | Standard deviation | P-value |
| Education level of spouse | illiterate | 4 | 0.89 | 0.000 | <0.0001 |
| | Elementary | 60 | 0.84 | 0.080 | |
| | Middle school | 86 | 0.85 | 0.087 | |
| | High school | 97 | 0.84 | 0.091 | |
| | University | 85 | 0.86 | 0.076 | |
| Income | <3000 shekels | 287 | 0.84 | 0.095 | 0.90 |
| | 3000-6000 shekels | 66 | 0.84 | 0.078 | |
| | >6000 shekels | 17 | 0.85 | 0.076 | |
| Job status | Working and Skilled (education based) | 133 | 0.85 | 0.081 | 0.008 |
| | Working and Unskilled | 68 | 0.86 | 0.079 | |
| | No job | 169 | 0.82 | 0.101 | |
| Chronic diseases | No Chronic Diseases | 193 | 0.83 | 0.099 | 0.01 |
| | Have Chronic Diseases | 177 | 0.85 | 0.080 | |
| History of brucellosis in the family | I don't know, no one infected | 282 | 0.84 | 0.094 | 0.46 |
| | 1st degree relative | 59 | 0.84 | 0.073 | |
| | 2nd degree relative | 29 | 0.82 | 0.098 | |
| Ownership of livestock | No | 330 | 0.85 | 0.090 | 0.001 |
| | Yes | 39 | 0.80 | 0.096 | |
| Heard of brucellosis before | Yes | 352 | 0.84 | 0.085 | <0.0001 |
| | No | 18 | 0.75 | 0.153 | |
| Seen educational material about brucellosis before | Yes | 122 | 0.84 | 0.090 | 0.70 |
| | No | 248 | 0.84 | 0.092 | |
| Expressing agreement with presence of clinical features for brucellosis | Yes | 344 | 0.85 | 0.082 | <0.0001 |
| | No | 26 | 0.76 | 0.156 | |
| Can brucellosis transmit from animals to humans | Yes | 340 | 0.85 | 0.084 | <0.0001 |
| | No | 30 | 0.77 | 0.139 | |
| Can may cause serious illness to humans | Yes | 281 | 0.85 | 0.083 | <0.0001 |
| | No | 89 | 0.80 | 0.106 | |
| Brucellosis may affect fertility in humans | Yes | 140 | 0.86 | 0.081 | 0.01 |
| | No | 230 | 0.83 | 0.096 | |
| Brucellosis may affect pregnancy in humans | Yes | 249 | 0.85 | 0.084 | <0.0001 |
| | No | 121 | 0.81 | 0.100 | |
| Brucellosis may affect daily activity in humans | Yes | 338 | 0.85 | 0.086 | <0.0001 |
| | No | 32 | 0.78 | 0.124 | |

As shown in the first section of Table 29, a significant correlation was detected between the practice score and the quantitative variables of age (r= 0.225, p= <0.0001) and knowledge (r=0.355. p=<0.0001). The correlation was positive and ranged in strength between weak to intermediate.

The second section shows the correlation with the qualitative variables of sex , marital status , educational level of the participant and spouse and income and job status and chronic diseases and difference in practice level whether there was a history of brucellosis in the family and history of livestock ownership and if there is practice difference if participant heard of brucellosis before or seen any educational material about the disease, agreement with the presence of clinical features for the disease and practice level with transmission and its ability to cause serious illness and complications to humans such as those affecting fertility, pregnancy, personal daily activities.

As the table shows, with regard to the sociodemographic factors only the variables of social status ($p<0.0001$), spouse's educational level ( $p<0.0001$), job status of the participant ($p=0.008$), and presence of chronic diseases ($p=0.01$ ) were significantly correlated with practice. Acorrelation was detected between practice and job status as the non-skilled working people had the highest score and the skilled working people had the lowest score ($p=0.008$), the social status practice score was higher in those who are married ($p<0.0001$), and the practice score is higher in those who have chronic diseases ($p=0.01$) such as hypertension ,diabetes , or cancers. Regarding the spouse's educational level, those who are illiterate had a higher level of practice than other educational categories (university or high level of education) ($p<0.0001$). A correlation was also noticed between those who don't own herds as they had a higher level of practice over those who own herds (P0.001).

With regard to general knowledge and its effect on practice level, the variable "Heard of Brucellosis Before" ($p<0.0001$) had a higher level of practice than those who had never heard of the disease. Regarding clinical features and transmission, the practice scores were higher for those agreed with the presence of clinical features for the disease ($p<0.0001$) and who knew that the disease can be transmitted from animals to humans ($p<0.0001$), causing serious illness and/or complications in humans. The table also shows significant correlation between the practice score and those who said that the disease can cause serious illness in humans which had a high score ($P<0.0001$), and those who said that the disease can affect fertility, pregnancy, or daily activities also have high practice score ($P<0.0001$)

### 5.1.8 Multivariate Analysis

#### 5.1.8.1 Knowledge

- Dependent variable: knowledge score
- Independent variable: general variables

**Table 30: multivariate linear regression analysis knowledge section**

| | Unstandardized Coefficients | | |
|---|---|---|---|
| | B | Std. Error | Sig. |
| Age (years) | 0.002 | 0.001 | **0.001** |
| Social Status | -0.011- | 0.024 | 0.632 |
| Money received for work | 0.023 | 0.015 | 0.130 |
| Gender of participant | .015 | .020 | 0.437 |
| Job description for participant | -0.016- | 0.011 | 0.171 |
| Level of education reached for participant | 0.005 | 0.010 | 0.602 |
| Level of education reached for spouse | -0.002- | 0.009 | 0.854 |
| Have any of your relatives (1st or 2nd degree) had Brucellosis before? | 0.012 | 0.012 | 0.325 |
| Do you have herds (cattle or camels) | 0.049 | 0.025 | **0.050** |
| Presence of a chronic disease | 0.016 | 0.017 | 0.340 |

Regression analysis for factors correlated with knowledge (Table 30) shows that only the variables of age and having animals in the surroundings are correlated with knowledge with the model having an $R^2$ of 0.08. The Table shows significant positive correlation between the age of respondent and knowledge as older people tend to have a higher knowledge score, whereas having herds is negatively correlated with the knowledge score as those who have animals in their surroundings tend to have a lower score.

### 5.1.8.2 Practice

- Dependent variable: practice score
- Independent variable: general variables

**Table 31: multivariate linear regression analysis practice section**

| | Unstandardized Coefficients | | |
|---|---|---|---|
| | B | Std. Error | Sig. |
| knowledge score | 0.207 | 0.031 | **0.000** |
| Age (years) | 0.001 | 0.000 | **0.049** |
| Social Status | -0.044- | 0.014 | **0.002** |
| Presence of a chronic disease | 0.003 | 0.010 | 0.798 |
| Money received for work | 0.011 | 0.009 | 0.205 |
| Gender of participant | 0.005 | 0.012 | 0.687 |
| Job description for participant | -0.002- | 0.007 | 0.766 |
| Level of education reached for participant | 0.003 | 0.006 | 0.585 |
| Level of education reached for spouse | 0.001 | 0.005 | 0.912 |
| Have any of your relatives (1st or 2nd degree) had Brucellosis before? | -0.008- | 0.007 | 0.276 |
| Do you have herds (cattle's or camels) in your surrounding? | -0.048- | 0.015 | **0.001** |

Multivariate regression analysis between the practice score and other general variables shows significant positive correlation with knowledge score and age but a negative correlation with social status and having herds around the family with the model having an $R^2$ of 0.21.

### 5.1.8.3 Attitude

- Dependent variable: attitude Score
- Independent variable: other general variables

**Table 32: multivariate linear regression analysis attitude section**

| | Unstandardized Coefficients | | |
|---|---|---|---|
| | B | Std. Error | Sig. |
| knowledge score | 0.241 | 0.112 | **0.032** |
| Practice Score | 1.171 | 0.179 | **0.000** |
| Age (years) | 0.005 | 0.001 | **0.000** |
| Social Status | -0.087- | 0.048 | 0.072 |
| Presence of a chronic disease | 0.013 | 0.034 | 0.700 |
| Money received for work | -0.071- | 0.030 | 0.**020** |
| Gender of participant | -0.137- | 0.039 | **0.001** |
| Job description for participant | 0.010 | 0.023 | 0.671 |
| Level of education reached for participant | 0.031 | 0.020 | 0.115 |
| Level of education reached for spouse | 0.015 | 0.017 | 0.374 |
| Have any of your relatives (1st or 2nd degree) had Brucellosis before? | -0.026- | 0.025 | 0.296 |
| Do you have herds (cattle's or camels) in your surrounding? | 0.042 | 0.051 | 0.414 |

By multivariate regression we found significant positive correlation with age, practice score, and knowledge score but a negative correlation with income and gender with the model having an $R^2$ of 0.32.

## 5.2 Local Dairy Producers Questionnaire Results

In the qualitative part of the study, eight interviews were conducted with dairy producers who were identified and recruited for the study using the snowball method, as their names were mentioned as a source for dairy products in the epidemiological investigation records for those who were infected with Brucellosis in the Ministry of Health report form.

The first part of the questionnaire had general questions on the age of the respondent, education level, family members working in the same field, where he/she produces dairy products, how he/she learned this work, if he/she had any training sessions on how to produce dairy products, how to maintain healthy products, if he/she has permission to work, whether there was any official inspection and/or authorization for his/her work and from which authorities, what was the authorities' role and how many times they visited his/her production site.

The second part of the questionnaire was composed of three major questions each containing 3-5 prop questions. The first major question was "How do you produce white cheese, labneh, laban, howirneh, butter and makheed?". The prop questions included "What is the temperature you rely on during the production process?" and also room temperature during production. Another prop question was "How do you produce healthy products free of contaminants?" We also asked about substances needed during production of dairy products and if there are any obstacles the producer faces during his/her work.

The second major question was about what the respondent knows about the disease, whether the production process is related to disease spreading in the community, whether it is an infectious disease or not, how it is transmitted, and the clinical features and complications of the disease.

The third major question was about prevention of the disease and the producer's role in how to prevent brucellosis and their source of milk used in the manufacturing process, and the last question was about how many years of experience in the field the producer has.

**Results:**

Results of the interviews of the eight participants showed that their age is between 30-70 years old, 62%( five out of eight producers) have high school education and only 38% (three out of eight producers) have university education, all of the eight producers produce dairy products at a special place for production, 75% (six out of eight producers) had this work inherited from their ancestors, 25% (two out of eight producers) work in the field by encountered experience and most of them (75%) (six out of eight producers) did not have any educational courses about how to produce dairy products or how to produce healthy products. Only 25% (two out of eight producers) had previously learned about production and safety of dairy products manufacture manufacturing. Of the eight interviewed producers 4 four (50%) said that they don't have any production permissions from Ministries of Health or Agriculture or from the municipality but all of them did have regular health checkups more than once during a year from the Ministry of Health at the production site checking for bacterial growth, hygiene and pH.

With regard to the major question of "How would you produce white cheese?" 50% of participants (4 out of eight producers) said that milk is not heated or boiled but just warm (30-40 °C) {Harart Al Emayeh} and then masah is added (initiating material) then the milk strained and when it becomes solid the producer cuts it into pieces of cheese. Only three producers (37%) said that milk should be boiled first (70-90 °C) and then masah added and strained and cut, participant said"

لصناعة الجبنة البيضاء نقوم باضافة المساة للحليب على درجة حرارة الاماية يعني ٣٠-٤٠ درجة اذا اردنا صنع منتج بلدي أما اذا اردنا صناعة منتج مبستر فنغلي الحليب لدرجة حرارة عالية٧٠-٩٠ درجة وثم نضيف المساة ثم يصفى ثم يجمد ويقطع ".

Concerning producing healthy products free of Brucella, 63% (five out of eight producers) answered that livestock should be vaccinated against Brucella and that they should rely on hygiene and clean tools during the production process. About limitations of this being done, 63% (five out of eight producers) attribute it to high cost of raw materials and one participant aged 30 years old who had a bachelor's degree in food industry said that "high taxes and high cost of fuel also limits their work".

When asked on how he produce Labnah 50% of participants (4 out of 8 producers) said it is similar to cheese in the temperature of milk being low temperature and then initiating

material added (robeh) and then strained. A participant said " لا نسخن الحليب بل نبقيه على حرارة الإماية ثم نضيف الروبة ثم يتم وضعه في شاش ليصفى ثم تتحول الى لبنة"

One (12%) of the producers interviewed said that he does not produce cheese or Labneh himself as he brings it from a village (Bani Naiem) , 37% of producers (3 out of 8 producers ) said that milk should be heated/boiled and then cooled and then the same process continues as robeh (initiating material) is added and strained. As mentioned before for protection against *Brucella* and limitations, they mentioned the same here (participants answered that livestock should be vaccinated against *Brucella* and they should rely on hygiene and clean tools during the production process, and limitations of this work are high cost of raw materials, high taxes and high cost of fuel).

Laban was prepared with the same method as Labnah but it is not strained and is kept in semifluid texture, and for Howirneh production the participants said that the green leaf of howirneh is sliced and salted and then added to Laban or Laban Makheed.

Regarding Butter and Laban Makheed, 87% (7 out of 8 producers ) said it's prepared by shaking cold Laban (milk plus robeh) in al Saqa, then milk separates into solid butter and liquid Makheed. A participant said" حليب مروب يتم خضه في السقى ثم بعد ٣٠-٦٠ دقيقة تنفصل الزبدة عن اللبن المخيض " .

The second major question was "What is Brucellosis?". All participants said it is a disease that affect livestock, may cause disease in humans, it can be prevented by livestock vaccination, 87% (7 out of 8 producers ) said that it may cause fever and fatigue in humans, 37% (3 out of 8 producers ) said it may cause sterility and 12%( 1 out of 8 producers ) said it may cause death, 75%(6 out of 8 producers) said it is transmitted through animals and dairy products, and 88%( 7 out of 8 producers ) said that the disease may spread if livestock are not vaccinated against Brucella." مرض الحمى المالطية هو مرض يصيب الاغنام وينتقل عبر منتجات الالبان للأنسان ويعمل حرارة وضعف للشخص المصاب"

The third major question was about disease prevention. 63%(5 out of 8 producers ) of participants said that animal vaccination is the key for protection against the disease, 75% (6 out of 8 producers ) said that boiling milk and cheese are very important to protect

against gaining the infection, and about the producer's role in preventing the disease brucellosis 37%(3 out of 8 producers ) said that trusting the source of dairy products is a major indicator for prevention against the disease, and 25%( 2 out of 8 producers) rely on farmers as they should vaccinate their livestock. A participant said "يجب تطعيم المواشي للوقاية من مرض الحمى المالطية وغلي الحليب والجبنة "

When asked about their source of milk 25% (2 out of 8 producers) said they bring it from a village and 75%(6 out of 8 producers ) said diverse animal farms and when asked about their years of experience respondents had at least 10 years in the field and some of them had reached 50 years of experience.

# Chapter Six:

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# Discussion, Conclusion and Recommendations:

## 6.1 Discussion: Local Dairy Consumers part

The purpose of this study was to assess knowledge, attitude and practice of brucellosis among the dairy product consumers and local community dairy producers in Hebron City. KAP studies were introduced around the world to assess disease prevention and promote control programs against the brucellosis disease and its burden. In Palestine a national control program was introduced by the Palestinian Authority since 1998. During the first 10 years of the program incidence of the disease dropped, but there have been no evaluations of the program since the early stages except for the KAP study carried out in the year 2004 by Husseini and Ramlawi (Husseini and Ramlawi, 2004)

Participants were involved in this study to be a part of evaluating the control strategy against Brucella disease through testing their KAP level to identify weak points to work on in the future.

### 6.1.1 Knowledge

#### 6.1.1.1 General Knowledge:

In this study the general knowledge score was found to be moderate with an average of almost 69%. This was close to what was found among Israeli Arabs by Baron-Epel *et al.*, 2018 as their KAP score was almost 72% but it was lower than the 100% reported among livestock owners in Jordan (Musallam, Abo-Shehada and Guitian, 2015) .

When we focused on certain aspects of knowledge, for example how the participants get knowledge, a weakens was found as 67% of participants never saw any educational material about the disease before. Such weakness could be an indication to authorities and their role to educate the community.

#### 6.1.1.2 Variables associated with Knowledge :

Univariate analysis of variables showed a correlation between the knowledge score and a number of the studied variables. Age of respondents was positively correlated with knowledge similar to what was detected for livestock owners in Somalia (Bile *et al.*, 2024). Also in our study a difference in knowledge score was detected between those who are married, single or divorced as divorced and widowed had a higher level of knowledge. This contrasted to what was found in Saudi Arabia where married people are more aware of brucellosis (Harbi *et al.*, 2023). A knowledge score difference was also detected among various educational groups of respondents showing that if the participant is more educated he will have a higher level of knowledge of brucellosis, a finding that was also seen in many previous studies in Saudi Arabia and Pakistan and Egypt.

Correlation was also detected between knowledge score and job status, i.e. different groups of jobs such as those who are working and skilled and those who are working and not skilled and those who don't have a job. In this study those who work and are skilled have a higher level of brucellosis knowledge similarly to literatures as working people are aware of the disease brucellosis, especially those working in the health care field(Zhang *et al.*, 2019).

A difference in knowledge score was established between those who have chronic diseases and those who don't have chronic diseases, as those with chronic diseases had a higher knowledge about brucellosis. This finding was unique to our study and it could be due to a higher sense of public health in those who have a disease.

Multivariate regression analysis for factors correlated with knowledge showed that only the variables of age and having animals in the surroundings tend to be associated with knowledge, with the model having an $R^2$ of 0.08. A significant positive correlation between age and knowledge was found as older people tend to have a higher knowledge score similar to a study conducted in Saudi Arabia (Harbi *et al.*, 2023). On the other hand having herds was negatively correlated with the knowledge score as those who had animals in the surroundings tend to have a lower score. This was similar to what was found in a study conducted in Pakistan in livestock owners which suggested that lower knowledge may increase zoonotic risk, which was attributed to the lower level of education of livestock owners. Similar findings were reported from Somalia and Saudi Arabia (Hussain *et al.*, 2021).

**Specific aspects and components of knowledge**

#### 6.1.1.3 knowledge of Susceptibility

An interesting finding was that knowledge of participants about sheep and goat susceptibility to infection was relatively high (78%) but when asked about camels and cows susceptibility knowledge level was low (for camels22% and for cows it was 40%). Knowledge of the possibility of these animals to transmit the disease was also found to be low. Similar trends were detected by Harbi *et al.*(2023) in Saudi Arabia. In Tanzania only 0.4% of participants knew that the disease is zoonotic in nature. (Witness Bashaka, 2015)(Kulabako *et al.*, 2024)(Zhang *et al.*, 2019) , and in Egypt about 82% of the participants in a KAP study of brucellosis did not know which animal species are more susceptible to brucellosis (Wahab *et al.*, 2019). However , in another study of brucellosis KAP in the al Taif district of Saudi Arabia 73.8% of the participants knew that animals such as camels, cows, and sheep could get brucellosis(Al-Homayani *et al.*, 2023). Such variability in knowledge level emphasises the need for studies to guide control efforts in targeted areas based on local requirements.

#### 6.1.1.4 Transmission Knowledge

Another weak point I noticed was related to the mode of the disease transmission. Participants mainly (93%) related transmission of brucellosis to dairy products whereas only a low percentage of 14% knew that air, 20% knew that contaminated foods and 24%

knew that contaminated water can be means of transmission. Also low percentages identified an infected mother via breastfeeding (17%) or transplacental transmission from an infected mother to a child (19%) may also transmit the disease to humans. My results were consistent with a brucellosis KAP study among farmers in Pakistan where the majority attributed infection to dairy products(Arif *et al.*, 2017). In Jordan a KAP level study among livestock owners found that more than 80% of participants considered consumption of unpasteurized milk to be a cause of brucellosis and a lesser percentage attributed the infection to other causes, such as contact with livestock, assisting in parturition, and meat consumption (Musallam, Abo-Shehada and Guitian, 2015)**.** A study even earlier in Jordan Bilal *et al.*, (1991) showed that only 8% in the community knew the source of the disease. In a study it showed that Vertical transmission from mother to child during pregnancy, delivery, or breastfeeding was reported in 15–20% of cases (Huy, 2024).

#### 6.1.1.5 Knowledge on Clinical Features and Consequences

Regarding the clinical features of the disease, respondents showed good knowledge about the clinical features as 93% think there are symptoms in infected people, and this was higher than the level of 46% among health workers in Tanzania (Mligo *et al.*, 2022) and the 75% in Al Taif (Al-Homayani *et al.*, 2023). However when participants in our study were questioned about their knowledge of the disease's consequences, it was found that only a low percentage of 38% knew that human sterility is caused by brucellosis disease as a study in Pakistan said that brucellosis cause loss of fertility in humans (Jamil *et al.*, 2021), 67% said it may cause human abortion, and 91% said it may affect daily activities and ability to work. In Saudi Arabia 63% said that arthritis be caused by brucellosis in humans (Harbi et al., 2023), and 42% in another KAP study didn't know the complications of brucellosis (Al-Homayani *et al.*, 2023), in another study said that Brucellosis during pregnancy can be associated with abortion (Karcaaltincaba *et al.*, 2010), in Al-taif a study was conducted show that the incidence of abortion in group study was 27% (Elshamy and Ahmed, 2008). Worthy to be mentioned that early detection and treatment of brucellosis prevent complications and if left untreated or poorly treated it may cause long term effects, relapses and serious complications.

#### 6.1.1.6 Knowledge of Prevention

Another aspect studied was knowledge of measures of control and prevention. The study showed high levels of knowledge among respondents. About 97% stated vaccination as a cornerstone for prevention, 98% stated boiling milk and pasteurization, and 97% said personal hygiene and wearing personal protective equipment when handling dairy products or dealing with animals or their secretions are important in prevention. Our percentages were higher than those preventive methods asked about in KAP studies in Pakistan (Arif et al., 2017) and Saudi Arabia (Al Taif) (Al-Homayani et al., 2023). In Maharashtra, India a KAP study conducted in animal handlers of 143 respondents showed that none of them used protective clothing while assisting in animal delivery or handling birth products which indicates poor knowledge and high risk behavior (Ghugey, Setia and Deshmukh, 2021).

### 6.1.2 Attitude:

Regarding the attitude of respondents to the disease, the mean attitude score was found to be high (4.21 out of 5) but when participants were asked for details and specific aspects of attitude the results differed by the aspect focused on and the potentially associated variables.

#### 6.1.2.1 Attitude and sociodemographic characteristics

Literature found that gender and education were determinants of satisfactory attitude(Alqahtani et al., 2021). In our study on univariate analysis the attitude score was found to have a correlation with age as increasing age shows favorable attitudes. A difference in attitude level was also found between males and females with males showing higher score. Moreover significant difference was detected between educational levels of the spouse as those with a higher degree of education had higher attitude levels.

Differences in attitudes were found in those who had different income categories as those with income below 3000 shekels had higher attitude level. Differences between those who are married, single or divorced/widowed were detected as married people have a better attitude score. These findings had similarity with what was seen in Saudi Arabia (Harbi *et al.*, 2023).

Another difference in attitude level in our study was detected between skilled workers and non-skilled. The skilled workers' score was 4.29 and the non-skilled workers' score was

4.33. The score of those who don’t have a job was 4.11. Additionally working people had higher attitude score than those who don’t work.

A difference in attitude level was also found between those who have chronic diseases and those who don't have chronic diseases as those who have chronic diseases have a better attitude score. Other studies focusing on the history of infection of brucellosis and KAP level didn’t mention chronic diseases and relation to KAP (Montaseri *et al.*, 2024). These correlations with chronic infection history suggest that infection with such diseases generates more care towards self-health.

Multivariate analysis confirmed the correlation between age, gender and education with attitude score.

#### 6.1.2.2 Attitude and general knowledge

Univariate analysis detected a difference in attitude level between those who had previously heard about the disease brucellosis and those who had not, as those who had heard of the disease had a higher attitude score than those who had not heard of the disease. This also aligned with the finding that those who had previously seen educational material on the disease had a higher attitude score compared to those who had not. Arif et al., (2017) has previously reported that those who had not heard of the disease displayed greater risky behavior and attitude.

By multivariate regression we found significant positive correlation with the knowledge score which was similarly found in other studies (Harbi *et al.*, 2023).

The attitude level was also affected not only by the general knowledge but by the type of knowledge concerning the different aspects of the disease. Difference in attitude was detected between those who expressed agreement with presence of clinical features for brucellosis and those who did not, and those who said that the disease can be transmitted from animals compared to those who did not agree that it can be transmitted from animals. Attitude level was also higher in those who said brucellosis causes serious illness in humans and may affect pregnancy and daily activities. A number of previous studies have found similar trends where good knowledge of disease features consequences and transmission and the subjects' behavior and attitude (Baron-Epel *et al.*, 2018)(Harbi *et al.*, 2023). Such findings emphasize the importance of knowledge and education for positive attitude and thus for control efforts.

#### 6.1.2.3 Attitude towards Livestock infection (presence of infected animals in the Herds)

When the attitude towards infected livestock and what should be done with infected animals was investigated, variability and weak aspects were detected. Concerning willingness to consulting a specialist (veterinarian) the attitude mark was 4.73 out of 5 (about 93 % agreed). However, participants didn't have a good attitude towards what should be done with infected animals where the score for agreement with the standard official policy of "test and slaughter" was only 3 out of 5 (agreement with the policy was only~33%). Such a weakness in attitude could be accounted for by discontinuity or irregularity of the application of national control program policies in Palestine as well as social and economic factors. A study conducted in Pakistan found that testing and slaughtering of infected herds is not economically or socially viable (Arif *et al.*, 2017), and in Egypt application of testing and slaughtering was found by Abd El-Wahab *et al.*( 2019) to only range between 15-30%, which was attributed to the respondents fear of notifying authorities about infected animals to evade slaughtering their livestock.

#### 6.1.2.4 Boiling unpasteurized dairy products

Participants' attitude score towards boiling unpasteurized milk and not consuming it fresh was 4.23 out of 5 (the percentage of who agreed was 80%). However, there was a small percentage of ~20% that said they like to consume fresh milk or cheese. This percentage (20%), even though it appears to be low, is a serious finding as unpasteurized fresh milk or cheese could be a major source of infection.

Consuming unpasteurized milk and milk products has been identified as the leading cause of human brucellosis with an incidence rate found to vary from 33.9% to 100% in some studies among consumers (Islam et al., 2023)(Dadar, Shahali and Whatmore, 2019).

The percentage of those who said that they depend on trusting ~~of~~ the source of milk enough for protecting themselves from brucellosis reached a high percentage of 21.6%. This when combined with the 20% of people willing to consume unpasteurized milk shows the seriousness of such attitude (Dadar *et al.*, 2020) noted that trust should not be relied on as contamination is still possible in dairy products. A KAP study in Israel showed the percentage of those who trust the source of milk to be 38.2% (Baron-Epel et al., 2018). In explaining such attitudes, the literature says that trusting the source of milk and personal belief-s overcome science and proved rules.

#### 6.1.2.5 Proper milk management if livestock is infected with Brucellosis

The questions on attitude towards proper milk management if livestock is infected with Brucella revealed that participants had a low attitude, as they don't agree to getting rid of the milk especially if livestock is infected by brucellosis (75% of participant indicated that they don't agree with getting rid of the milk). This finding proves that the community should be educated and know how to deal with local dairy products, especially if livestock is suspected to be infected, and people should learn safety measures to prevent the occurrence of the disease as the WHO pointed out that most of human brucellosis cases are due to ingesting unpasteurized milk or cheese from infected goats or sheep(WHO, 2020)(Dadar, Shahali and Whatmore, 2019). The proper milk management to kill *Brucella* is pasteurization (63°C for 30 minutes or 72°C for 15 seconds) which completely inactivate *Brucella* in milk (Olsen, Boggiatto and Vrentas, 2017).

#### 6.1.2.6 Attitude towards reporting infected livestock to a Specialist "If an animal is infected and not reported then why**?"**

Participants had a positive attitude towards the need to report infected livestock to a specialist (stakeholder). Respondents refused the excuses used by some for not reporting the animal, such as "as not of their responsibility to report" or fear of obstacles during animal sale or fear of troubles with the government if they report the animal. A similar study in Uganda had relatively high self-reported prevalence (55.5%) (Kulabako et al., 2024).

This positive attitude might be indicate or a reflection of the high general knowledge of brucellosis and respondents having positive thoughts of general hygiene.

#### 6.1.2.7 Attitude towards proper disposal of infected animals waste

Since research shows that the dangerous practice and source of biological hazards and disease spread of burying animal waste, such as the placenta, is a common practice among some farmers and owners, our participants were asked about their attitude towards this. Attitude towards proper disposal of infected animal waste showed a faulty attitude as most of participants (67%) said that we should burry infected animals or their wastes.

The proper way to dispose of animal waste is by burning it. These criteria might not be well known as general knowledge may indicate burying something dangerous is enough. Animal waste needs special care and the best way to dispose of animal wastes is by anaerobic digestion or alkaline hydrolysis or by burning (Franke-Whittle and Insam, 2013).

#### 6.1.2.8 Role of Authorities towards Brucellosis

Regarding the participants' attitude towards the role of authorities in Brucellosis prevention, most respondents show a high level of agreement with the right role of the authorities. About 99% agreed on the role to be providing therapies, 97% as providing personal protective equipment, 98% as educating people, 96% as doing regular health cheeks and 97% as providing permissions for sale and/or production of dairy products.

#### 6.1.2.9 Attitude towards correct Criteria's followed when buying dairy products

The criteria followed by consumers to choose a source to buy from varies between people. Following criteria that rely on health protection considerations should be a priority. Sajdakowska et al.,( 2020) in a study on dairy products quality from a consumer point of view found that consumers rely on freshness 20%, naturalness 16%, appearance and taste and smell 12%, composition and nutritional values 11.5%, lack of preservative 10%, price 6%, producer 4.7%, shelf life 4%, quality 3.8%, and origin 3.7%. Another study found that criteria for dairy product purchases are intention followed by the price of the product, quality of the products, and last but not the least product packaging(Kumar, 2021).

In our study, attitude towards correct criteria to be followed when buying dairy products showed a high level of positive attitude towards the right criteria that should be followed when buying dairy products. The participants (99%) correctly chose hygiene (hygiene of the store and products itself) to be the driving criteria, while quality of products was selected by 97% (manufacturing quality) and having a selling or production license was selected by 93%. But still some of respondents (36%) rely on cost of dairy products or proximity of the store (36%) from their house as their main drive, which when selected as the main criteria would constitute risk factors for the disease brucellosis.

### 6.1.3 Practice:

#### 6.1.3.1 Practice score and sociodemographic characters

As for the knowledge and the attitude on practice, participants in our study had a relatively high general score of 84%, however even though the study found favorable practices for individuals tested by the questionnaire there are still some unfavorable behaviors which will be discussed below.

In a univariate analysis of the practice score, a correlation was detected between age and not only attitude level but also practice score as mentioned before, as better KAP level is accompanied with increased age of the respondent.

A difference in practice score was detected as being higher in those who are married, have a university education, are skilled workers and/or have chronic diseases. The practice score was also higher in those who don't own livestock.

In Pakistan a study found that those with no or lesser level of education were less likely to have good hygienic practices at their homes and were putting themselves at more risk of contracting brucellosis (Arif et al., 2017). The same findings were reported in studies conducted in Yemen (Al-Shamahy, 2000) and Tajikistan (Lindahl *et al.*, 2015)

These findings emphasize the need for any control program to take into consideration the importance of specific emphasis on certain socio-demographic groups.

#### 6.1.3.2 Practice and General Knowledge

In our study's univariate analysis, the practice score was higher among those who had heard about brucellosis before, those who expressed agreement with the presence of clinical features for the disease, and those who said that the disease can be transmitted from animals to humans. The score was also higher among those who said that the disease can cause serious illness to humans such as sterility or abortion or working disability.

In the same direction, literature says that if respondents have good knowledge of disease features, consequences, and transmission, their behavior and attitude will be more controlled (Arif *et al.*, 2017)(Baron-Epel *et al.*, 2018)(Harbi *et al.*, 2023)

In details-focused multivariate regression analysis done between the practice score and other variables, significant positive correlations were confirmed between the knowledge score and age, but a negative correlation with social status and having herds around the family were found, with the model having an $R^2$ of 0.21.

#### 6.1.3.3 Use of personal protective equipment when handling livestock

With regard to good practices, participants reported following or intent to follow preventive practices if they handle livestock. High percentages of our study subjects

reported wearing gloves (95%), use of personal protective equipment (94%), washing hands with soap and water after contact (97%) or using an alcohol hand rub (94%).

In literature it was mentioned that environmental hygiene and sanitation and personal protection in humans have significant impact in minimizing the disease spread in livestock and human populations(Nyerere *et al.*, 2020)(Wang *et al.*, 2021). Our findings suggest that the study subjects care about their own behaviors with regard to personal hygiene.

#### 6.1.3.4 Source of dairy products

In contrast to the use of personal protective measures while contacting livestock, in close up analysis there were still some health-threatening practices in our study. About 71% of the participants reported buying dairy products from non-regulated sources, and 70% of respondents reported buying milk and dairy products from several sources, and 67% reported buying dairy products from local dairy producer (all these sources are not confident and not licensed and sell hazardous dairy products).

In Israel in a study of KAP among Israeli Arabs, such practices were reported at a less frequent as it was found that nearly 41% of respondents reported consuming cheese from non-regulated sources and 16.1% of respondents reported purchasing milk from non-regulated sources (Baron-Epel *et al.*, 2018). The problem in our community might even be more serious since studies that reported such negative practices noted that they are underreported as respondents may not be aware of the source of dairy products.
Consuming raw milk and milk-based products that have not been produced under strict control conditions can cause brucellosis(Islam *et al.*, 2023), so educating people on the seriousness of such behaviors and given utmost importance on following and dealing with non-regulated sellers and products is very important for control success.

#### 6.1.3.5 Boiling dairy products

Many studies have found that in regions where cheese and other dairy products are produced from raw milk, and that people consume such raw milk, the rate of Brucellosis infection was high compared to regions that use boiled milk (Celebi and Eda Balkan, 2013)(Dadar, Shahali and Whatmore, 2019).

Since it is common in some communities to buy dairy products from community producers, and since this is expected as well in the Palestinian community, participants were asked about dealing with dairy products. A significant portion of respondents (24%) reported that they do not boil white cheese before consuming it which is one of the major threats that cause disease spread in the community.

#### 6.1.3.6 Practices towards Manure

Dealing with and handling livestock secretion and waste can be important in protecting against the disease .Faddane *et al.*, (2022) said that cattle contact, including handling abortion waste products and manure, were all risk factors for brucellosis. In our study a small proportion of the participants (21%) use manure as fertilizer which is a risk factor for infection, as Brucella may also survive in aborted infected fetuses and contaminated manure for more than 2 months in winter or a few hours if exposed directly to sunlight(El-Sayed and Awad, 2018).

These findings revealed another point where attention is need in educating people.

## 6.2 Discussion : Local dairy producers part

### 6.2.1 General findings:

There were eight community dairy milk products producers interviewed in the study. Their ages ranged between 30-70 years old, a moderate percentage 62% (5 out of 8 producers ) had high school education, and 75% (6 out of 8 producers ) of those producers inherited or got involved in this work from their parents or grandparents who showed them how to be local dairy milk products producers. These results suggest relying on family experience rather than modern, quality health-based experience.

### 6.2.2 How are local dairy products produced?

When asked about the production and manufacturing process almost all local dairy products have the same method of production with trivial differences. For us the concern is that the process described holds risk of contamination and so might be risky and can still be a threat that may transmit brucellosis to the community.

When we asked how white cheese is produced, 50% (4 out of 8 producers) of respondents said they add an initiating agent called masah to warm (unpasteurized) milk, and when we

asked them to define warm they respond that the temperature would not exceed 30'c, and then the milk becomes solid after it is strained, and then it is cut into pieces of cheese .

In other studies it was noticed that the same tradition or technique of production was used to produce white cheese Soltani *et al.*, (2022), and that consumption of this kind of product may be a cause for transmission of brucellosis disease .(Sabbaghian, 1975).

As for the method of making labneh 50% of producers(4 out of 8 producers) said it is similar to the process of white cheese production ,as warm milk (unpasteurized) is used and then an initiating agent is added, followed by straining it, and it then becomes a semisolid product, similar to sour cream.

Regarding Laban, unpasteurized warm milk is used and the initiating material Robeh is added to the milk, and it is not strained but kept in its semifluid texture, but when producing makheed the unpasteurized milk is shaken in a bag until the mixture separates to semisolid butter and liquid sour milk (makheed).

It is worth notting that irrespective of the product produced, unpasteurized milk is used and it is heated to such a temperature that might work as an incubation temperature for any harmful pathogens contaminating the processed milk.

### 6.2.3 Producers and Brucellosis Disease:

One of the major aspects of the interviews was the knowledge attained by producers about the brucellosis disease and its transmission, and if they consider themselves as possibly being part of the cycle of the disease in infecting humans.

Respondents unanimously replied that the disease comes from infected livestock and that the disease can infect humans, and 87% (7 out of 8 producers) of the producers mentioned that fever and fatigue are of the disease features in humans, 37% (3 out of 8 producers) said it may cause sterility and 12% (1 out of 8 producers) said it might cause death.

As for their possible responsibility for the spread of brucellosis, they said that they depend on vaccinating livestock, 63% of respondents (5 out of 8 producers) rely on vaccination and they don't exclude use of personal hygiene and clean tools during the production process. About 75% (6 out of 8 producers) said that boiling milk or cheese for consumers is protective against infection, irrespective of many of them not pointing to their use of milk boiling during production of their products.

To our knowledge, no similar studies on local dairy producers and brucellosis disease have been carried out, to described similarities or differences between my study and other studies and so my study would be unique to this end.

The above discussed findings emphasize the need for including local dairy producers in any control program agendas, and to organize, regulate and follow up on this production section as an important aspect in product supply and the possibility of disease spread.

## 6.3 Study Limitations:

- During the study we faced some difficulties in data collection from certain clinics in the city especially in the area politically classified as H2, which is under the full control of the Israeli army, and so there were difficulties in reaching part of the sample. To overcome this problem, the missed participants were compensated for by selecting additional numbers from clinics that were accessible and so no major effect on the results is expected to have occurred.

- A limitation of the study was its focus on the city of Hebron while the source of milk and sometimes dairy products might be mainly from the surrounding villages, so study applicability is limited for the urban population. For a better understanding of the problem, maybe future studies involving the villagers would give more precise information.

- Possibility of information bias can't be completely excluded as the participants in the study probably try to give their best answers and this may reflect underreporting in certain circumstances in determining KAP level**.**

## 6.4 Conclusions:

This study is a one-of-a-kind study of the knowledge, attitude and practice of participants in the community using qualitative and quantitative tools to measure KAP level and to study risk factors affecting it. It is also conducted following the initiation of the Palestinian control program in 1998. Socioeconomic determinants, general knowledge, practice and attitude among dairy milk products consumers and local dairy milk products producers were identified.

The KAP level of diary milk products consumers was relatively high, but still faulty beliefs and behaviors were identified and discussed thoroughly. Certain factors affecting KAP level were also discussed and explained, and results were found to be relatively similar to previous literature and to previous KAP studies done in Palestine in 1999. Some findings were exceptional to our study, such as KAP level of diary milk products producers. Findings were unexpected and interviews were reviewed and risky behaviors were determined.

The results suggest aspects to be tackled, dealt with and improved in the control program, and findings that would help the decision makers and authorities to reach better achievements and direct their efforts.

## 6.5 Recommendations:

### 6.5.1 Recommendations to the community

- Increase community awareness for prevention and control of Brucellosis.
- Consumption of pasteurized milk and dairy products.
- Avoiding dairy product consumption from unknown source.

### 6.5.2 Recommendations to policy makers and stockholders:

- Increase coordination between Ministry of Health and Ministry of Agriculture/veterinary services concerning brucellosis prevention and control.
- Activate national zoonotic committee through regular monthly meetings.

- Strengthening surveillance system by Ministry of Health and Ministry of Agriculture as well as health and veterinary inspections for food and homemade dairy products.
- Allocate more budgets for brucellosis prevention and control by both Ministry of Health and Ministry of Agriculture including vaccination and diagnosis facilities.

### 6.5.3 Recommendations to public health researchers

- Involving academic people in research for brucellosis.
- Conducting different surveys by both Ministry of Health and Ministry of Agriculture to identify the magnitude of brucellosis.

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## Appendices

## Appendix 1: Questionnaire for Community dairy products producers (In Arabic)

### الإستبيان الخاص بمنتجي منتجات الألبان المحليين في مدينة الخليل لتقييم معرفتهم بمرض الحمى المالطية

❖ **القسم الأول : معلومات عامة (أرجو الاجابة على الاسئلة المفتوحة ووضع اشارة ✓ في المكان المناسب حسب اجابتك)**

١. العمر.....

٢. التعليم( بالسنوات ان امكن) .....

٣. هل هناك من عَمِل غيرك من أفراد الأسرة بمهنة انتاج منتجات الألبان المحلية .....

٤. أين تقوم بتحضير منتجات الألبان

- المنزل
- مشغل خاص
- الدكان/ المخزن

٥. أين تعلمت إنتاج منتجات الألبان ؟ .....

٦. هل حصلت على أية دورات تعليمية عن كيفية الإنتاج

- نعم
- لا

٧. هل حصلت على أية دورات تعليمية عن كيفية الحفاظ على السلامة الصحية للمنتج :

- نعم
- لا

٨. هل تمتلك ترخيص لإنتاج منتجات الألبان

- نعم
- لا

٩. اذا كانت الإجابة نعم ، فمن أية جهة أصدر الترخيص

- وزارة الصحة
- وزارة التموين
- وزارة الزراعة
- البلدية
- غير ذلك ، حدد .....

١٠. وماهي طبيعة الترخيص

- بيع
- انتاج
- غير ذلك، حدد .....

١١. هل تقوم أي من الجهات الرسمية التالية ( الصحة ، الزراعة ، الرقابة و التموين ، البلدية ) بالتفتيش على مكان الإنتاج؟

- نعم
- لا

١٢. حدد الجهة التي تقوم بالتفتيش على مكان الانتاج ؟ يمكن اختيار أكثر من اجابة

- وزارة الصحة
- الزراعة
- الرقابة و التموين
- البلدية
- لا يتم التفتيش من أي جهة

١٣. ما هي طبيعة التفتيش

- صحي
- ترخيص
- لم يتم التفتيش

١٤. كم عدد المرات التي تم فيها التفتيش خلال العام الماضي .....

❖ **القسم الثاني : أسئلة تقييم المعرفة و العمل و السلوك**

**السؤال الأول :**

**سؤال رئيسي :**

هل بإمكانك وصف كيفية تحضير كل مما يلي :

١. الجبنة البيضاء ( قم بالوصف)

**أسئلة فرعية :**

- ما هي الظروف و الشروط الحرارية التي تعتمدها و توفرها في مكان التصنيع وفي عملية التصنيع نفسها ؟ **إشرح**

- كيف بإمكانك تحضير هذا المنتج بشكل صحي آمن و خالي من الملوثات ؟ **إشرح**

- إشرح ما هي المواد التي تستعملها في عملية التصنيع إضافة الى الحليب.

- ما هو دافعك للإنخراط في عملية صناعة الألبان ؟ **إشرح**

- هل هناك صعوبات او تحديات تواجهك لإنتاج منتج صحي **؟إشرح**

٢. اللبنة ( قم بوصف طريقة التحضير )

**أسئلة فرعية :**

- ما هي الظروف و الشروط الحرارية التي تعتمدها و توفرها في مكان التصنيع وفي عملية التصنيع نفسها ؟ **إشرح**

- كيف بإمكانك تحضير هذا المنتج بشكل صحي آمن و خالي من الملوثات ؟ **إشرح**

- إشرح ما هي المواد التي تستعملها في عملية التصنيع إضافة الى الحليب.

- هل هناك صعوبات او تحديات تواجهك في عملية إنتاج منتج صحي . **إشرح**

٣. اللبن ( قم بوصف طريقة التحضير )

**أسئلة فرعية :**

- ما هي الظروف و الشروط الحرارية التي تعتمدها و توفرها في مكان التصنيع وفي عملية التصنيع نفسها ؟ **إشرح**

- كيف بإمكانك تحضير هذا المنتج بشكل صحي آمن و خالي من الملوثات ؟ **إشرح**

- إشرح ما هي المواد التي تستعملها في عملية التصنيع إضافة الى الحليب ؟

- هل هناك صعوبات او تحديات تواجهك لإنتاج منتج صحي ؟ **إشرح**

٤. الحويرنة ( قم بوصف طريقة التحضير )

**أسئلة فرعية :**

- ما هي الظروف و الشروط الحرارية التي تعتمدها و توفرها في مكان التصنيع وفي عملية التصنيع نفسها ؟ **إشرح**

- كيف بإمكانك تحضير هذا المنتج بشكل صحي آمن و خالي من الملوثات ؟ **إشرح**

- إشرح ما هي المواد التي تستعملها في عملية التصنيع إضافة الى الحليب.

- هل هناك صعوبات او تحديات تواجهك لإنتاج منتج صحي ؟ **إشرح**

٥. الزبدة ( قم بوصف طريقة التحضير )

**أسئلة فرعية :**

- ما هي الظروف و الشروط الحرارية التي تعتمدها و توفرها في مكان التصنيع وفي عملية التصنيع نفسها ؟ **إشرح**

- كيف بإمكانك تحضير هذا المنتج بشكل صحي آمن و خالي من الملوثات ؟ **إشرح**

- إشرح ما هي المواد التي تستعملها في عملية التصنيع إضافة الى الحليب؟

- هل هناك صعوبات او تحديات تواجهك لإنتاج منتج صحي . **إشرح**

٦. المخيض / اللبن أب ( قم بوصف طريقة التحضير )

**أسئلة فرعية :**

- ما هي الظروف و الشروط الحرارية التي تعتمدها و توفرها في مكان التصنيع وفي عملية التصنيع نفسها ؟ **إشرح**

- كيف بإمكانك تحضير هذا المنتج بشكل صحي آمن و خالي من الملوثات ؟ **إشرح**

- إشرح ما هي المواد التي تستعملها في عملية التصنيع إضافة الى الحليب؟

- هل هناك صعوبات او تحديات تواجهك لإنتاج منتج صحي ؟ **إشرح**

**السؤال الثاني :**

**سؤال رئيسي :**

**١.** وفق معلوماتك ما هو مرض الحمى المالطية ( اشرح ) ؟

**٢.** وفق معلوماتك هل يمكن أن ترتبط عملية إنتاج منتجات الألبان المحلية بانتشار مرض الحمى المالطية؟ إشرح إجابتك

**أسئلة فرعية:**

١. برأيك هل يعتبر مرض الحمى المالطية مرضاً معدياً ؟ إشرح كيف

٢. بحسب معرفتك إشرح ماهي طرق انتقال الحمى المالطية للإنسان ؟

٣. وفق معلوماتك ما هي اعراض الحمى المالطية لدى البشر ؟

٤. وفق معلوماتك ما هي مضاعفات المرض لدى البشر؟

**السؤال الثالث:**

**سؤال رئيسي :**

من وجهة نظرك ما هي سبل الوقاية من مرض الحمى المالطية (إشرح) ؟

**أسئلة فرعية :**

١. برأيك ما هو الدور الذي يمكن أن تلعبه كمنتج في عملية الوقاية من مرض الحمى المالطية ؟

٢. ما هو مصدر الحليب الذي تستخدمه في عملية التصنيع ؟

٣. ما هي عدد سنوات ( تقريباً) الخبرة لديك في عملية الإنتاج ؟

**Appendix 2: Questionnaire for Community dairy products Consumers (In Arabic)**

## استبيان لتقييم معرفة مستهلكي الحليب و منتجات الألبان في مدينة الخليل حول مرض الحمى المالطية

**القسم أ – معلومات المشارك. أرجو الاجابة على الاسئلة المفتوحة وضع اشارة ✓ في المكان المناسب حسب اجابتك**

١) مكان السكن داخل المدينة ( الحي/المنطقة) .....

٢) سنة الميلاد .....

٣) الجنس ☐ ذكر ☐ أنثى

٤) الحالة الإجتماعية

☐متزوج/ه ☐ أعزب/عزباء ☐ مطلق/ه ☐ أرمل/ه

٥) رقم الهاتف.. .....

٦) معدل دخل الأسرة (شهرياً)

- أقل من 3000 شيكل
- 3000-6000 شيكل
- أكثر من 6000 شيكل

٧) التحصيل العلمي الذي أنهيته / أنهيتيه

- أُمي/ة
- المدرسة الابتدائية (أنهى/ة لغاية الصف السادس )
- المدرسة الإعدادية (أنهى/ة لغاية الصف التاسع )
- الثانوية العامة ( أنهى/ة شهادة الدراسة الثانوية)
- تعليم جامعي . ( حاصل/ة على شهادة جامعية )

٨) التحصيل العلمي للزوج/ة :

- أُمي/ة
- المدرسة الابتدائية (أنهى/ة لغاية الصف السادس )
- المدرسة الإعدادية (أنهى/ة لغاية الصف التاسع )
- الثانوية العامة ( أنهى/ة شهادة الدراسة الثانوية)
- تعليم جامعي . ( حاصل/ة على شهادة جامعية )
- غير متزوج/ة

٩) العمل الحالي ( أذكر عملك ) .....

١٠) هل تعاني من أي من الأمراض المزمنة الآتية:

| | نعم | لا |
|---|---|---|
| سكري | | |
| ضغط | | |
| أمراض قلب وشرايين | | |
| أورام | | |
| أخرى ( حدد) ..... | | |

١١) هل أصيب أحد أقربائك (درجة أولى أو ثانية) بالحمى المالطية من قبل :

- نعم قريب من درجة أولى(إبن/زوج /أب)
- نعم قريب من درجة ثانية
- لا لم يصب أحد
- لا أعلم

١٢) في حال أصيب أحد أقربائك بالحمى المالطية فهل عرفتم مصدر العدوى ؟

- نعم ،،، ما هو .....
- لا
- لم يصب أحد

١٣) في حال أصيب أحد أقربائك فهل أتخذتم أية إجرائات لعدم تكرار الإصابة بالمرض و الوقاية منه في الأسرة

- نعم
- لا
- لا أعرف
- لم يصب أحد

١٤) هل يوجد لدى أفراد الأسرة (أهل البيت) أو لديك مواشي (أغنام-ماعز أو أبقار/جمال ) ؟

- نعم
- لا

**اذا كانت أجابتك نعم فأجب/أجيبي عن الأسئلة الآتية (١٥-١٨) :**

١٥) اذا كان لدى الأسرة مواشي فهل لديك أي دور في تربيتها أو العناية بها ؟

- نعم
- لا

١٦) اذا كان لدى الأسرة مواشي فأين تقوم/تقومين بتربيتها :

- بجانب المنزل
- أسفل المنزل
- مزرعة بعيدة عن المنزل

١٧) اذا كان لدى الأسرة ( أهل البيت ) مواشي فهل هي مطعمة ضد الحمى المالطية ؟

- نعم
- لا
- لا أدري

١٨) اذا كان لدى الأسرة ( أهل البيت ) مواشي فهل سبق أن أصيبت بالحمى المالطية:

- نعم

- لا
- لا أعلم

**القسم ب: المعرفة بمرض الحمى المالطية :**

١) هل سمعت/ي عن مرض الحمى المالطية من قبل ؟

- نعم
- لا

٢) هل سبق لك الإطلاع على أية مواد تثقيفية أو توضيحية حول مرض الحمى المالطية ؟

- نعم
- لا

٣) حسب معلوماتك أي من التالية قابلة للإصابة بالحمى المالطية ؟

| | نعم | لا | لا أعلم |
|---|---|---|---|
| الانسان | | | |
| الأغنام و الماعز | | | |
| الأبقار | | | |
| الجمال | | | |

٤) وفق معلوماتك أي من التالية قد تكون وسيلة لنقل داء الحمى المالطية للإنسان :

| الوسيلة | نعم | لا | لا أدري |
|---|---|---|---|
| شرب مياه ملوثة | | | |
| أكل خضار وفواكه غير مغسولة جيداً | | | |
| عن طريق الرضاعة الطبيعية | | | |
| عن طريق الهواء | | | |
| الأم الى جنينها أثناء الحمل | | | |
| عن طريق منتجات ولحوم الماشية و مخلفاتها | | | |

٥) برأيك هل تظهر أعراض لدى البشرالمصابين ؟

- نعم
- لا
- لا أعلم

٦) اذا كانت إجابتك نعم فأي من الآتية تعتبر من الأعراض ؟

| العرض | حرارة | ألم في المفاصل | ألآم في البطن | تعرق |
|---|---|---|---|---|
| نعم | | | | |
| لا | | | | |
| لا أعلم | | | | |

٧) هل ينتقل داء الحمى المالطية من الحيوانات- منتجاتها أومخلفاتها- للبشر ؟

- نعم
- لا
- لا أعلم

٨) اذا أجبت بنعم على السؤال السابق فبرأيك أي من الحيوانات الآتية تنقل داء الحمى المالطية للإنسان ؟

| | نعم | لا | لا أعلم |
|---|---|---|---|
| الأغنام و الماعز | | | |
| الأبقار | | | |
| الجمال | | | |

٩) برأيك أي من منتجات الحيوانية الآتية تنقل المرض للإنسان ؟

| | نعم | لا | لا أعلم |
|---|---|---|---|
| الحليب | | | |
| الجبنة | | | |
| منتجات الألبان الأخرى | | | |
| لحوم نيئة | | | |
| إفرازات و أنسجة الحيوانات | | | |

١٠) وفق معلوماتك هل الحمى المالطية قابلة للعلاج عند الحيوانات ؟

- نعم
- لا
- لا أعرف

١١) وفق معلوماتك ما هي درجة خطورة الحمى المالطية لدى الإنسان ؟

- ذات خطورة
- غير خطرة
- لا أعلم

١٢) هل باعتقادك يؤثر مرض الحمى المالطية على القدرة الإنجابية لدى الشخص المصاب ؟

- نعم
- لا
- لا أعلم

١٣) هل يؤثر مرض الحمى المالطية على إمكانية إستمرار الحمل لدى المرأة المصابة ؟

- نعم
- لا
- لا أعلم

١٤) هل بإعتقادك إذا أصبت/ي بداء الحمى المالطية ، ستتأثر قدرتك على العمل ؟

- نعم
- لا
- لا أعلم

١٥) وفق معلوماتك أي من التالية تعتبر من طرق الوقاية من الحمى المالطية ؟

| الوسيلة | نعم | لا | لا أدري |
|---|---|---|---|
| غَلي الحليب أو بسترته قبل استهلاكه أو تصنيعه | | | |
| تطعيم المواشي | | | |
| **الوسيلة** | **نعم** | **لا** | **لا أدري** |
| غسل اليدين بالماء والصابون مباشرة بعد التعامل مع الحيوانات أو منتجاتها أو مخلفاتها | | | |
| التخلص الصحيح من بقايا الحيوانات و مخلفاتها | | | |
| تنظيف البيئة | | | |
| طبخ اللحم لدرجة النضوج | | | |
| إتلاف الحيوانات المصابة وعدم استخدام منتجاتها | | | |
| التبليغ عن الحيوانات المصابة | | | |

**القسم د : الممارسة و التصرف**

١) ما هي الإجرائات التي يجب اتباعها لتحمي نفسك عند التعامل مع المواشي أو التعامل مع منتجاتها

| الإجراء | أرتدي قفازات | ألبس ملابس واقية | أغسل يدي بالماء والصابون | أستخدم المعقمات الكحولية |
|---|---|---|---|---|
| نعم | | | | |
| لا | | | | |

٢) هل تقوم/ي بتصنيع منتجات ألالبان بنفسك ؟

- نعم
- لا

٣) هل تشتري/ن الحليب ومنتجاته من مصدر واحد ، أم من عدة مصادر ؟

- مصدر واحد

- عدة مصادر

٤) أي من منتجات الألبان الآتية تستهلك :

| المنتج | جبنة | حوير نة | لبن رائب | لبن مخيض | حليب مغلي | حليب طازج | زبدة | سمنة بلدية |
|---|---|---|---|---|---|---|---|---|
| **نعم** | | | | | | | | |
| **لا** | | | | | | | | |

٥) من أين تحصل على منتجات الألبان التي تستهلكها (المصدر) ؟

| **المصدر** | مباشرة من المزرعة | بائع متجول | صنع أو إنتاج منزلي | مُصنع محلي | الشراء من منتج مرخص (من المحلات التجارية) |
|---|---|---|---|---|---|
| نعم | | | | | |
| لا | | | | | |

٦) في حال أشتريت/ي الحليب الغير معبأ من قبل الشركات التجارية ( الحليب الغير مبستر ) فهل تقوم/تقومين بغليه ؟

- نعم
- لا
- أحياناً

٧) أي من المؤشرات الآتيه تقوم بالاعتماد عليها لمعرفة أن الحليب قد تم غليه بشكل كافي؟

| | |
|---|---|
| المؤشر الذي تعتمد عليه لإنهاء الغلي | |
| حتى يسخن الحليب فقط | |
| لغاية ظهور الرغوة | |
| أستمر بالغلي بضع دقائق بعد ظهور الرغوة | |
| أخرى ( حدد ).....<br>..... | |

٨) هل تقوم/تقومين بغلي الجبنة البيضاء( الغير معبأة من الشركات التجارية المرخصة مثل الجنيدي ، الجبريني ...) قبل أكلها ، أو استخدامها ؟

- لا أستخدمها
- لا أغليها
- نعم ، أقوم بغليها دوما
- أحياناً أغليها

٩) اذا كانت الاجابة نعم ، فما هي فترة غلي الجبنة التي تعتمدها ؟

- حتى يسخن الماء فقط ، لكن لا يصل لدرجة الغليان
- حتى يبدأ الماء بالغليان فقط
- أتركها لمدة قصيرة على النار بعد أن يبدأ بالغليان

١٠) هل تستخدم/تستخدمين روث المواشي كسماد للنباتات أو تستخدمه/تستخدمينه للطابون ؟

- نعم
- لا
- أحياناً

١١) ما هي وسائل الوقاية التي يجب اتباعها عند التعامل مع روث المواشي للسماد/او للطابون ؟

| | نعم | لا |
|---|---|---|
| غسيل الأيدي بالماء و الصابون | | |
| ملابس و أدوات واقية ( كمامة ...) | | |
| استخدم معقمات كحولية | | |

١٢) في حال قمت/قمتي بالتعامل مع المواشي او مع منتجاتها فهل تغسل يديك ؟

- أقوم بغسلها كل مرة
- أقوم بغسلها غالبا
- أقوم بغسلها أحياناً
- أقوم بغسلها نادراً
- لا أغسلها أبداً

**القسم ه : التوجهات و الموقف من المرض:**

الرجاء وضع ✓ عند إجابتك

| ١) في حال أصيبت أحد المواشي بالحمى المالطية فبرأيك ما هو الإجراء الواجب القيام به ؟ | موافق بشدة | موافق | محايد | غير موافق | غير موافق بشدة |
|---|---|---|---|---|---|
| | ٥ | ٤ | ٣ | ٢ | ١ |
| ٢) نقوم بذبحها و إستهلاكها | | | | | |
| ٣) نعرضها على الطبيب البيطري | | | | | |
| ٤) نعالجها بأنفسنا | | | | | |
| ٥) نبيعها للسوق | | | | | |
| ٦) نقوم بعزلها عن القطيع وذبحها و اتلافها | | | | | |

| ٧) لماذا لا يتم غلي الحليب أو الجبنة عند شرائها من منتج محلي ؟ | موافق بشدة | موافق | محايد | غير موافق | غير موافق بشدة |
|---|---|---|---|---|---|
| | ٥ | ٤ | ٣ | ٢ | ١ |
| ٨) لأنه لا يوجد وقت كافٍ للغلي | | | | | |
| ٩) لتفضيل المنتج الطازج | | | | | |
| ١٠) لأن الغليان يقلل من جودة العناصر الغذائية | | | | | |
| ١١) بسبب التأثير على الطعم و النكهة | | | | | |
| ١٢) للثقة بالمصدر المحلي | | | | | |
| ١٣) لأن الحليب المغلي لا يصلح لصنع منتجات بيتية أخرى | | | | | |

| السؤال | موافق بشدة | موافق | محايد | غير موافق | غير موافق بشدة |
|---|---|---|---|---|---|
| | ٥ | ٤ | ٣ | ٢ | ١ |
| ١٤) يعمل غلي الحليب على قتل الكائنات الحية الدقيقة المسببة للأمراض ؟ | | | | | |
| ١٥) يتوجب إعلام المختصين عند إصابة أحد قطعان الماشية بالحمى المالطية؟ | | | | | |
| ١٦) الناس الذين يربون المواشي أكثر عرضة للإصابة بالحمى المالطية ؟ | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| ١٧) الجبن المصنوع في المنزل او من قبل المنتجين الشعبيين(المحليين) ألذ من الذي يتم شراؤه مبستراً و مرخصاً من وزارة الصحة ؟ | | | | | |
| ١٨) منتجات الحليب المبسترة تختلف في الطزاجه عن تلك المصنوعة في المنزل؟ | | | | | |
| ١٩) معلوماتك كافية حول داء الحمى المالطية ؟ | | | | | |
| ٢٠) يمكن السيطرة على داء الحمى المالطية ؟ | | | | | |
| ٢١) المعلومات المتوفرة للناس حول المرض كافية ؟ | | | | | |
| ٢٢) أنت/ي بحاجة لمعلومات أخرى عن الحمى المالطية | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| ٢٣) في حال أصيبت أحد الحيوانات بالحمى المالطية ، فماذا علينا أن نفعل بحليبها | موافق بشدة | موافق | محايد | غير موافق | غير موافق بشدة |
| | ٥ | ٤ | ٣ | ٢ | ١ |
| ٢٤) نستخدم الحليب بدون اي معالاجات | | | | | |
| ٢٥) نغلي الحليب على درجة حرارة ٧٠ مئوية قبل الإستخدام | | | | | |
| ٢٦) نبيع الحليب مباشرةً | | | | | |
| ٢٧) نقوم بالتخلص من الحليب | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| ٢٨) في حال لو أصيب أحد أفراد القطيع بالحمى المالطية ولم يتم ابلاغ المختصين بذلك ، لماذا لايتم ذلك ؟ | موافق بشدة | موافق | محايد | غير موافق | غير موافق بشدة |
| | ٥ | ٤ | ٣ | ٢ | ١ |
| ٢٩) ليست من مسؤوليتنا كأفراد الإبلاغ | | | | | |
| ٣٠) لكي لا تحدث معوقات أثناء بيع الحيوان المصاب | | | | | |
| ٣١) لكي يتجنب الشخص المشاكل من الدوائر الحكومية | | | | | |
| ٣٢) لأنه لا خطورة في إصابتها | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| ٣٣) ما الإجراء الواجب عمله | موافق | موافق | محايد | غير موافق | غير موافق بشدة |

| | | | | | |
|---|---|---|---|---|---|
| بالحيوانات المجهضة/أو مخلفاتها ؟ | بشدة | | | | |
| | ٥ | ٤ | ٣ | ٢ | ١ |
| ٣٤) إطعامها للكلاب | | | | | |
| ٣٥) دفنها | | | | | |
| ٣٦) رميها بالشارع/ القمامة | | | | | |
| ٣٧) رميها في مجرى للمياه | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| ٣٨) مصادر اللبنة التي تفضلها/تفضلينها | موافق بشدة | موافق | محايد | غير موافق | غير موافق بشدة |
| | ٥ | ٤ | ٣ | ٢ | ١ |
| ٣٩) المصنعة بيتياً | | | | | |
| ٤٠) المبسترة | | | | | |
| ٤١) المصنعة محلياً من قبل منتجيين محليين (غير الشركات التجارية) | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| ٤٢) دور الجهات المختصة تجاه الأشخاص المصابين بالحمى المالطية او المعرضين للإصابة بها ؟ | موافق بشدة | موافق | محايد | غير موافق | غير موافق بشدة |
| | ٥ | ٤ | ٣ | ٢ | ١ |
| ٤٣) توفير العلاج اللازم لهم | | | | | |
| ٤٤) التوعية و الوقاية من المرض | | | | | |
| ٤٥) توفير إجرائات الوقاية الخاصة بالحيوانات | | | | | |
| ٤٦) التفتيش الصحي | | | | | |
| ٤٧) الترخيص | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| ٤٨) عند شراء الحليب او أحد منتجاته فيجب اعتماد اي من التالية : | موافق بشدة | موافق | محايد | غير موافق | غير موافق بشدة |
| | ٥ | ٤ | ٣ | ٢ | ١ |
| ٤٩) النظافة | | | | | |
| ٥٠) السعر | | | | | |
| ٥١) الجودة | | | | | |
| ٥٢) مصدر المنتج ( محلي ، مبستر ، بيتي) | | | | | |
| ٥٣) القرب منك | | | | | |
| ٥٤) الثقة في البائع | | | | | |
| ٥٥) وجود ترخيص | | | | | |

٥٦) كيف تحب/تحبين أن تحصل/ي على معلومات عن الحمى المالطية ؟( ممكن اختيار أكثر من أجابة)

- عن طريق التلفاز
- عن طريق الراديو
- عن طريق مواقع التواصل الاجتماعي
- عن طريق حملات التوعية و البروشورات
- أخرى ( حدد ) .....

٥٧) من وجهة نظرك ما هي المعلومات التي تعتقد/تعتقدين أنها تنقصك وانت بحاجة لمعرفتها ؟

.....

.....

.....

# Appendix 3: Knowledge items

| **Appendix 3 : Knowledge towards brucellosis disease in Hebron City (n=370)** | | | |
|---|---|---|---|
| **Knowledge Item** | Answers % (N) Yes | No | Total |
| 1. Have you ever heard about Brucellosis? | 95% (352) | 5% ( 18 ) | 100% (370 ) |
| 2. Have you ever seen any educational materials or brochure about Brucellosis? | 33% (122) | 67% ( 248) | 100% (370) |
| 3. Humans are susceptible to get infected with brucellosis? | 94% (349) | 6% (21 ) | 100% (370) |
| 4. Sheep are susceptible to get infected with brucellosis? | 78% (287) | 22% (83) | 100% (370) |
| 5. Cows are susceptible to get infected with brucellosis? | 40% (148) | 60% (222) | 100% ( 370) |
| 6. Camels are susceptible to get infected with brucellosis? | 22% (79) | 78% (291) | 100% (370) |
| 7. Drinking contaminated water may transfer brucellosis to humans? | 24% (89) | 76% (281) | 100% (370) |
| 8. Eating unwashed fruits and or vegetable may transfer brucellosis to humans? | 20% (74) | 80% (296) | 100% (370) |
| 9. Breastfeeding may transfer brucellosis to humans? | 17% (61) | 83 % (309) | 100% (370) |
| 10. Air may transfer brucellosis to humans? | 14% (53) | 86% (317) | 100% (370) |
| 11. Mother to her fetus during pregnancy brucellosis may transfer to humans? | 19% (70) | 81% (300) | 100% (370) |
| 12. Dairy products, other animal's products, meat or remnants may transfer brucellosis to humans? | 93% (344) | 7% (26) | 100% (370) |
| 13. Do you think there are symptoms in infected people? | 93% (344) | 7% (26) | 100%(370) |
| 14. Fever is a feature of brucellosis in Humans? | 91% (335) | 9 % (35) | 100%(370) |
| 15. Joints pain is a feature of brucellosis in Humans? | 78% (290) | 22% (80) | 100% (370) |
| 16. Abdominal pain is a feature of brucellosis in Humans? | 75% (277) | 25% (93) | 100% (370) |
| 17. Sweating is a feature of brucellosis in Humans? | 77% (284) | 23% (86) | 100% (370) |
| 18. Can brucellosis transmitted from animals to humans? | 92% (340) | 8% (30) | 100% (370) |
| 19. Sheep can transmit brucellosis to humans? | 92% (339) | 8% (31) | 100% (370) |

| | | | |
|---|---|---|---|
| 20. Cows can transmit brucellosis to humans? | 51% (188) | 49% (182) | 100% (370) |
| 21. Camels can transmit brucellosis to humans? | 24% (88) | 76% (282) | 100% (370) |
| 22. Milk may cause Brucellosis? | 94% (346) | 6% (24) | 100% (370) |
| 23. Cheese may cause Brucellosis? | 95% (352) | 5% (18 ) | 100% (370) |
| 24. Other Dairy products may cause brucellosis? | 84% (312) | 16% (58) | 100% (370) |
| 25. Raw Meat may cause Brucellosis? | 44% (312) | 16% (58 ) | 100% (370) |
| 26. Animal's secretions and tissue may cause brucellosis? | 39% (143) | 61% (227) | 100% (370) |
| 27. Is brucellosis treatable in animals? | 67% (248) | 33% (122 ) | 100% (370) |
| 28. Brucellosis is a risky disease in humans? | 76% (281) | 24% (89) | 100% (370) |
| 29. Brucellosis may affect fertility of the affected person? | 38% (140) | 62% (230) | 100 % (370) |
| 30. Brucellosis may affect pregnancy (cause abortion) of the affected women? | 67% (249) | 33% (121 ) | 100% (370) |
| 31. Brucellosis may affect your ability to work? | 91% (338) | 9% (32) | 100% (370) |
| 32. Boiling and or pasteurizing milk before consumption is considered a method of preventing Brucellosis? | 98% (362) | 2% (8 ) | 100% (370) |
| 33. Vaccinating livestock is considered a method of preventing Brucellosis? | 97% (358) | 3% (12 ) | 100% (370) |
| 34. Washing hands with water and soap immediately after handling herds or its products is considered a method of preventing Brucellosis? | 97% (357) | 3% (13) | 100% (370) |
| 35. Proper disposal of herd's remnants or wastes is considered a method of preventing Brucellosis? | 94% (349) | 6% (21 ) | 100% (370) |
| 36. Cleaning the environment is considered a method of preventing Brucellosis? | 96% (354) | 4% (16) | 100% (370) |
| 37. Proper meat cocking is considered a method of preventing Brucellosis? | 96% (354) | 4% (16) | 100% (370) |
| 38. Destroying infected herds and don't use its products is considered a method of preventing Brucellosis? | 91% (336) | 9% (34 ) | 100% (370) |
| 39. Reporting infected Herds is considered a method of preventing Brucellosis? | 96% (356) | 4% (14) | 100% (370) |

# Appendix 4: Attitude Items

| Appendix 4 : Attitudes towards factors enhancing brucellosis in Hebron City (n=370) | | | |
|---|---|---|---|
| **Attitude Item** | Mean | SD | (scores 5–4)% |
| 8. If livestock infected with brucellosis, we do not slaughter and consume it | 4.02 | .622 | 91 |
| 9. If livestock infected with brucellosis, we show it to the veterinarian | 4.73 | .733 | 92.7 |
| 10. If livestock infected with brucellosis, we do not treat it ourselves | 4.00 | .533 | 91.1 |
| 11. If livestock infected with brucellosis, we do not sell it to the market | 4.10 | .531 | 93.7 |
| 12. If livestock infected with brucellosis, we isolate it from the herd and slaughter and destroy it | 3.00 | 1.390 | 32.7 |
| 13. I don't boil unpasteurized milk or cheese because there is no enough time to boil it | 4.51 | .878 | 90 |
| 14. I don't boil unpasteurized milk or cheese because I like to consume fresh products | 4.23 | 1.231 | 80 |
| 15. I don't boil unpasteurized milk or cheese because boiling reduces the quality of its nutrients | 4.42 | .954 | 85.9 |
| 16. I don't boil unpasteurized milk or cheese because boiling will affect the taste and flavor | 4.37 | 1.042 | 84.4 |
| 17. I don't boil unpasteurized milk or cheese because I trust the source of milk | 4.17 | 1.265 | 78.4 |
| 18. I don't boil unpasteurized milk or cheese because Boiled milk is not suitable for making other dairy products | 4.39 | .986 | 84.1 |
| 19. Boling Milk Kills Microbes Causing Disease | 4.87 | .515 | 97.6 |
| 20. Specialists informed when a herd of livestock infected with brucellosis, especially if I a livestock breeder | 4.88 | .442 | 97.8 |
| 21. People who raise livestock are more likely to get brucellosis | 4.38 | 1.088 | 79.8 |
| 22. I think that brucellosis can be controlled | 4.51 | .783 | 90.3 |
| 23. if an animal has brucellosis, I use its milk without any processing | 4.09 | .669 | 93 |
| 24. if an animal has brucellosis, I Boil milk till 70 'c before using it | 2.83 | 1.407 | 32.2 |
| 25. if an animal has brucellosis, I will sell the milk directly to Market | 4.12 | .575 | 93.8 |
| 26. if an animal has brucellosis, I will get rid of the milk | 2.01 | 1.443 | 25.2 |
| 27. It is not of our responsibility to report infected livestock by Brucella | 4.48 | .748 | 93.2 |
| 28. I don't report infected livestock so that there are no obstacles during the sale of the affected animal if I'm are breeder | 4.30 | 1.033 | 86.2 |
| 29. I don't report infected livestock to avoid troubles from government departments | 4.31 | 1.019 | 86.8 |
| 30. I don't report infected livestock because there is no risk of | 4.48 | .790 | 93.5 |

| | | | |
|---|---|---|---|
| infection in animals | | | |
| 31. The proper way to get rid of animal aborts or wastes is feeding it to dogs | 4.08 | .620 | 91.1 |
| 32. The proper way to get rid of animal aborts or wastes is by burying | 2.28 | 1.520 | 32.9 |
| 33. The proper way to get rid of animal aborts or wastes is throwing it in the garbage | 3.86 | 1.032 | 83 |
| 34. The proper way to get rid of animal aborts or wastes is throwing it in the water stream (sewage system) | 4.10 | .665 | 91.7 |
| 35. Role of Authorities towards Brucellosis control is to provide necessary treatment for infected people | 4.90 | .425 | 98.7 |
| 36. Role of Authorities towards Brucellosis control is to educate people about the disease | 4.89 | .444 | 98.1 |
| 37. Role of Authorities towards Brucellosis control is to provide PPEs | 4.86 | .503 | 97 |
| 38. Role of Authorities towards Brucellosis control is to do regular health checkup on dairy products producers | 4.86 | .574 | 96.8 |
| 39. Role of Authorities towards Brucellosis control is to give work permissions for dairy products producers | 4.86 | .519 | 97.1 |
| 40. Hygiene is one of criteria's I follow when buying dairy products | 4.94 | .331 | 98.9 |
| 41. Cost is one of criteria's I follow when buying dairy products | 3.18 | 1.239 | 63.8 |
| 42. Quality is one of criteria's I follow when buying dairy products | 4.88 | .460 | 97 |
| 43. The source of products is one of criteria's I follow when buying dairy products | 4.84 | .555 | 95.4 |
| 44. The proximity of the store to my house is one of criteria's I follow when buying dairy products | 3.23 | 1.211 | 64.6 |
| 45. Trust of seller is one of criteria's I follow when buying dairy products | 4.76 | .747 | 93.3 |
| 46. Store License for production and sale is one of criteria's I follow when buying dairy products | 4.88 | .481 | 93.3 |
| On a scale of 1–5 marks, 1 represents- very low score, and 5 represents- full score | | | |

## Appendix 5: Practice Items

| Appendix 5 : Practices towards brucellosis disease in Hebron City (n=370) | | | |
|---|---|---|---|
| **Practice Items** | Correct Answers % (N) | | |
| | Yes | No | Total |
| 5. I wear gloves when handling with animals/livestock, or with its products. | 95% (350) | 5% (20 ) | 100% (370) |
| 6. I wear protective clothing when handling with animals/livestock, or with its products. | 94% (346) | 6% (24) | 100% (370) |
| 7. I wash my hands with soap and water when handling with animals/livestock, or with its products. | 97% (358) | 3% (12) | 100% (370) |
| 8. I use alcohol-based sanitizers when handling with animals/livestock, or with its products. | 94% (347) | 6% (23) | 100% (370) |
| 9. I manufacture dairy products myself. | 15% (54 ) | 85% (316) | 100% (370) |
| 10. I buy milk and dairy products from several sources. | 70% (260) | 30% (110) | 100% (370) |
| 11. I consume Cheese. | 97% (359) | 3% (11) | 100% (370) |
| 12. I consume Huwayrna. | 90% (331) | 10% (39) | 100% (370) |
| 13. I consume Yogurt. | 98% (364) | 2% (6) | 100% (370) |
| 14. I consume Buttermilk. | 86% (319) | 14% (51) | 100% (370) |
| 15. I consume milk. | 98% (361) | 2% (9) | 100% (370) |
| 16. I consume Butter. | 91% (338) | 8% (32) | 100% (370) |
| 17. I consume Homemade margarine ( Samneh Balady) | 92% (341 ) | 8% (29) | 100% (370) |
| 6 I get dairy milk products from the Farm. | 6.5% (24 ) | 93.5% (346) | 100% (370) |
| 7 I get dairy milk products from a Peddler. | 4.9% (18 ) | 95.1% (352) | 100% (370) |
| 8 I get dairy milk products from a homemade source. | 9.7% (36) | 90.3% (334) | 100% (370) |
| 9 I get dairy milk products from local dairy products producer. | 67% (248) | 33 % (122) | 100% (370) |
| 18. I get dairy milk products from pasteurized – Licensed- products. | 92% (341 ) | 8% (29 ) | 100% (370) |
| 19. I boil unpasteurized milk. | 96% ( 354 ) | 4% (16) | 100% (370) |
| 20. I keep milk boiling few minutes after foam appears. | 97% (345) | 3% (9) | 96% (354) |

| | | | |
|---|---|---|---|
| 21. I boil white cheese before eating it. | 76% (282) | 24% (88) | 100% (370) |
| 22. I keep cheese boiling few minutes after it boiling starts. | 94% (265) | 6% (17) | 76% (282) |
| 23. I use manure as fertilizer or for Taboon. | 21% (76) | 79% (294) | 100% (370) |
| 24. I wear gloves if I dealt with manure | 90% (69) | 10% (7) | 100% (76) |
| 25. I wash my hands with soap and water if I deal with manure. | 93% (71) | 7% (5) | 100% (76) |
| 26. I wear PPEs if I deal with manure. | 89% (68) | 11% (8) | 100% (76) |
| 27. I use hand sanitizer /or alcohol hand rap if I deal with manure. | 90% (69) | 10% (7) | 100% (76) |

# Appendix 6: MOH Study Approval

State of Palestine
Ministry of Health
General Directorate of Education in
Health and Scientific Research

دولة فلسطين
وزارة الصحة
الإدارة العامة للتعليم الصحي
والبحث العلمي

Ref.: .....
Date:.....

الرقم: ٢٠٢١/٧٧٤/٦٢٥
التاريخ: ٢٠٢١/٩/٢٨

الأخ مدير عام الادارة العامة للرعاية الصحية الأولية المحترم ،،،

تحية واحترام،،،

الموضـــوع: تسهيل مهمة بحث

مرفق طلب تسهيل مهمة **الطالب: اياد زياد سعدي ابو رميله– ماجستير الأمراض المعدية/ جامعة القدس**، وباشراف د. خلدون بدر، في عمل بحث رسالة الماجستير بعنوان:

**Evaluation of Brucellosis preventive measures among patients with "**

**"Brucella infection in West Bank**

من خلال السماح للطالب بجمع معلومات بمرض الحمى المالطية في منطقة الخليل، وذلك في:

- **مديريات صحة الخليل (شمال– وسط– جنوب)**

على ان تكون المعلومات والبيانات لأغراض البحث العلمي فقط وتحت طائلة المسؤولية.
على ان يتم الالتزام بجميع تعليمات واجراءات الوقاية والسلامة الصادرة عن وزارة الصحة بخصوص جائحة كورونا، وتحت طائلة المسؤولية.
على ان يتم تزويد الوزارة بنسخة PDF من نتائج البحث، التعهد بعدم النشر.

مع الاحترام،،،

د. عبد الله القواسمي
مدير التعليم الصحي والبحث العلمي

نسخة: عميد كلية الصحة العامة المحترم/ جامعة القدس

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تلفاكس: 09-2333901

# Appendix 7: Ethical Committee Approval from Al-Quds University

Al-Quds University
Jerusalem
School of Public Health

جامعة القدس
القدس
كلية الصحة العامة

التاريخ:2022/3/29

عزيزي الطالب اياد ابو ارميله المحترم
برنامج ماجستير: الوقاية وضبط الامراض المعدية

الموضوع: موافقة لجنة اخلاقيات البحث العلمي

قامت اللجنة الفرعية لأخلاقيات البحث التابعة لكلية الصحة العامة بمراجعة مشروع الرسالة

بعنوان:

" Brucellosis KAP among community milk products producers and Consumers in Hebron City"

المقدم من (مشرف الرسالة/ د. خلدون بدر).

يعتبر مشروعك مستوفيًا لمتطلبات أخلاقيات البحث في جامعة القدس.

نتمنى لكم كل التوفيق في تسيير المشروع.

رئيسة لجنة اخلاقيات البحث
د. نهى الشريف

كلية الصحة العامة
Faculty of Public Health

نسخة/ أعضاء لجنة البحث
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فرع غزة / تلفاكس 08-264420-2644210
ص.ب. 51000 القدس

**المعرفة والمهارات والممارسات المتعلقة بداء الحمى المالطية بين منتجي ومستهلكي منتجات الألبان المحلية في مدينة الخليل**

**إعداد: إياد زياد سعدي أبو ارميلة.**

**المشرف: د. خلدون بدر**

## الملخص

**المرجعية:** يلعب مستهلكو ومصنعو منتجات الألبان دور هام في الوقاية من "الحمى المالطية" بين العائلات لذلك يجب التركيز الخاص لهاتين الفئتين من خلال تعزيز معرفتهم وسلوكهم المتعلق بالمرض وكيفية الوقاية منه. حيث يجب أن تعكس الممارسات للتدابير الوقائية الفعَالة ضد انتشار مرض الحمى المالطية مثل غلي الحليب ومنتجاته بالشكل المناسب.

**الهدف:** لتقييم مستوى KAP المتعلقة بالحمى المالطية بين المستهلكين ومنتجي منتجات الألبان المحلية في مدينة الخليل.

**المواد والأساليب:** أجريت هذا لدراسة في مدينة الخليل حيث قد استهدفت المواطنين البالغين الذين يستهلكون منتجات الألبان والذين يرتادون عيادات الرعاية الصحية التابعة لوزارة الصحة بالإضافة الي منتجي منتجات الألبان في المجتمع. حيث تضمن البحث نوعين من الأبحاث: دراسة كمية استهدفت مستهلكي منتجات الألبان ودراسة نوعية استهدفت منتجي الألبان. تم جمع البيانات باستخدام استبيانين في هذه الدراسة؛ الأول هو استبيان بمساعدة باحث تم ملؤه لمستهلكي منتجات الألبان لتحديد خصائصهم الديمغرافية و مستوى KAP لمرض الحمى المالطية، وطرق الوقاية، أما الثاني فهو استبيان نوعي استهدف منتجي منتجات الألبان المحليين الذي احتوى على ثلاثة أسئلة رئيسية مع أسئلة فرعية (أسئلة فرعية للمزيد من التفاصيل) وتم اجراؤه من خلال العديد من المقابلات وجها لوجه مع المشتركين، حيث تم تحليل البيانات ومعالجتها من خلال برنامج SPSS وتم الحصول على الإحصاءات الوصفية وتحديد العلاقات والارتباطات مع مستوى KAP وتم اجراء تحليل الانحدار لتحديد العلاقات النهائية مع مستوىKAP .

**النتائج:** في الجزء الكمي من الدراسة تم أخذ عينة ل ٣٧٠ شخصًا قاموا بملء الاستبيان في ١٤ عيادة وفي الجزء النوعي تم إجراء ٧ مقابلات مع منتجي منتجات الألبان. في الجزء الكمي، كان ٦٤% من المستجيبين فوق سن الأربعين وكان ٥٢% منهم ذكورًا، و٨٨,٩% متزوجين، و٧٧,٦% لديهم دخل أقل من ٣٠٠٠ شيكل. بلغ ٢٣,٨% عن وجود تاريخ إصابة سابقة بمرض الحمى المالطية في العائلة، وأفاد ١٠,٥% فقط بوجود قطعان حيوانات في محيطهم، و٤٧,٨% يعانون من أمراض مزمنة مثل ارتفاع ضغط الدم أو مرض السكري. فيما يتعلق بمستوى KAP كانت المعرفة ٦٩%، ودرجة المواقف ٤,٢١، ودرجة الممارسات ٨٤ %.

في الجزء النوعي تم إجراء ٨ مقابلات ووضحت النتائج أن أعمار المشاركين تراوحت ما بين ٣٠–٧٠ عامًا، وكان ٦٢% (٥ من أصل ٨ منتجين) لديهم تعليم ثانوي، و٧٥% (٦ من أصل ٨ منتجين) ورثوا هذه المهنة عن أجدادهم، بينما ٢٥% فقط (٢ من أصل ٨ منتجين) قد تعلموا كيفية إنتاج منتجات آمنة. وحيث ان ٥٠% (٤ من أصل ٨ منتجين) ليس لديهم ترخيص عمل من وزارة الصحة. أما فيما يتعلق بعملية الإنتاج، فقد وجدنا أن الطريقة المعتادة لإنتاج منتجات الألبان لا تشمل غلي الحليب بدرجة حرارة تصل إلى ٧٠ درجة مئوية، بل تبلغ فقط حوالي ٣٠ درجة مئوية، ويعتمد المنتجون على تطعيم قطعان الحيوانات. وأشار ٧٥% (٦ من أصل ٨ منتجين) ممن تم مقابلتهم إلى أن غلي الحليب و الجبنة أمران مهمان للغاية.

**الخاتمة:**

تعد هذا الدراسة فريدة من نوعها حيث تهتم في المعرفة والمواقف والممارسات لدى المشاركين في المجتمع باستخدام أدوات نوعية وكمية لقياس مستوى KAP ودراسة عوامل الخطر التي تؤثر على مستوى KAP ، والعوامل الاجتماعية والاقتصادية، والمعرفة العامة، والممارسات والمواقف.

**التوصيات:** رفع مستوى الوعي في المجتمع للوقاية والسيطرة على مرض الحمى المالطية. واستهلاك الحليب المبستر ومنتجات الألبان. بالإضافة الي تعزيز التنسيق بين ووزارة الصحة ووزارة الزراعة وخدمات الطب البيطري فيما بتعلق بالوقاية ومكافحة مرض الحمى المالطية.