A study of brucellosis in Fayoum

Thesis presented
By

Mohammed Masoud Said Desokey

(M.B.B.Ch.)

For the degree of Master

In Public Health

Under the supervision of

Prof. Dr. Ibrahim Soliman Hegazy

Professor of public health

Faculty of Medicine

Cairo University

Prof. Dr. Hanan Abdel-Ghani El-Raghi

Professor of public health

Faculty of Medicine

Cairo University

Prof. Dr. Monera Mahmoud El-Kholi

Assistant Professor of public health

Faculty of Medicine

Cairo University

Faculty of Medicine

Cairo University

2009

Acknowledgement

Firstly, I am extremely grateful and thankful to **Allah** who gave me the ability and the power to finish this work.

I am really happy to grasp this opportunity to express my sincere appreciation and deep gratitude to **Prof. Dr. Ibrahim Soliman Hegazy,** Professor of public health**,** Faculty of Medicine**,** Cairo University for his faithful guidance and supervision during the course of this work. It is a pleasure to record my thanks to him for his continuous help and encouragement throughout this research.

My sincere thanks and gratitude to **Prof. Dr. Hanan Abdel-Ghani El-Raghi**, Professor of public health, Faculty of Medicine, Cairo University for her supervision, valuable advises and scientific help.

Thanks to **Prof. Dr. Monera Mahmoud El-Kholi,** Assistant Professor of public health, Faculty of Medicine, Cairo University for her supervision and participation in this work.

Also, I wish to thank every body who helped me throughout this research, particularly health workers in Fayoum fever hospital and all patients interviewed during the study. Finally, great thanks to my family who supported me during this work.

Abstract

Introduction: Brucellosis is still an endemic disease in animals and human in Fayoum.

Aim and objectives: This descriptive study was conducted in Fayoum fever hospital to determine some epidemiological characteristics of ***Brucella*** infection.

Subjects and methods: Available recorded data for admitted brucellosis patients, during period of two years (from 1/1/2006 to 31/12/2007) were extracted using a data collection form, and the newly diagnosed cases of ***Brucella***, during the six month period of the study (from 1/2/2008 to 31/7/2008), were interviewed by using a questionnaire form.

Results: The findings of the present study revealed that, most of patients were above age of 15 years old [(86.2 %) of recorded and (90.6 %) of interviewed cases]. Females constituted (59.7 %) of the interviewed cases. Most of patients live in rural areas; this is similar in recorded (92.2 %) and interviewed (93.3 %) cases, with (64.4 %) of interviewed patients raised animals at home or on a separate place. Most of recorded patients (76.5 %) were reported during period from March to October. The most observed symptoms among interviewed patients were fever (100 %), malaise (98 %), arthralgia (92.6 %), headache (91.7 %) and bony aches (91.3 %). Consumption of unpasteurized milk and milk products was found in majority (92.6 %) of interviewed cases while (73.8 %) of patients, due to their occupations, had history of contact with animals.

Conclusion: This study emphasized that brucellosis represents a significant public health problem in Fayoum governorate.

Key words: Brucellosis, ***Brucella*** infection, females, rural, occupation, relapse, unpasteurized milk, contact with animals.

Contents

List of abbreviations

AFI	Acute febrile Illness
AIDS	Acquired Immunodeficiency Syndrome
AVMA	American Veterinary Medical Association
B. abortus	Brucella abortus
BAPA	Buffered Acidified Plate Antigen
BACTEC 9204 and Bac/Alert	Semi-automated blood culture systems seem to shorten the time needed to detect organisms from blood and other body fluids
BBAT	Buffered Brucella Antigen Test
B.C	Before century
B. canis	Brucella canis
B. cetaceae	Brucella cetaceae
B. ceti	Brucella ceti
B. maris	Brucella maris
B. melitensis	Brucella melitensis
B. neotomae	Brucella neotomae
B. ovis	Brucella ovis
B. pinnipediae	Brucella pinnipediae
B. pinnipedialis	Brucella pinnipedialis
BSIs	bloodstream infections
B. suis	Brucella suis
BW	Biological weapon
CDC	Centers for Disease Control and Prevention
CFSPH	Center for Food Security and Public Health
CFT	Complement Fixation Test
cfu	Colony forming unit
CSF	Cerebrospinal fluid
CSR	Communicable disease Surveillance and Response
CT	Computed Tomography
DNA	Deoxyribonucleic acid
EC	European Commission
ELIZA	Enzyme-linked Immunosorbent Assay
EMC	Emerging and other Communicable Diseases, Surveillance and Control
ESCD	Enhanced Surveillance for Communicable Diseases

ESUE	Epidemiology and surveillance unit of Egypt
EU	European Union
FAO	Food and Agriculture Organization
HIV	Human Immunodeficiency Virus
HPA	Health protection agency Centre for Infections
ICSP	International Committee on Systematics of Prokaryotes
IELIZAs	Indirect Enzyme-linked Immunosorbent Assays
IgG	Immunoglobulin G
IgM	Immunoglobulin M
IUFD	Intrauterine Fetal Death
KSA	Kingdom of Saudi Arabia
MERC project	Middle East Regional Cooperation project
MOHP	Ministry of Health and Population of Egypt
MZCP	Mediterranean Zoonoses Control Program
OIE	Office International des Epizootics
PCR	Polymerase chain reaction
PHC	Primary Health Care
PUO	Pyrexia of Unknown Origin
RBT	Rose Bengal Test
R-LPS	Rough- lipopolysaccharide
SATs	Serum agglutination Tests
spp.	species
S-LPS	Smooth-lipopolysaccharide
TAHRP	Tri-national Animal Health research Project
TAT	Tube Agglutination Test
TMP/SMX	Trimethoprim–sulfamethoxazole
TNF	Tumour necrosis factor
USA	United state of America
USAMRIID	United State Army Medical Research Institute of Infectious Disease
USDA	United State Department of Agriculture
USSR	Union of Soviet Socialist Republics
WHO	World Health Organization
Y. enterocolitica	Yersinia enterocolitica
Z-N	Ziehl-Neelsen

List of Tables

List of figures

Definitions

- **Zoonosis:**

Zoonosis is any disease or infection that is naturally transmissible from vertebrate animals to humans ***(WHO, 2009c)***.

- **Control:**

Control of the disease is pursued by measures designed to reduce the disease occurrence in populations. The aim of an animal control program is to reduce the impact of a disease on human health and the economic consequences. The elimination of the disease from the population is not the objective of a control program, and it is implicit that some "acceptable level" of infection will remain in the population ***(WHO, 2006)***.

- **Eradication:**

Eradication in veterinary practice means the regional extinction of an infectious agent ***(EC, 2001)***.

- **Elimination:**

Elimination refers to the reduction in the incidence of the disease below the level achieved by control, so that either very few or no cases occur, although the infectious agent may persist ***(EC, 2001)***.

- **Surveillance**:

Surveillance consists of systematic collection, collation, analysis, interpretation and prompt dissemination of data on specific diseases or syndromes to those who need to know, for relevant action to be taken. The main purpose of a surveillance system is to determine the need for immediate or longer-term actions in response to diseases and to provide information to optimize the use of the available resources through data analysis, determination of priorities, design of alternative actions, and determination of their likely costs and benefits ***(WHO, 2006)***.

Introduction

Brucellosis, a bacterial disease caused by members of the genus ***Brucella***, is an important zoonosis. It affects a wide variety of mammals causing significant reproductive failure which may lead to enormous economic losses ***(Corbel, 1997a; CFSPH, 2007)***. ***Brucella*** organism is small, non-capsulated, non-motile, non-spore forming, aerobic, gram-negative coccobacilli that are able to invade, survive and even replicate in cells of the monocyte-macrophage system. It was firstly isolated by David Bruce from spleen of British soldiers in 1887 in Malta ***(Cutler et al., 2005; Mantur et al., 2007).***

There are six named species of ***Brucella***; ***Brucella melitensis*** is found in sheep and goats; ***B. abortus*** in cattle; ***B. suis*** in pigs; ***B. canis*** in dogs; ***B. ovis*** in sheep and ***B. neotomae*** in rodents. Recently, other ***Brucella*** species were isolated from marine mammals. But species considered important agents of human disease are ***B. melitensis***, ***B. abortus***, ***B. suis*** and ***B. canis (CFSPH, 2007)***.

Humans contract brucellosis through ingestion of infected animal products, contact with infected animals and its materials, and through the inhalation of infected aerosolized particles ***(CDC, 2007; WHO, 2009a)***. Person-to-person spread of brucellosis is extremely rare. But it can be transmitted through breast feeding, transplacental route, sexual contact and tissue transplantation ***(CDC, 2007)***.

Humans may develop numerous symptoms in addition to the usual ones of fever, malaise, headache, sweats, rigors, weight loss, arthralgia and muscle pain ***(Mantur et al., 2006; Purcell et al., 2007)***. Osteoarticular complications occur in 20-60 % of cases; peripheral arthritis and sacroiliitis are the most frequent joint manifestations. Genitourinary involvement is seen in 2-20 % of cases; orchitis and epididymitis are common manifestations. Also, abortion,

IUFD, premature labor can occur. The case fatality rate of untreated brucellosis is < 2 % and usually results from endocarditis caused by ***B. melitensis (Heymann and Thuriaux, 2004; Pappas et al., 2005; WHO, 2006)***. However, Because of the predilection to affect joints and the vague symptoms and chronic nature of the disease, symptoms can result in relatively long-term disability ***(Maloney, 2008; Al-Nassir et al., 2009)***.

Diagnosis of brucellosis depends on the presence of history of exposure to infection, clinical picture with a positive blood culture or tissue culture and/or detection of raised ***Brucella*** agglutinins in the patient serum. Most authorities consider an agglutinin titre of 1/160 or higher to be significant in a symptomatic patient ***(WHO, 2006)***. However, some consider that titres of 1/320 to 1/640 or higher are significant especially in endemic areas ***(Madkour, 2003)***.

Human brucellosis is usually treated by combination of doxycycline and rifampicin for 6 weeks to prevent reoccurring infection. Depending on time of treatment and severity of illness, recovery may take a few weeks to several months ***(CDC, 2007)***.

The true global incidence of human brucellosis is difficult to determine due to the lack of disease reporting and notification system in many countries ***(Corbel, 1997a)***. But the disease incidence worldwide is estimated at more than 500,000 infections per year ***(WHO, 1997; Pappas et al., 2006)***. Nowadays the disease is rare in the United States of America (USA) and in many other industrialized nations because of routine screening of domestic livestock and animal vaccination programs ***(Pappas et al., 2006)***. However, the disease is still a leading zoonosis with social and economic importance in the countries of the Eastern Mediterranean Region ***(Abdou, 2000)***.

Brucellosis is endemic in Egypt; infecting cattle, buffaloes, sheep, goats, camels, pigs, horses, donkeys and mules ***(WHO/MZCP, 1998)***. It was first

reported in animals in 1939. But attention to the disease was increased during the 1960s with the importation of Friesian cows as the incidence of brucellosis in the cattle became very high ***(Refai, 2002)***. ***B. melitensis***, ***B. abortus*** and ***B. suis*** are responsible for the infections ***(WHO/MZCP, 1998)***. But ***B. melitensis*** particularly biovar 3 is the most commonly isolated species from animals in Egypt ***(Refai, 2002)***.

The Epidemiology and Surveillance Unit of the Egyptian Ministry of Health and Population has recorded a substantial increase in the number of patients with brucellosis in the recent past, from 24 cases in 1988 to 1429 in 1998 ***(ESUE, 2001)***. An earlier report (1992) described the distribution pattern of human cases of brucellosis during the period 1982–91: the infection rate was generally low except in 1987 and 1991, when there were marked increases in numbers of cases. This was clearly observed in Alexandria and Menofiya, and also in Giza and Domiyat ***(Wassif, 1992)***.

Most Middle-Eastern countries have already attempted to control the disease in ruminants by using various strategies with vaccination as the main measure of control. The control of the disease in cattle in most countries of the region is based on serological surveillance of target animals, followed by slaughtering of positive animals (test-and-slaughter policy) and vaccination of heifers with a full or reduced dose of ***Brucella abortus*** strain 19. These efforts were reported, in some cases, to significantly reduce the incidence of the disease in cattle in some countries like Egypt ***(Refai, 2002)***.

On the other hand, the incidence of brucellosis in sheep and goats, though reported for many years in almost all countries of the Middle-Eastern region, is still high and sporadic efforts are still made to control the disease. The test-and-slaughter policy, applicable to individual reactors only, has proven to be entirely ineffective and unreliable. This is due to the difficulty encountered by the veterinary services in identifying, vaccinating and monitoring infected

flocks, and in controlling their movements. Also, the total elimination of positive flocks, though most effective, fast and economic on the long run, but it is not practical because of high cost at once and difficult provision of replacement ***(Refai, 2003a)***.