PREVALENCE OF SEROPOSITIVITY OF BRUCELLOSIS AMONG OCCUPATIONALLY EXPOSED WORKERS

By

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Abstract:

Objectives: The purpose of this study was to investigate the seroprevalence of brucellosis among high-risk individuals, consisting of veterinarians, para-veterinarians, butchers and animal services workers. **Methods:** The present work was carried out at El Nil health insurance hospital, by using the recently developed indirect enzyme-linked immunosorbent assay (ELISA) for antibodies to Brucella abortus for high risk individuals with occupational exposure to animals (220) workers in addition to detailed history and clinical examination was done for included group. **Results:** seropositive group was in the age group of 20 up to 30, while majority of the negative group was above 40 years , with statistically significant difference in between. Seronegative group had longer work duration and shorter working hours compared   to seropositive group with statistically significant difference in between . Animal services workers had the highest prevalence of seropositivity among other groups, followed by veterinarians assistant or support workers. More than 45% of the studied seropositive cases were asymptomatic, while fever only found in 2 cases out of 35 seropositive (5.7%). Low back pain was the second most frequent symptom among the studied cases. Working in animal services in addition to   young age (less than 30 years) and working hours more than 5 hours per day were considered the most important independent predictors of seropoisitivity. **Conclusions:** younger age groups together with longer working hours correlated with seropositivity, Majority of seropositive cases were asymptomatic and this necessitate routine serology for diagnosis among high risk workers . The highest prevalence of seropositivity was present among animal services and veterinarian support workers.

Keywords: Brucellosis, professional hazard, seroprevalence, indirect enzyme-linked immunosorbent assay, zoonosis

Background

Brucellosis is one of the world's major zoonosis that continues to be of public health and economic concern in many parts of the world. The disease is usually transmitted from infected animals to man by direct contact or by consumption of raw milk infected with Brucella organisms (Ajay and Nanu 2005) . Brucellosis is considered an occupational disease. Primarily a disease of animals, it is transmitted directly or indirectly to man. Dairy workers, shepherds, veterinarians, abattoir workers and animal husbandry personnel are particularly at risk. It constitutes an uncontrolled public health problem in many developing countries

Brucella organisms are shed in milk, urine and vaginal discharges and they thereby contaminate the environment. The infection occurs through the ingestion of unboiled milk of infected animals, contact with vaginal discharge, urine, feces and blood of infected animals, through skin and mucous membrane as conjunctiva and also by inhalation (Alton et al, 1975). Brucellosis is of particular concern in Egypt because nearly 70% of Egyptian population resides in rural areas in close contact with animals like cattle, sheep, goat etc (Ahmed et al, 1992). The global picture of Brucellosis has shown resurgence especially in USA (Cooper 1991). Brucellosis has become a major public health concern in the Saudi Arabia and the Middle East countries, as they are a traditional bedouin pastoralist society (Handa et al 1998).

Egypt is an agricultural country and exposure of human beings to animals is quite high and lead to fever of unknown origin among occupationally exposed and unexposed groups (Waasif, 1992). In spite of this, limited studies on brucellosis have been undertaken in an occupationally-exposed group. Hence, the present study was conducted to assess the seroprevalence of antibodies to Brucella abortus in individuals who are in contact with animals because of their occupation. The study group involved the screening of high-risk group individuals from Kaliobia governorate slaughter houses for antibodies to Brucella abortus .

Material and methods

Sampling plan

All the available exposed group of workers from 3 slaughter houses belonging to EL Nil health insurance hospital for periodic medical examination in addition to serology screening for brucellosis according to the Egyptian law for occupational diseases.

Type of the study:

Cross sectional study

Methods

Blood samples were collected from 220 employees of Department of Animal husbandry and Veterinary Services from Shubra El khima, and Kaliobe butchers. Out of this, 120 were butchers, 100 were veterinary inspectors and animal services workers (40 veterinarians, and 60 workers). A detailed history of these individuals was collected which included their name, age, occupation, nature of work, history of consumption of raw milk, history of fever (nature and duration) in the past and complaints of joint pain, if any.

Serum was collected from all subjects and analyzed in two steps.

Step one

Rose Bengal plate test (RBPT) was performed

Step two

The standard tube agglutination test (STAT) was performed for seropositive cases by Rose Bengal test. The antigen required for both tests was procured from the Institute of Animal Health and Veterinary Biological, A titer of 1:80 or greater was taken as an index of seropositivity (Handa , et al 1998).

Ethical consideration

- Oral consent was obtained from all the studied workers,

- Confidentiality of information obtained

- Freedom of choice to participate

Statistical methodology

Analysis of data was done by IBM computer using SPSS (statistical program for social science version 12) as follows .Description of quantitative variables as mean, SD and range. Description of qualitative variables as number and percentage. Chi-square test was used to compare qualitative variables between groups. Student t-test of two independent samples was used to compare two groups as regard quantitative variable. Logistic regression analysis was done to find out the most important independent predictors of seropositivity. Significance value (p) was >0.05 insignificant results , P<0.05 significant results, P<0.01 highly significant results (M Clinton, et al 1992).

Results

Table (1a) Comparison between both groups as regard age

Age	Seronegative N=185	Seropositive N=35	P
Age			
<20	20(10.8%)	12(34%)	
21-30	30(16.2%)	15(42.8%)	
31-40	87(47%)	4(11.4%)	**<0.05**
>41	48(25.9%)	4(11.4%)	S
Age (mean±SD)	43±11	33±12.6	

Table (1b) Comparison between both groups as regard general data

General data	Seronegative N=185	Seropositive N=35	P
Working duration(yrs)	10.4±4	8±4	**<0.05** S
Working hours	4.2±2	6±2	**<0.05** S
Smoking index	376±130	390±150	>0.05 NS

S: significant

N S: Non significant

Table (2) Comparison between both groups as regard nature of work

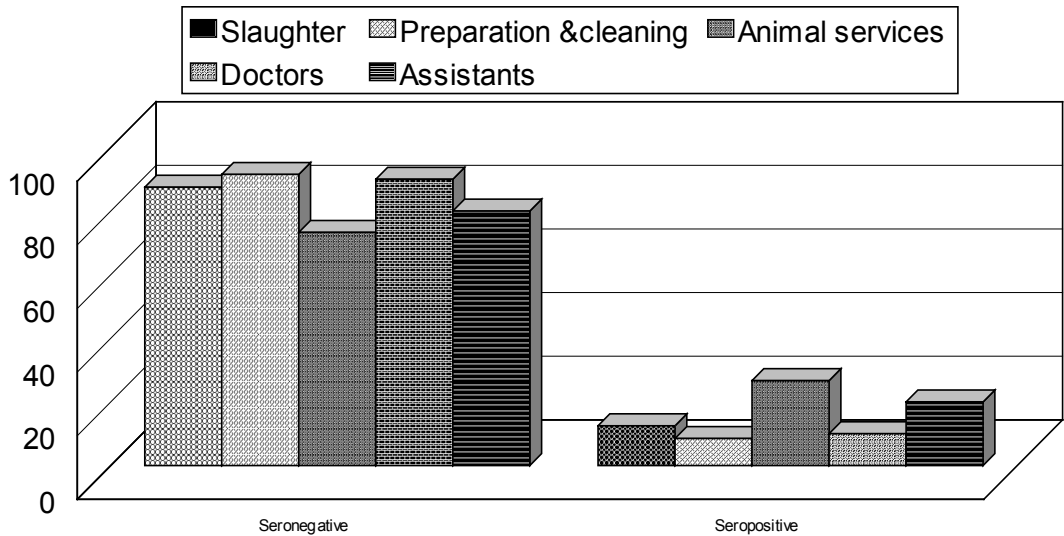| Variables	Seronegative N=185	Seropositive N=35	X²	P
Butchers (120)	**108(90%)**	**12(10%)**	**9.2**	**<0.05**
Slaughter (40)	35(87.5%)	5 (12.5%)		
Preparation &cleaning (80)	73(91.5%)	7(8.5%)		**S**
Animal services (60)	**44(73.3%)**	**16(26.7%)**		
Veterinarian supervisors (40)	**33(82.5%)**	**7(17.5%)**		
Doctors (10)	9(90%)	1(10%)		
Assistants (30)	24(80%)	6(20%)		

S: significant

Figure (1) Distribution of the different jobs according to serology results

Table (3) Distribution of the studied cases as regard symptoms

Symptoms	Total	Seronegative N=185	Seropositive N=35	X²	P
Asymptomatic	186	170 (91.8%)	16 (45.7%)	**75**	**<0.001 HS**
Fever	2	0	2(5.7%)		
Low back pain	14	4 (2.1%)	10(28.5%)		
Fatigue	19	11(5.9%)	8(22.9%)		
Anorexia	9	2(1.08%)	7(20%)		

HS: Highly significant

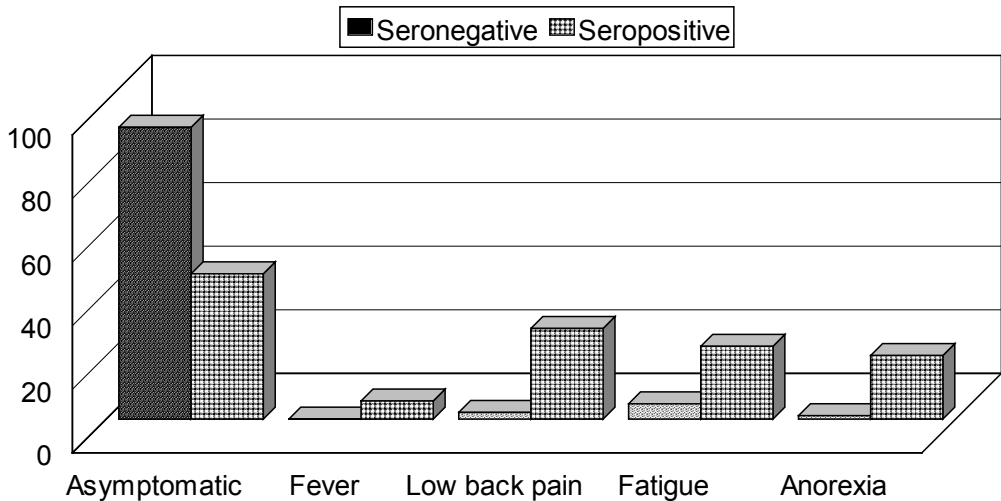Total: not mutually exclusive due to combination of symptoms

Figure (2) Distribution of seropositive cases as regard symptoms

Table (4) Relation between different risk factors and seropositivity by logistic regression analysis

Variables	Beta-coefficient	P	0dd›s (95%CI)
Working in animal services	0.97	**<0.01**	3.5(1-15.6)
Age (less than 30)	-0.56	**<0.05**	1.8(1-8.7)
Working hours > 5hours	0.48	**<0.05**	2.1(1-12.3)

Results

Table (1) shows that majority of the seropositive group was in the age group of 20 up to 30, while majority of the negative group was from 30 to 40 years old with statistically significant difference . Average working duration was 10 years nearly in seronegative group compared to 8 years in seropositive group with statistically significant difference in between.

Average working hours was 4 hours in seronegative group compared to average of 6 hours in serpositive group with statistically significant difference in between by using unpaired t-test. Smoking index (number of cigarettes per day x duration of smoking) was 376 in seronegative compared to 390 in seropositive group with no evidence of significant difference. As regard gender, all the studied workers were males.

Table (2) shows that animal services workers had the highest prevalence of seropositivity among other groups, followed by veterinarians assistant or support workers. Only one doctor shows positive serology out of 7 veterinarian supervisors. Slaughter butchers had higher prevalence than preparation workers 5 workers out of 12 with statistically significant difference.

Table (3) shows that more than 45% of the studied seropositive cases were asymptomatic, while fever only found in 2 cases out of 35 seropositive (5.7%). Low back pain was present in 28.5% of the studied cases. About 22.9% of the studied cases had vague symptoms like fatigue and most cases had more than one symptom so the total more than 35 (not mutually exclusive, because some workers had combination of symptoms). About 20% of the studied cases had anorexia in combination either

with fatigue or low back pain. Seropositive group had a higher prevalence of symptoms compared to seronegative with highly statistically significant different between both groups.

Table (4) shows that seropositivity was common among workers who are working in animal services (cleaning, care and feeding) their age was less than 30 years and exposed for more than 5 hours/ day.

Discussion

Brucellosis is diagnosed either by isolation of Brucella organism in culture or by a combination of serological tests and clinical findings consistent with brucellosis. Isolation of the Brucella organism is the definitive means of diagnosis but in practice it is difficult due to the early tissue localization, exacting culture requirements of the organism and also prolonged time required for isolation. In practice blood cultures are positive in 10-30% of brucellosis and the remainder is diagnosed serologically (Alton et al, 1975).

The current study included 220 high risk workers for occupational Brucella infection. The mean age of the studied group was 37+15 and all were males. By comparison of both seropositive and seronegative groups it was concluded that, younger age group less than 30 years had highest

prevalence of seropositivity among all other age groups (42.8%) and 34% below the age of 20 years with statistically significance . These results agreed with the study done by Ajay and Nanu , 2005, in India which includes 386 slaughter workers and animal breeder farmers. They concluded that younger age group less than 30 years had higher prevalence of seropoisivity (35%) compared to the other subgroups. These results could be due to three main factors, the first was less experience in dealing with animals and more exposure , more liable for risky work behavior, and also on immunological basis. Prolonged exposure to the Brucella organism leads to formation of some antibodies which may participate in protection against the infection, as confirmed by a study by Charif et al, 2001 which study immunological characteristics of Brucellosis in occupationally exposed workers.

Concerning work duration, seropositive group had a shorter work duration compared to seronegative with good evidence of significant difference in between. These results may be due to tendency that, new workers usually were included in heavy jobs with higher chance to get the infection especially for assistance and support workers. On the other hand lack of training or experience may play a role in liability for

infection. These results agreed with a study by Shama, et all 2000. The latter study included 200 butchers and veterinarians workers, the average work duration of seropositive group was about 7+2 years. Another study by, Wise 1980 in USA about Brucellosis risk factors, he concluded that, less experient workers, or younger groups were more liable for infection.

Concerning working hours, the average working hours in the seropositive group was 6 hours/ day compared to 4 hours in the seronegative group with statistically significant difference. In a study by Kumar, 1997 working hours among the seropositive group was longer than seronegative group (8 hours and 6 hours) respectively. These results may be due to nature of job of majority of seropositive group as animal services and support workers.

As regard seropositvity prevalence, animal services workers, 16 workers out of 60 workers were seropositive (26.7%) compared to other subgroups (table (2) followed by support workers or veterinarian assistants. These results partially agreed with an Indian study by Kapoor et al, 1985. He concluded that butchers were the most frequently infected group followed by animal services group. These results may be due to nature of work of animal service workers or veterinarian

assistance. These jobs require close contact not only with animal carcasses for cleaning, but also close contact with living animals and animal excreta. Another very important issue was observed during carrying out the current study, which is eating, drinking and smoking, in the same workplace by contaminated hands. Those workers are exposed to infection by all routes. Concerning butchers, in the current study 12 butchers out of 120 butchers were seropositive (10%). Blood and secretions contact are considered the major sources of the organism. Skin contact was considered the major route of infection due to ability of brucella abortus to penetrate intact skin. Butchers also are exposed indirectly to the infection by eating, drinking or smoking with contaminated hands. As regard doctors in the current study only 1 doctor out of 10 is seropositive this may be explained that doctors were more oriented by mode of transmission of the disease and the possible use of protective measures.

Concerning symptoms, 45% of the studied seropositive group (35) were asymptomatic . Low back pain and fatigue were the most prevalent symptoms among other symptoms (28.5, 22.9%) respectively. These results in agreement with a study by Kiel , et al 1987 in Sudia Arabia which concluded that 50% of the seropositive

group of veterinarians were asymptomatic. While fatigability and low back pain were considered the most frequent symptoms. So there is a difficulty in diagnosis of brucellosis due to no specific or typical symptoms were found especially in occupational exposure. Fever was only found in 5.7% of seropositive cases and this may be due to repeated exposure make the cases either subclinical or very mild symptoms and not typical. And this raises the attention of the rule of serology in diagnosis of Brucellosis not based on the clinical data only. In the current study , logistic regression model was performed to find out the most important independent predictors of seropositivity and it is concluded that working in animal services job as described above, with odd's ratio (3.5) and 95% CI was 1-15.6 in addition to young age and working hours more than 5 hours daily increase the risk of seropisitvity.

Conclusions

This study showed that, younger age groups were more susceptible for brucella abortus infection, in addition to working more than 5 hours per day. On the other hand majority of seropisitive cases were asymptomatic (45.7%) and low back pain was the most frequent symptom among seropositive cases. Workers in animal services and veterinarian support were the most frequently infected subgroups (26.7% and 20% respectively).

Recommendations:

- To increase workers awareness about the disease symptoms and possible preventive measures.

- Environmental hygiene (proper cleaning, ventilation and disinfection) of animal slaughter houses.

- Emphasis on periodic serological screening for occupationally exposed workers.

- Elimination of the infection in animals by vaccination to produce Brucella free animals.

- To pay attention about unsafe behaviors as eating, drinking and smoking during the work with contaminated hands.

- To increase workers awareness about value of personal protective equipments in prevention of the disease.

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