

**PREVALENCE OF *LEPTOSPIROSIS* AMONGST SLAUGHTERHOUSE WORKERS AND BUTCHERS IN SANA'A CITY-YEMEN**

**Abstract**

Zoonotic infections can be work-related risks to people who labor in nearby connection with animals. The goals of present study were to find out the prevalence of *leptospira* antibodies and impact factors of *leptospirosis* among this risk groups in Sana'a city. A 267 serum samples were assembled from the study groups and a written record was completed for all workers to record individual and behavioral information. The sera were tested for *leptospirosis* IgG antibodies by commercial ELISA technique. The acquired data illustrated that 100% of individuals did not employ at all personal protective equipments (masks, gloves, overalls and boots) and 100% of participants had absolutely not used disinfectants to their blades and hands, while 10% be aware of they were at risk of zoonotic infections like *leptospirosis* only. The seroprevalence of *leptospirosis* was 41.3%. There was highly significant associated between positive of IgG antibodies and older age (median>27 years) (OR= 3 times, PV<0.001), work history median > 8 years (OR=2.8 times, PV<0.001) and history of >5 times cut in the last year (OR=3.7, PV<0.001). In conclusion: the present of *leptospira* IgG antibodies among slaughter-house workers and butchers in Sana'a city is relatively common, similar to that reported previously from Yemen, and from neighboring countries among risk groups. Encouraging universities in Yemen to undertake active disease surveillance because these efforts will eventually allow policy makers and other authorities to convert knowledge into policy by set appropriate evidence foundation priorities in the field of *Leptospirosis* disease control and prevention.

**KEYWORDS:** Seroprevalence, *Leptospirosis*, Butchers, Slaughterhouse Workers, Sana'a city-Yemen

**Introduction**

Numerous zoonotic diseases are occupational risks be opposite by persons who approach into close contact with animals and their carcasses. The possibility of get in touch with animal pathogens whilst working depends on a variety of aspects, for instance the health of the animals, the kind of job executed the incidence of make contact with animals, and/or their tissues and carcasses, the employ of personal and environmental protective measures, and the manners and levels of awareness of the people at risk<sup>[1]</sup>. Slaughterhouse workers and butchers are on elevated risk of contracting zoonosis. In Yemen, previous studies have recognized zoonosis similar to leptospirosis and brucellosis, such as potential occupational hazards for slaughterhouse workers<sup>[2,3]</sup> *Leptospirosis* is a widespread infections that involves both humans and animals.<sup>[1]</sup> *Leptospira* spp., can be spreading to humans throughout broken skin or mucous membranes by making contact with tissues, body fluids, and organs of infected animals, or by ingestion of food or water contaminated by the urine of infected animals<sup>[4]</sup> In humans, *leptospirosis* cause a wide variety of signs including fever, jaundice meningo-encephalitis, kidney failure myocarditis, myalgia, conjunctivitis, meningitis, and pulmonary haemorrhage with respiratory failure, which occasionally outcomes in fatality<sup>[5]</sup> *Leptospirosis* is an occupational hazard with farmers, butchers and slaughterhouse workers<sup>[4]</sup> Since butchers and slaughterhouse workers are in contact with

animals; and their body fluids and tissues, they are at great hazard of contracting zoonosis.<sup>[6]</sup> Trade in considerable numbers of livestock from neighboring countries to Yemen, and reports of leptospirosis, Q fever and brucellosis eruption in neighboring countries[3,7] encouraged us to assess the prevalence of *leptospirosis* and risk factors in slaughterhouse workers and butchers in Sana'a city, Yemen.

## Subjects and Laboratory Methods

This cross sectional study was completed in the Faculty of Medicine and Health Sciences in the Medical Microbiology Department at the Sana'a University, during the period from July 2017 to September 2017 on 267 butchers and slaughterhouse workers in Sana'a City-Yemen. The blood specimens were collected from slaughterhouse workers and butchers subsequent get their consent, 2 ml of whole blood were collected by venipuncture in a disposable syringe and transferred immediately to plane tube, sera were separated from this tube by centrifugation following clotting of blood, and sera were reserved at -20 °C. Sera of participants were examined to the present of *Leptospirosis* antibody (IgG) by a commercial ELISA technique (Serion/Verion Co, Germany).

**Data collection:** Data were collected by predesigned questionnaire. Data including demographic data of the patients, clinical information, potential risk factors of *leptospirosis* and laboratory results.

## Ethical approval

We obtained written consent from all cases. Assent was taken from participants before collecting the specimens. The study proposal was evaluated and approved by the Ethics Committee of Faculty of Medicine and Health Sciences, Sana'a University.

## Results

In the present study, 267 blood specimens were taken from butchers and slaughterhouse workers live in Sana'a city, Yemen. The median age (range) and work duration time of contributors in this study were 27 years (14 years to 66 years) and 8 years (2 years to 41 years), in that order. All workers were males. All 267 (100%) workers were directly involved in carrying and handling of animal remains; animal slaughtering and examining the carcasses. All workers were in direct contact with cattle (including calves), goats and sheep throughout their daily activities. Besides 80% of the individuals described a history of splashing with animal body fluids and viscera several times into worker's face and 95.5% onto other parts of their bodies. Additionally 71.2% of our study subjects had an incidence of hand cut or other parts cut at least 5 times during their work within the last year. As well, 100% of workers did not use any personal protective equipments as overalls, masks, gloves, and boots). What's more, 100% of workers had never applied disinfectants to their hands and knives, whilst 10% knew they were at risk of zoonosis as *leptospirosis*. 41.3% of workers had positive titer of anti-*Leptospira* IgG. Considering the risk factors, there were associations between the older age of the workers and the prevalence of *leptospirosis* in which median age >27 years shows a highly significant odd ratio (OR=3, 95%CI=1.7-5.2, PV<0.001). Also, there was a significant correlation between seroprevalence of *leptospirosis* and work history >8 years ratio (OR=2.8, 95%CI=1.6-4.8, PV<0.001). A marginally significant correlation between positive *leptospirosis* and splashing of animal secretions into body (OR: 3.6, 95% CI: 0.7-35,

pv=0.07). There was a significant association between *leptospirosis* and history of >5 times cut in the last year (OR=3.7, 95% CI=2 -6.9, PV<0.001).

## Discussion

*Leptospirosis* is important unnoticed zoonosis worldwide with a complicated epidemiology. The disease have an effect on domestic and wild mammals; and human. Due to the range of clinical symptoms and obscurity of developing diagnostic confirmatory laboratory methods, *leptospirosis* continues inadequately explore, especially in country like Yemen in which facilities and resources for laboratory diagnosis is not available. *Leptospirosis* is considered an occupational disease of people employ in agriculture, animal slaughtering, forestry and sewage works.<sup>[4]</sup> In addition in recent years, *leptospirosis* is recognized as public health problem worldwide due to increased in mortality and morbidity of it in various countries.<sup>[7]</sup> For this reason we investigated *leptospirosis* in one of these risk groups. To our knowledge, the present study is one of the first study assess the *Leptospira* antibodies in butchers and slaughter house workers in Sana'a city and second study to assess the prevalence of *Leptospira* antibodies in populations at risk in Yemen after Al-Robasi *et al.* in (2015) <sup>[3]</sup> whom done it among populations at risk in Hodeida Governorate, Yemen.

The total seroprevalence of *leptospirosis* according to positive *Leptospira* IgG antibodies (cut off > 30 IU/ml) in our study group was 41.3%. This result is similar to previously seroprevalence studies reported in Yemen Hodeida in which the rate was 42% <sup>[3]</sup>. Also similar findings were demonstrated in studies conducted in Thailand: 12.7- 40% <sup>[8]</sup>, in Indonesia : 37%. <sup>[9]</sup> Ethiopia: 48% <sup>[10]</sup>, in India: 58% <sup>[11]</sup>, and in Iran: 58%. <sup>[12]</sup> Nevertheless, dissimilar findings were found among population at risk in Colombia as 19% <sup>[13]</sup>, in Tanzania: 15%.<sup>[14]</sup>

*Leptospirosis* infection affects both adults and children everywhere<sup>[7,15,16]</sup> When age of our slaughter house works and butchers was considered, the maximum rate of *Leptospira* IgG antibodies was found among older age group (median age >27 years) (50.9%) with associated OR equal to 3 (pv<0.001). This result is similar to findings in previous studies in Yemen among risk groups in Hodeida <sup>[3]</sup> which reported that higher prevalence of *leptospirosis* were in the 4th and 5th decades. Also the present results were similar with the results from the other parts of the world, in Iran, they confirmed that the highest seropositivity were present in aged range from 40-50 years <sup>[15]</sup>, but different from that in Chile, in which they show that the maximum rate of *leptospirosis* depend on antibodies result was in younger age (21-40 years) <sup>[16]</sup>, and in India the majority were obtained in the 35-44 years old.<sup>[7]</sup> These results can be explained with that the increasing of prevalence rate with increasing age could indicate an accumulation risk of infection over time.

The long duration of occupational exposure is more favorable for the transmission of *Leptospira* spp. than shorter duration. There was significant rise of the rate of *Leptospira* antibodies in longer occupational duration (work history median >8 years (table 2). Separate surveys were done among butchers and workers of slaughterhouse in Iran <sup>[17, 18, 19]</sup>, Brazil <sup>[20]</sup>, Mexico <sup>[21]</sup> and New Zealand <sup>[22]</sup> found the same results. These results can be explained by the longer exposure to occupational risks.

The reasonably significant high seropositivity rate in our study is fascinating, because there is not human *leptospirosis* case has been recorded from Sana'a city and not any of the *Leptospira* IgG antibodies positive workers in our study had clinical signs and symptoms of *leptospirosis*. On the other hand, clinical human cases of *leptospirosis* have been reported from Oman and Saudi Arabia <sup>[7]</sup> which share borders with Yemen.

## Conclusions

Separately from occupational factors, other factors as admittance to supplies of safe water and crucial hygiene can be part of the cause to infection risks. The risk of *leptospirosis* to slaughterhouse workers and butchers possibly will be determined more accurately by integrated the general population samples as a control group, which unluckily was impossible at the time of the study. An additional, disadvantage of the present study was absent of golden standard tests for approval of *leptospirosis* diagnosis.

The present survey gives important data on the health situation of slaughterhouse workers and butchers in Sana'a city, Yemen, this is can be helpful for health policy makers in planning. Furthermore our universities should be coordinate with the Leptospirosis Burden Epidemiology Reference Group (LERG) in WHO to clear the situation of *leptospirosis* in Yemen.

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## Conflict of interest:

"No conflict of interest associated with this work".

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Table 1: The frequency of *Leptospira* antibodies level by IU/ml among slaughter-house workers and butchers in Sana'a city, 2017.

IU/ml	frequency		comment
	No	%	
>30 U/ml	110	41.3	Definite <i>Leptospira</i> infections
Less than 30 U/ml	157	58.7	Definite rejection for <i>Leptospira</i> infections
Total	267	100	

Table 2: Analysis of risk factors associated with the seroprevalence (>30 IU/ml) of *Leptospira* IgG antibodies among butchers and slaughter-house workers in Sana'a city, Yemen, 2017.

Factors	<i>Leptospira</i> IgG antibodies >30 IU/ml n=110		OR	95% CI	$\chi^2$	pv
	No.	%				
<b>Age (median=27 years)</b>						
≤27 years n=102	26	25.4	0.3	0.19-0.5	16.8	<0.001
>27 years n=165	84	50.9	3	1.7-5.2	16.8	<0.001
<b>Work history (median=8 years)</b>						
≤ 8 years n=102	27	26.4	0.35	0.2-0.6	14.7	<0.001
>8 years n=165	83	50.3	2.8	1.6-4.8	14.7	<0.001
<b>Splashing of animal secretions</b>						
<b>Face</b>						
No n=52	18	34.6	0.7	0.37-1.3	1.1	0.2
Yes n=215	92	42.7	1.4	0.75-2.6	1.1	0.2
<b>Body</b>						
No n=12	2	16.6	0.27	0.02-1.3	3.1	0.07
Yes n=255	108	42.3	3.6	0.7-35	3.1	0.07
<b>Occupational injury (cutting hand or other organs)</b>						
≤ 5 times n=77	16	20.8	0.26	0.14-0.49	18.6	<0.001
>5 times n=190	94	49.5	3.7	2-6.9	18.6	<0.001

**OR** Odds ratio = Relative risk

**95%CI** 95% Confidence intervals

$\chi^2$  Chi-square = 3.9 or more is significant

**pv** Probability value = 0.05 or less is significant