



RESEARCH ARTICLE

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

Essam Mohammed Alastot¹, Hassan A. Al-Shamahy¹

Medical Microbiology and Clinical Immunology, Faculty of Medicine and Health Sciences, Sana'a University, Yemen

ABSTRACT

Objective: 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.

Methods: 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.

Results: 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, $P<0.001$), work history median > 8 years (OR=2.8 times, $P<0.001$) and history of >5 times cut in the last year (OR=3.7, $P<0.001$).

Conclusion: 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: Butchers, leptospirosis, Sana'a city-Yemen, Seroprevalence, slaughter house workers.

Article Info: Received 6 February 2018; Revised 17 March; Accepted 28 April; Available online 15 May 2018



Cite this article-

Alastot EM, Al-Shamahy HA. Prevalence of leptospirosis amongst slaughterhouse workers and butchers in Sana'a city-Yemen. Universal Journal of Pharmaceutical Research 2018; 3(2): 15-18.

DOI: <https://doi.org/10.22270/ujpr.v3i2.133>

Address for Correspondence:

Hassan A. Al-Shamahy, Department of Microbiology, Faculty of Medicine and Health Sciences, Sana'a University, Sana'a, Yemen. Tel.: +967-1-239551, E-mail: shmahe@yemen.net.ye

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 risk¹. 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^{2,3}. Leptospirosis is a widespread infections that involves both humans and animals¹. *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 animals⁴. 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 fatality⁵. Leptospirosis is an occupational hazard with farmers, butchers and slaughterhouse workers⁴. Since butchers and slaughterhouse workers are in contact with animals; and their body fluids and tissues, they are at great hazard of contracting zoonosis⁶. 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 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.

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	110	41.3	Definite <i>Leptospira</i> infections
< 30	157	58.7	Definite rejection for <i>Leptospira</i> infections
Total	267	100	

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 current 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 equipment 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. Total 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, $p<0.001$). 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, $p<0.001$). A marginally significant correlation between positive leptospirosis and splashing of animal secretions into body (OR: 3.6, 95% CI: 0.7-35, $p=0.07$). 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, $p<0.001$).

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 works⁴. In addition in recent years, leptospirosis is recognized as public health problem worldwide due to increased in mortality and morbidity of it in various countries⁷. For this reason we investigated leptospirosis in one of these risk groups. To the best 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., whom done it among populations at risk in Hodeida Governorate, Yemen³. The total seroprevalence of leptospirosis according to positive *Leptospira* IgG antibodies (cut off > 30 IU/ml) in current study group was 41.3%. This result is similar to previously seroprevalence studies reported in Yemen Hodeida in which the rate was 42%³. Also similar findings were demonstrated in studies conducted in Thailand: 12.7-40%⁸, in Indonesia: 37%⁹. Ethiopia: 48%¹⁰, in India: 58%¹¹, and in Iran: 58%¹². Nevertheless, dissimilar findings were found among population at risk in Colombia as 19%¹³, in Tanzania: 15%¹⁴.

Leptospirosis infection affects both adults and children everywhere^{7,15,16}. When age of 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 ($p<0.001$). This result is similar to findings in previous studies in Yemen among risk groups in Hodeida³ 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 years¹⁵, 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 years¹⁶, and in India the majority were obtained in the 35-44 years old⁷. 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^{17,18,19}, Brazil²⁰, Mexico²¹ and New Zealand²² found the same results. These results can be explained by the longer exposure to occupational risks.

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	χ^2	pv
	No	%				
Age (median=27 years)						
≤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
Work history (median=8 years)						
≤ 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
Splashing of animal secretions						
Face						
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
Body						
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
Occupational injury (cutting hand or other organs)						
≤ 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; χ^2 - Chi-square = 3.9 or more is significant p- Probability value = 0.05

The reasonably significant high seropositivity rate in current 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 current 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 which share borders with Yemen⁷.

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.

ACKNOWLEDGEMENTS

Authors acknowledge the financial support of Sana'a University, Yemen.

AUTHOR'S CONTRIBUTION

Alastot EM: conducted field works, laboratory works and wrote up the thesis. **Al-Shamahy HA:** supervised the experimental work, revised and edited the thesis draft and the manuscript.

DATA AVAILABILITY

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

CONFLICT OF INTEREST

No conflict of interest associated with this work.

REFERENCES

- Battelli G. Zoonoses as occupational diseases. *Veterinaria Italiana* 2008; 44: 601-609.
- Al-Shamahy HA, Wright SG. A study of 235 cases of human brucellosis in Sana'a, Republic of Yemen. *East Med Health J* 2001; 7(1-2):238-246. PMID: 12596975
- Al-Robasi AB, Rohaim WD, Al-Danani DA. Seroprevalence of *Leptospira* antibodies among populations at risk. *J Micro Infect Dis* 2015; 5 (1):1-4. <https://doi.org/10.5799/ahinjs.02.2015.01.0165>
- Adler B, De La Pena Moctezuma A. *Leptospira* and leptospirosis. *Vet Microbiol* 2010; 140: 287-296. <https://doi.org/10.1016/j.vetmic.2009.03.012>
- Bharti AR, Nally JE, Ricaldi JN, Matthias MA, Diaz MM, Lovett MA, et al. Leptospirosis: a zoonotic disease of global importance. *The Lancet Infectious Diseases*. 2003; 3: 757-771. [https://doi.org/10.1016/S1473-3099\(03\)00830-2](https://doi.org/10.1016/S1473-3099(03)00830-2)
- Omokhodion FO, Adebayo A. Occupational hazards and self-reported health problems of butchers in Ibadan, southwest Nigeria. *J Public Health* 2013; 21(2): 131-134. <https://doi.org/10.1007/s10389-012-0528-5>
- WHO SEARO organized an informal regional expert consultation on leptospirosis surveillance, diagnosis and risk reduction in Chennai from. 17-18 October WHO. 2009. http://www.searo.who.int/entity/emerging_diseases/topics/Communicable_Diseases_Surveillance_and_response_SEA-CD-216.
- Thipmontree W, Suputtamongkal Y, Tantibhyanghul W, et al. Human leptospirosis Trends: Northeast Thailand. 2001-2012. *Int J Environ Res Public Health* 2014; 11: 8542-8551. <https://doi.org/10.3390/ijerph110808542>
- Laras K, Van C, Bounlu K, et al. The importance of leptospirosis in Southeast Asia. *Am J Trop Med Hyg* 2002; 67:278-286. <https://doi.org/10.4269/ajtmh.2002.67.278>
- Yimer E, Koopman S, Messele T, et al. Human leptospirosis in Ethiopia: A pilot study in Wonji, Ethiopian. *J Health Develop* 2004; 18:48-51. <https://doi.org/10.4314/ejhd.v18i1.9866>
- Koteeswaran A. Seroprevalence of leptospirosis in man and animals in Tamilnada. *India J Med Microbio* 2006; 24:329-331. <https://doi.org/10.4103/0255-0857.29411>
- Faragi H, Assmar M, Ebrahimipour GH, et al. The survey of seroprevalence of leptospirosis in Mazandaran province of Iran using Microscopic agglutination test and indirect immunofluorescence assay. *Iranian J Biolog*. 2010; 22:608-618.
- Gongora A, Parra J, Aponte L, Gómez L. Seroprevalence of *Leptospira* spp in population groups of Villavicencio, Colombia. *Rev Salud Publica*. 2008; 10:269-278. <https://doi.org/10.1590/S0124-00642008000200007>
- Schoonman L, Swai ES. Risk factors associated with the seroprevalence of leptospirosis, amongst at-risk groups in and around Tanga City. *Ann Trop Med Parasitol* 2009; 103:711-718. <https://doi.org/10.4103/0974-777X.127941>
- Esmaili R, Hesamzadeh A, Alizadeh-Navaei R, et al. Incidence of leptospirosis in Mazandaran province, North of Iran: A one year survey. *Pak J Biol Sci* 2009; 12:1330-1333. <https://doi.org/10.3923/pjbs.2009.1330.1333>
- Zamora J, Riedemann S, Montecinos MI, Cabezas X. Serological survey of human leptospirosis in a high risk population in Chile. *Rev Med Chil* 1990; 118:247-252. PMID: 2131502
- Majd NS, Darian EK, Khaki P, et al. Epidemiological patterns of *Leptospira* spp. among slaughterhouse workers in Zanjan-Iran. *Asian Pacific J Trop Dis* 2012; 2: 550-552. [https://doi.org/10.1016/S2222-1808\(12\)60218-7](https://doi.org/10.1016/S2222-1808(12)60218-7)
- Imandar M, Hassanpour A, Asgarlou S, et al. Seroprevalence of leptospirosis in industrial livestock slaughterhouse workers in Khoys City. *Scientific J Kurdistan University of Medical Sciences* 2011; 16: 77-85. <https://doi.org/10.1371/journal.pone.0144953>
- Vande-yousefi J, Moradi BidHendi S, Aarabi A, et al. Serological study of Leptospirosis in humans and livestock. Third National congress of diseases transmitted between humans and animals. 1997: 59-60. <https://doi.org/10.1371/journal.pone.0144953>
- Gonçalves DD, Teles PS, Reis CRd, et al. Seroepidemiology and occupational and environmental variables for leptospirosis, brucellosis and toxoplasmosis in slaughterhouse workers in the Paraná State, Brazil. *Revista do Instituto de Medicina Tropical de São Paulo* 2006; 48: 135-140. <https://doi.org/10.1371/journal.pone.0144953>
- Rodríguez-Parra ME, Bocanegra-Alonso A, Casar-Solares A, et al. Epidemiological patterns of *Leptospira interrogans* among slaughterhouse workers from the Eastern United States-Mexico border region. *African J Microbiol Res* 2012; 6: 1584-1590. [https://doi.org/10.1016/S2222-1808\(12\)60218-7](https://doi.org/10.1016/S2222-1808(12)60218-7)
- Dreyfus A, Benschop J, Collins-Emerson J, et al. Seroprevalence and risk factors for leptospirosis in abattoir workers in New Zealand. *Int J Environmental Res Public Health* 2014; 11: 1756-1775. <https://doi.org/10.3390/ijerph110201756>