

Research Article



Risk Factors of Leptospirosis in Rice Cultivators as Compared to non Rice Cultivators in Punjab, Pakistan

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Abstract | Leptospirosis is a global zoonotic infectious disease having alarming public health concerns. Generally this is an occupation related disease and the victims belong to animal slaughtering, owners of pet shops, farm workers, handlers of meat, sewerage and agriculture workers. Leptospirosis affect multiple organs in human body and may lead to myocarditis, renal failure, respiratory distress and hypotension. This disease is an emerging infectious problem in many developing countries like Pakistan. A total of 250 subjects were selected from five different rice growing districts of Punjab, Pakistan after the approval of institutional ethical review board (IERB), 250 subjects were selected for this comparative cross sectional study. Multiple stage probability technique was used for sampling. In the first stage one union council was selected from each district randomly. In the second stage, 25 subjects involved in rice cultivation from the last 10 years were selected from each union council. Similarly 25 subjects who never worked in the rice paddy field were also randomly selected from each union council as controls. The serum sample of each subject was tested against each of the five antigens against the serovars. A total of 250 subjects were included in the study. Out of these, 125 subjects were exposed to the rice paddy water where as 125 were not exposed to rice paddy water. The cumulative seropositivity among the exposed is (83.2%) as compared to (42%) among the non exposed to rice paddy field water. The calculated cumulative odds ratio is 6.7 which represent a strong association of the risk for the development of disease among the exposed than the non exposed subjects. Leptospirosis is a public health zoonotic disease which is widely present in tropical and sub tropical areas. This study concludes that there is a strong association of rice cultivation with Leptospirosis. It is recommended that rice cultivators should protect their body parts with gloves or boots as prevention is the most appropriate way to control any disease.

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Introduction

Leptospirosis is a global zoonotic infectious disease having alarming public health concerns ⁽¹⁾. The disease is caused by different types of Leptospira.

Due to the complimentary circumstances Leptospirosis is more common in the developing countries ⁽²⁾. Wild and domestic animals serve as the reservoirs. This infection is transmitted through the urine of the animals and contaminate water and soil. The contam-

inated soil and water transmit infection of *Leptospirosis* to human beings⁽³⁾.

Generally this is an occupation related disease and the victims belong to animal slaughtering, owners of pet shops, farm workers, handlers of meat, sewerage and agriculture workers⁽⁴⁾. *Leptospirosis* affect multiple organs in human body and may lead to myocarditis, renal failure, respiratory distress and hypotension⁽⁵⁾. This disease is an emerging infectious problem in many developing countries and is often endemic⁽⁶⁾.

The dissemination of the organisms to human beings is also considered from the Rice field water mixed with the infected urine of rat⁽⁷⁾. The organism penetrate the human host from the broken mucosa or skin and may lead to bacteremia/ septicemia. It multiplies mainly in the central nervous system, liver or kidneys. The organism persist in the kidney tubules and infective bacteria is shed in the urine. The disease is characterized by high grade fever, headache, arthralgia, myalgia, meningitis followed by jaundice and renal failure⁽⁸⁾. *Leptospira* infection may remain asymptomatic or symptomatic depending upon the infecting type of the organism⁽⁹⁾.

The workers of rice cultivation are exposed to water in the rice field which may be infected with the urine of rat. Due to this exposure these workers are at higher risk of disease development as compared to non cultivators of rice. Keeping in view the above mentioned scenario this study was planned and conducted to find out the strength of association of disease development among the rice cultivators and non cultivators. The objective was to quantify the risk factor of *Leptospirosis* in rice cultivators as compared to non rice cultivators in Punjab, Pakistan.

Materials and Method

After the approval of institutional ethical review board (IERB), 250 subjects were selected for this comparative cross sectional study, from five different rice growing districts of Punjab including Sahiwal, Okara, Narowal, Gujranwala and Sheikhupura. The farmers cultivating rice were included in the study where as the farmers not cultivating rice were excluded from the study. Multiple stage probability technique was used for sampling. In the first stage one union council was selected from district randomly. In the second stage, 25 subjects involved in rice

cultivation from the last 10 years were selected from each union council. Similarly 25 subjects who never worked in the rice paddy field were also randomly selected from each union council as controls. This resulted in a total 125 adult males working in the rice paddy fields and matched 125 adult males who never worked in the rice paddy fields. A sample of 5 ml blood was drawn from each study subject through the adoption of standard procedure. Each serum sample was tested against each of the five antigens against the serovars i.e. '*Leptospira interrogans varcanicola*, *grippotyphosa*, *hardgo*, *icterohaemorrhagiae* and *Pomona*' by the slide macro agglutination test (SMAT) as described by Lysons. The results were interpreted as negative in the absence of no agglutination, followed by mild agglutination and strong agglutination. The seropositive and seronegative results were compared and odds ratio was calculated to find out the strength of association among the exposed and non exposed.

Results

A total of 250 subjects were included in the study. Out of these, 125 subjects were exposed to the rice paddy water where as 125 were not exposed to rice paddy water. These study subjects were selected from five different rice cultivating districts of Punjab. The results of seropositivity and seronegativity among the exposed and non exposed are presented in Table 1. The cumulative seropositivity among the exposed is (83.2%) as compared to (42%) among the non exposed to rice paddy field water. The calculated cumulative odds ratio is 6.7 which represent a strong association of the risk for the development of disease among the exposed than the non exposed subjects. The seropositivity among the exposed is highest in Gujranwala district (92%) as compared to Okara (88%), Sahiwal (84%), Sheikhupura (83.2%) and Narowal (72%),

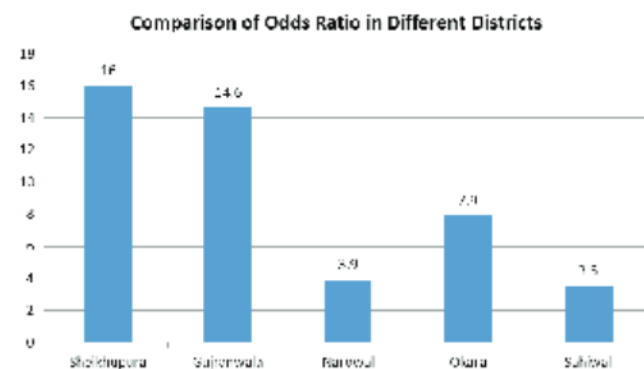


Figure 1: Comparison of odds ratio among rice cultivators and non rice cultivators.

Table 1: Comparative seropositivity in rice cultivators and non rice cultivators of five districts in Punjab.

S. No	Rice Growing Area	Category of Exposure	Seropositivity		Seronegativity		Odds Ratio
			No.	(%)	No.	(%)	
1	All Five Districts n=250	*Rice n= 125	104	(83.2)	21	(16.8)	6.7
		** Non Rice n= 125	53	(42)	72	(58)	
2	District Sheikhpura n=50	*Rice n=25	20	(80)	5	(20)	16
		** Non Rice n= 25	5	(20)	20	(80)	
3	District Gujranwala n=50	*Rice n=25	23	(92)	2	(8)	14.6
		** Non Rice n= 25	11	(44)	14	(56)	
4	District Narowal n=50	*Rice n=25	18	(72)	7	(28)	3.9
		** Non Rice n= 25	10	(40)	15	(60)	
5	District Okara n=50	*Rice n=25	22	(88)	3	(12)	7.9
		** Non Rice n= 25	12	(48)	13	(52)	
6	District Sahiwal n=50	*Rice n=25	21	(84)	4	(16)	3.5
		** Non Rice n= 25	15	(60)	10	(40)	

*: Rice cultivators were exposed to rice paddy water; **: Rice cultivators were not exposed to rice paddy water.

respectively. Similarly the calculated odds ratio reflect a very strong association among the exposed to rice paddy workers in Sheikhpura 16, Gujranwala 14.6, Okara 7.9 as compared to Narowal 3.9 and Sahiwal 3.5, respectively (Figure 1).

Discussion

Leptospirosis is a public health zoonotic disease which is widely present in tropical and sub tropical areas globally. It is a water borne problem prevalent in humid and hot climate of developing countries like Pakistan^{(10), (11)}. The contamination of water with the urine of rats, domestic and wild animals attributes to the burden of this disease⁽¹²⁾. The cultivators or the workers of rice field paddy water usually stand for many hours in water for the implantation of rice in the mud field. This exposure of several hours is a strong risk factor among the exposed individuals for the development of disease. This case control study was planned and conducted to quantify this risk factor of Leptospirosis in rice cultivators as compared to non rice cultivators in Punjab, Pakistan. The quantification of the risk factor and its strength of association is presented in the forms of odds ratio. The results presented in Table 1 (odds ratio= 6.7) represent that there is a strong contribution of rice cultivation as a risk factor for Leptospirosis. These results are consistent with the finding of another study conducted by Syed Muhammad Ali in South West Iran which concluded that the farmers of rice cultivation are more significantly infected with Leptospirosis as compared to other residents of the rural areas⁽¹³⁾. Similarly, it

was found in another study in Srilanka that the rice farming activities are the strongest exposure risk factor associated with Leptospirosis⁽¹⁴⁾.

Conclusion

Leptospirosis is a public health zoonotic disease which is widely present in tropical and sub tropical areas. This study concludes that there is a strong association of rice cultivation with Leptospirosis. It is recommended that rice cultivators should protect their body parts with gloves or boots as prevention is the most appropriate way to control any disease.

References

1. Ko AI, Goarant C, Picardeau M. Leptospira: the dawn of the molecular genetics era for an emerging zoonotic pathogen. *Nature Reviews Microbiology*. 2009 Oct 1;7(10):736-47. <https://doi.org/10.1038/nrmicro2208>
2. Bharti AR, Nally JE, Ricaldi JN, Matthias MA, Diaz MM, Lovett MA, Levett PN, Gilman RH, Willig MR, Gotuzzo E, Vinetz JM. Leptospirosis: a zoonotic disease of global importance. *The Lancet infectious diseases*. 2003 Dec 31;3(12):757-71. [https://doi.org/10.1016/S1473-3099\(03\)00830-2](https://doi.org/10.1016/S1473-3099(03)00830-2)
3. Kawaguchi L, Sengkeopraseuth B, Tsuyuoka R, Koizumi N, Akashi H, Vongphrachanh P, Watanabe H, Aoyama A. Seroprevalence of leptospirosis and risk factor analysis in flood-prone

- rural areas in Lao PDR. *The American journal of tropical medicine and hygiene*. 2008 Jun 1;78(6):957-61.
4. Sharma S, Vijayachari P, Sugunan AP, NATARAJASEENIVASAN K, SEHGAL SC. Seroprevalence of leptospirosis among high-risk population of Andaman Islands, India. *The American journal of tropical medicine and hygiene*. 2006 Feb 1;74(2):278-83.
 5. Myint KS, Murray CK, Scott RM, Shrestha MP, Mammen MP, Shrestha SK, Kuschner RA, Joshi DM, Gibbons RV. Incidence of leptospirosis in a select population in Nepal. *Transactions of the Royal Society of Tropical Medicine and Hygiene*. 2010 Aug 31;104(8):551-5. <https://doi.org/10.1016/j.trstmh.2010.04.001>
 6. Gonçalves AT, Paiva C, Melo-Mota F, Vieira ML, Carreira T, Nunes MS, Mota-Vieira L, Ahmed A, Harstkeerl RA, Hyde K, Collares-Pereira M. First isolation of human *Leptospira* strains, Azores, Portugal. *International Journal of Infectious Diseases*. 2010 Sep 30;14:e148-53. <https://doi.org/10.1016/j.ijid.2009.12.004>
 7. Gohar A. 19.148 Comparative seropositivity against leptospirosis between rice cultivators and non-rice cultivators. *International Journal of Infectious Diseases*. 2016 Dec 31;53:78. <https://doi.org/10.1016/j.ijid.2016.11.197>
 8. Manocha H, Ghoshal U, Singh SK, Kishore J, Ayyagari A. Frequency of leptospirosis in patients of acute febrile illness in Uttar Pradesh. *J Assoc Physicians India*. 2004 Aug 26;52.
 9. Khan MA and Rehman A. Bacterial Zoonosis Pakistan in: zoonosis, Bacterial disease, Daya Publishing House New Dehli India 2014 page; 436-441.
 10. Boland M, Sayers G, Coleman T, Bergin C, Sheehan N, Creamer E, O'connell M, Jones L, Zochowski W. A cluster of leptospirosis cases in canoeists following a competition on the River Liffey. *Epidemiology and infection*. 2004 Apr;132(2):195. <https://doi.org/10.1017/S0950268803001596>
 11. Laras K, Van Cao B, Bounlu K, Nguyen TK, Olson JG, Thongchanh S, Tran NV, Hoang KL, Punjabi N, Ha BK, Ung SA. The importance of leptospirosis in Southeast Asia. *The American journal of tropical medicine and hygiene*. 2002 Sep 1;67(3):278-86. <https://doi.org/10.4269/ajtmh.2002.67.278>
 12. Shi MH, Tu YR, Li QJ. Study on geographical distribution of leptospirosis in China. *Zhonghua liuxingbingxuezhazhi= Zhonghualixingbingxuezhazhi*. 1995 Oct;16(5):259-62.
 13. Alavi SM, Khoshkho MM. Seroprevalence study of leptospirosis among rice farmers in khuzestan province, South west iran, 2012. *Jundishapur journal of microbiology*. 2014 Jul;7(7):e11536. <https://doi.org/10.5812/jjm.11536>
 14. Agampodi SB, Nugegoda DB, Thevanesam V, Vinetz JM. Characteristics of Rural Leptospirosis Patients Admitted to Referral Hospitals during the 2008 Leptospirosis Outbreak in Sri Lanka: Implications for Developing Public Health Control Measures. *The American journal of tropical medicine and hygiene*. 2015 Jan 7;92(1):139-44. <https://doi.org/10.4269/ajtmh.14-0465>