

Febrile Illness Outbreak Investigation in Sundarharicha-5 Foklan Tapu, Morang District

Ashok Pandey,¹ Arun Kumar Sah,¹ Pradeep Belbase,¹ Anil Kumar Sah,¹ Anjani Kumar Jha,¹

¹Nepal Health Research Council, Ramshahpath, Kathmandu, Nepal.

ABSTRACT

Background: On the date of 24 July 2017, the major national daily newspaper reported that there were two death cases from an unknown disease in the Morang district, Sundarharicha Municipality 5, Foklan Tapu. A team of researcher and experts were mobilized in the affected area to investigate and identify the etiological and epidemiological causes.

Methods: Both qualitative and quantitative methods was used to conduct the outbreak investigation. 83 blood samples were taken from the patients and microbiological analysis was done at National Public Health Laboratory, Kathmandu. Similarly, 2 verbal autopsies and 5 Key in-depth interviews were taken from a local community leader, local health service providers, medical officer of Koshi Zonal Hospital, district public health officer and medical director of WHO.

Results: Out of 83 participants, 49% and 25% of the participants were positive to IgM and IgG antibodies of *Leptospira* species respectively. 87% of the participants were exposed to animal living in his/her home (including pets).

Conclusions: An outbreak which was existing during this investigation turned out to be leptospirosis outbreak, whose exposure was consumption of unhealthy meat during social gathering.

Keywords: Epidemiological; etiological; febrile illness; outbreak investigation.

INTRODUCTION

The infectious sources of febrile illness remain poorly consider in many parts of the world in this century.^{1,2} This is due to a lack of human resources, medical facilities, and limited diagnostic facilities.^{1,3,4} In Nepal, febrile illness is one of the main reasons for seeking medical attention in rural areas, but there is limited information on the incidence of specific infections.^{5,6} Nepal being in similar tropical and geographical region, the country has also verified febrile illness infection occasionally.^{2,6} Only, few studies have been carried out in this regard and there are only few evidence of outbreak investigation in the country^{2,7,8}

Leptospirosis is a zoonotic disease, which is transmitted through direct contact of skin or mucous membrane with urine or tissue of infected animals, indirect transmission due to contaminated water or soil.⁹ The transmission of this disease is more favorable in hot, humid tropical condition and dense population. In addition, it widely varies with socioeconomical and environmental condition.¹⁰ The purpose of outbreak investigation was to identify the etiological

and epidemiological causes of febrile illness. It also involved implementing control measures to prevent additional illness and evaluating the impact of those control measures to make sure that the problem has been adequately addressed. This study has generated evidence of febrile illness infection of Foklan Tapu of Morang district Nepal.

METHODS

A descriptive study was conducted at Sundar Haraicha Municipality ward no 5, Foklan Tapu, Morang district. Eighty-three blood samples were taken from the participants and laboratory analysis were done at NPHL, Teku, Kathmandu. Similarly, 2 verbal autopsies (VA) were taken from the deceased family and 5 Key in-depth interviews (KII) were taken from local community leader, local health service providers, district public health officer of Morang district, emergency department chief of Nobel Medical College and Teaching Hospital, Biratnagar and medical director of WHO, regional office Biratnagar. Whole blood samples were collected from the people who were suffering from fever, corzya, headache and drowsiness from last

Correspondence: Ashok Pandey, Nepal Health Research Council, Ramshahpath, Kathmandu, Nepal. Email: Pandeyg7@gmail.com, Phone: +9779851148695.

30 days. Blood samples were transported to NPHL for investigation by maintaining appropriate cold chain.

Rapid test was done for Leptospirosis, Scrub Typhus, and Dengue. The negative result was found for Scrub typhus and Dengue whereas Leptospirosis was found to be positive. Furthermore, ELISA test was done for all suspected samples of Leptospirosis by using the NovaLisa® product number LEPM0660 (96 Determinations). The findings were analyzed using SPSS software, 20 versions. Thematic analysis was done for KII data and appropriate verbatim was developed as well as the manual analysis was done for VAs. Ethical approval was obtained from the ethical review board of NHRC (Reg. no. 382/2017) on the expedited process as per outbreak investigation guidelines.

RESULTS

Out of 83 participants, 41(49%) and 21(25%) were IgM and IgG positive respectively. The median age of participants was 18 years (range 1 - 85 years). The majority 70(84%) of the participants were from disadvantaged Janajati ethnicity. (Table 1)

Table 1. Socio-demographic characteristics of participants (n=83).

Characteristics	Frequency	Percent
Sex		
Male	29	34.9
Female	54	65.1
Ethnicity		
Disadvantaged janajatis	70	84.3
Upper caste groups	13	15.7
Religion		
Hindu	76	91.6
Buddhist	6	7.2
Christian	1	1.2

Table 2. Animal Exposures within past 8 weeks(n=83).

Animal exposure	Frequency	Percent
Animals living in his/her home (including pets)	72	86.7
Insect bite (e.g. mosquito, tick, and spider)	16	19.3
Close contact with rodents (e.g. rats, mice, squirrels, prairie dogs)	16	19.3
Close contact with birds (includes turkeys and chickens)	16	19.3

Close contact with swine	12	14.5
Close contact with bird droppings	11	13.3
Close contact with rodent droppings or rodent nests	8	9.6
Animal bite (including wild and domestic animals)	4	4.8
Spending time on a farm, rural area or petting zoo	4	4.8
Skin, dress, or eating wild game	3	3.6
Hunting or fishing	2	2.4
Performing or assisting with an animal necropsy	2	2.4

The majority 72(87%) of the participant were exposed to animal living in his/her home (including pets). Similarly, equal number of participants 16(19%) of the participants were exposed with insect bite (e.g. mosquito, tick, and spider), close contact with rodents (e.g. rats, mice, squirrels, prairie dogs), and close contact with birds (includes turkeys and chickens). (Table 2)

“In every household, there are lot of pet animals including pig, buffalo, goat, duck, chicken, etc. Their pets can enter in their kitchen and bedroom easily at any time.” - A Local Health Workers.

“An unknown mad dog bites a buffalo in the nearby the household of Koshi Tappu Wild Life area where Janajati people lived. That buffalo was buried in nearby house. Tonight, the deceased family member as well as neighbour were consumed that buried buffalo flesh meat mainly skin part.” - local community leader

Table 3. Exposure in public gathering (n=83).

Exposure in public gathering	Yes		No	
	Frequency	%	Frequency	%
Attending any party, function in last 1 month	74	89.2	10	10.8
Attending birthday celebration in last 1 month	25	30.1	58	69.9
Working with any chemicals or toxins	2	2.6	81	97.4

The majority 74(89%) of the participants had attended post-election celebration party (Bhoj) in the community

territory in last 15 days. 25(30%) of the participants had participated in neighborhood birthday party (Bhoj) in last 5 days (Table 3).

“Local political leader who won local election hadorganised the winning ceremony (Bhoj). Villagers were invited where they ate chicken and pulao”. - Alocal community leader.

Table 4. Laboratory Diagnosis of Leptospira (n=83).

Laboratory Diagnosis	Leptospira immunoglobulin M (IgM)		Leptospira immunoglobulin G (IgG)	
	Frequency	%	Frequency	%
Positive	41	49.4	21	25.3
Negative	31	37.3	51	61.4
Equivocal	11	13.3	11	13.3

Almost half 41(49%) of the participants were IgM positive antibodies to Leptospira species. Detection of IgM positive antibodies to Leptospira species suggested recent infection. Similarly, one out of four, 21(25%) participants werepositive to IgG antibodies of Leptospira species. Detection of IgG positive antibodies to Leptospira species suggested the prolonged infection. (Table 4) The cut off for IgM and IgG was 10 NTU. IgM and IgG positive >11 NTU suggestpresence of antibodies against pathogen. IgM and IgG Equivocal 9-11 NTU suggest antibodies against the pathogen could not be detected clearly.

“Like the darkness under the candle” Foklan Tapu is nearby with the well facilitated Itahari and Biratnagar cities but surrounded by two rivers. They eat unhealthy food, and meat. Their home has no proper sanitation. They use open space mostly river for defecation”. - A District public health officer of Morang district and Medical director of WHO, regional office Biratnagar.

Verbal Autopsy 1 (14 year child)

According to the participant, her son died of unknown febrile illness. The deceased was 14 years old male. The deceased person was exposed to a contaminated water source while swimming. He ate the flesh meat taken from the hilly region of Shankhusawa district. The flesh meat of buffalo was rotten. They had never taken precaution for freezing the meat. After consumption of that meat, he had a cough with sputum for 3 days. It was associated with muscle pain, muscle cramps, particularly affecting the muscles in the lower back and calves. Deceased was taken to the BPKIHS, Dharan hospital and admitted there for a week. After the medical testing, the doctor instructed to the family of deceased person for the test

of cerebrospinal fluid (CSF). Hospital doctor gave him usual treatment in the intensive care unit (ICU). They were not allowed to visit the patient during the stay at ICU. Suddenly, on the 8th day of ICU, when deceased person’s mother was inside the ICU of the hospital, Her son sat down and asked for water,after a while he was dead on the spot.

Verbal Autopsy (4 year child)

According to the participant, her daughter died of unknown febrile illness. The deceased was 4-years-old female. She had the fever for five days. The deceased had been attending the party organized by a newly elected local leader. The party was for celebrating the winning happiness of local election,where she ate chicken and pulao (Fried rice). When the fever was very high, her mother gave her medicine, which she had bought from a nearby pharmacy. After taking medicine, she felt better and got back to normal life. At the same night, a buffalo died, after getting bitten by a dog (sick dog as told by villager) and they just cooked the dead buffalo which was eaten by everybody. In the third day of eating that meat, she suddenly had a high fever in the morning with muscle cramps. She was barely able to open her eyelid. The family members took her to a nearby hospital in Itahari, but in the middle of the day, she died.

DISCUSSION

Acute febrile illness (AFI) is illness of less than a week duration with unrecognized source that persist all part of the world.⁶ Leptospirosis is a major cause of the febrile illness outbreak.¹¹ Leptospirosis is complex and dynamic that results from interactions of agent, host and environment.¹² Human and animals living together in the same environment which will continue to increase the risk of transmission of leptospirosis.^{13,14} As a finding of a verbal autopsy of 14 years child, he ate the flesh meat of buffalo which was rotten and unfreeze meat and other findings of a verbal autopsy of 4 years female child, she ate chicken and pulao (fried rice). Rodents, cattle, other domestic animals and wild animal have reservoirs or vectors for leptospirosis.^{15,16} which have been linked to Weil’s disease - a serious and life threatening disease in humans. In this study, muskrats were sampled across 43 regions of Lower Saxony, Germany, during 2007 to 2009 and were tested for leptospirosis using Polymerase Chain Reaction (PCR) The leptospirosis can be directly transmitted through tissues, body fluids or urine etc and indirectly through the environment.^{12,13}

This study shows that out of 83, about half of the participants (49.4%) were IgM positive. A study conducted in Bangladesh, 11 % were IgM positive and 16 (3%) were equivocal.¹⁷ A serological survey of the rural district of

Bangladesh in 1994 showed 38% (out of 89) seropositive, that indicate the rural population is the high risk of leptospiral infection.¹⁷

This study shows that female had a high proportion (66%) among total leptospirosis cases. This is in contrast with a study conducted in Bangladesh where 62% of them were male and 49% were female. It is also contrasted with the study in Egypt (male 53% and female 47%)⁵. However, Nepal and Bangladesh, have similar environmental and sanitation condition that contributes to the burden of disease.¹⁷As per our study, verbal autopsy of 14 years male child, he was exposed to contaminated water while swimming. The IgM positive participants had the presence of signs and symptoms such as cough, fever, chest pain, sweats, shortness of breath, sore throat and joint pain.¹⁸In our study, 13.1% of the participants were equivocal cases for both IgM and IgG. This was just a descriptive cross sectional study so we were not able to repeat the test with a fresh sample in 2 to 4 weeks.

According to verbal autopsy of both 14 years' male child and 4-year female child, cases had symptoms like muscle pain, muscle cramps, back, high fever and claves pain. This seemed like the symptoms of acute febrile illness. This study could not follow the study design as per its proposal (case control study) due to isolated geographical location of Foklan tapu. Foklan tapu was situated in between two rivers and was nearby Koshi Tappu Wildlife Reserve. Hence, it was not possible to compare between two similar groups i.e. case and control.

CONCLUSIONS

Nepal remains a place for a frequent outbreak of febrile illness and sometimes even without identification of causative agents of outbreak. After the investigation, Leptospirosis was identified as cause of outbreak in Foklan Tapu Sundarharicha Municipality of Morang district. *Leptospira* was responsible agent for the manifestation of an outbreak. The exposure for this outbreak was originated from contaminated water while swimming and or consumption of contaminated meat. This research finding could be used by concerned stakeholders in emergency and outbreak response to manage risk factors at an outbreak of leptospirosis. Awareness raising on disease patterns and recording of incidence may enrich practices of prevention of leptospirosis.

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