International Journal of Community Medicine and Public Health
Cherian MP et al. Int J Community Med Public Health. 2020 Sep;7(9):3568-3574
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20203924

Original Research Article

Promoting community participation in prophylactic measures against Leptospirosis following devastating floods in central Kerala: an exploratory study

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Received: 29 June 2020
Revised: 05 August 2020
Accepted: 10 August 2020

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ABSTRACT

Background: Community capacity is superior in Kerala, making the people identify, mobilize, and address public health problems. The state of Kerala in South India was devastated by the 2018 August flood with cumulative rainfall of 2307 mm, 41% above the average rainfall received. Community participation helped to restore health with minimal post-flood morbidity. This paper intends to demonstrate the role of community participation in prophylaxis against Leptospirosis.
Methods: As a part of post-flood recovery activity to prevent communicable diseases, the health system sought community health volunteers, local teachers, and philanthropic organizations. Training was given to volunteers to do preventive measures like chlorination of well water, provide leptospirosis prophylactic drugs based on the guidelines and promote the use of boiled water as well as personal and environmental hygiene. The health workers supervised preventive activities in the areas designated to the volunteers. Medical officers visited random houses to ensure quality and gave necessary instructions. The health staff counseled those who were unwilling for preventive measures.
Results: The activity resulted in low incidence of leptospirosis cases (n=13; Incidence <0.02) in the population.
Conclusion: Community engagement was effectively utilized by the public health system in disaster mitigation and control during this flood.

Keywords: Community participation, Leptospirosis, Doxycycline, Prophylaxis

INTRODUCTION

Leptospirosis is a zoonotic infectious disease with high mortality caused by the bacteria Leptospira.[1,2] The transmission is through the exposure of the skin or mucous membrane when exposed to water or soil contaminated with the urine of infected animals or through contact with tissues from infected animals.[3] Leptospirosis is one of the most common and emerging zoonoses in the World.[4,5] The disease is an occupational hazard with increased risk of exposure among farmers, sand miners, cleaners, veterinarians, agricultural workers.[6,7]

In India, Leptospirosis was considered a rare disease in the past. However, since the 1980s, there has been an increasing trend of this disease in the coastal states of India, especially during the monsoon months. Rain and floods are considered the main risk factors for Leptospirosis and several outbreaks have been reported

following extreme weather events.[8–10] The state of Kerala in India has been facing a threat over the outbreak of Leptospirosis, especially during monsoon. After heavy rainfall, flooding and standing water are common during the monsoon months in Kerala, which makes it favorable for the spread of Leptospirosis infection.[11] At least 100 deaths were reported yearly in Kerala before 2010.[12] Notably, the incidence and mortality of Leptospirosis in Kerala for the following years showed a declining trend as compared to the previous years due to advances in diagnosis, treatment and preventive strategies.[13,14]

The state of Kerala in South India was devastated by the 2018 August flood with cumulative rainfall of 2307mm, 41% above the average rainfall received.[15] Due to many favorable factors, Leptospirosis outbreaks are expected in the post-flood period. In order to meet this emergency, community participation was sought to restore positive health.[16] Community capacity is superior in Kerala, which makes the people identify, mobilize, and address social and public health problems. Community coalitions were formed to restore health with minimal post-flood morbidity, outbreaks, and mortality.[17] Community coalitions are defined as groups of individuals, factions, and constituencies who agree to work together to achieve a common goal.[18] Coalitions strive to improve, change, and introduce innovative solutions to health problems by using existing and potential resources in effective ways.[19] Post-flood social messages, the tragedy, the informal moral messages, and various contextual factors resulted in the formation of community coalitions irrespective of caste, creed, color, religious or political background. The health department utilized these coalitions to improve the health outcomes in the post-flood community.

As community participation is one of the four pillars of primary health care, these coalitions were utilized for bringing positive health outcomes.[20–22] Several studies have reported the effectiveness of chemoprophylaxis in preventing the post-flood surge of Leptospirosis.[23–25] This paper intends to demonstrate the role of community participation in prophylaxis against Leptospirosis following the devastating floods.

METHODS

Most parts of the Pathanamthitta district were affected by the flood in August 2018. This is a cross sectional study with qualitative and quantitative components. The service areas of four Primary Health Centers (PHC) in the Chathankery block (Chathenkary, Kadapra, Kuttapuzha, and Niranam) were selected.

The working pattern of the post-flood community activities coordinated by the PHCs and the reason for the involvement were analysed using in-depth interviews and Focus Group discussions. In-depth interviews were carried out with two medical officers and four Community health volunteers. A focus group discussion of 45 minutes was conducted with six community members. Topic guide was prepared before the interview. The second author conducted the interviews along with a trained social worker who scribed all the interviews. The interviews were also recorded using an audio device. The contextual factors that promoted the community involvement were analysed.

Data on total population catered by the PHCs, flood-affected population, and population given prophylaxis against Leptospirosis were obtained from the local PHCs. The volunteers reported the population which was given prophylaxis daily. The tablets were issued based on the same. Random houses were visited by the Primary Health Centre Medical officer to monitor and ensure the quality and correctness of the data. The number of leptospirosis cases reported from the PHCs through the peripheral health notification system from August 20th to September 30th, 2018 was obtained from the PHCs.

Data was collected in pre-designed data collection sheets by the investigators. Microsoft Excel version 2007 used as a tool to enter data. Responses were coded into variables to simplify the process of data entry. Before analysis, data were rechecked randomly. The interviews were transcribed, later to be validated and revalidated from local language to English and later followed by coding the data and organizing into themes and subthemes.

The study was approved by the Institute Research Board and the Institute Ethics Committee (No. IEC/2019/02/63). All the participants of the qualitative analysis consented to participate in the study. The confidentiality of the information collected was maintained. The data was obtained with prior permission from the PHC medical officer.

Operational definitions

Diagnosis of leptospirosis

The diagnosis was made in this disaster setting if the patient had clinical features of acute febrile illness with headache, myalgia, and prostration associated with any of the following symptoms of conjunctival suffusion, anuria or oliguria, jaundice, hemoptysis, haemorrhages from the intestine, meningeal irritation, cardiac arrhythmia or failure, and skin rash. If any patient presented with this symptom complex, Leptospira IgG/IgM Combo Rapid Test was performed. A positive test will trigger the health system to start the patient on treatment with Leptospirosis.

Leptospira IgG/IgM combo rapid test by CTK biotech is a lateral flow chromatographic immunoassay that can be performed within 15-20 minutes by minimally skilled personnel and without the use of laboratory equipment. This test is intended to be used for the simultaneous detection and differentiation of IgG and IgM antibodies to

Leptospira Interrogans (*L. Interrogans*) in human serum, plasma, or whole blood.

Prophylactic drugs

All the adults were given 200 mg of Doxycycline once weekly as a single dose (2 tablets of 100 mg each), after morning breakfast. This was continued as long as the exposure was continuing but limited to 6 weeks. For children in the age group of 8-12 years, Doxycycline (100 mg) once weekly was given as a single dose.

RESULTS

Quantitative results

The study population was 99229 from the four PHC areas of the villages. Out of the total population, 81% (80,631) of the population were given prophylaxis with the help from community health volunteers. From the population who received prophylaxis, only 13 (0.02) cases of Leptospirosis were identified (Table 1).

Table 1. Post flood leptospirosis prophylaxis (20th Aug to 30th Sept 2018).

Village	A	B	C	D	Total
Total Population	19571	23769	26073	26073	99229
Population Given Prophylaxis (%)	18930 (97)	17255 (73)	21000 (81)	23446 (79)	80631 (81)
Leptospiros-is Cases (%)	06 (0.03)	01 (0.01)	04 (0.02)	02 (0.01)	13 (0.02)
Community Health Volunteers	18	21	21	20	80

Qualitative results

Based on the information obtained from the focus group discussions, three significant themes emerged from the discussions: Working pattern, Compassionate and Committed minds, Non-Governmental Civilian Efforts, and 'My responsibility to protect my people' from the Community Health Volunteers.

Working pattern

As a post-flood recovery activity to prevent communicable diseases, the health system sought the help of community health volunteers, local teachers, and philanthropic organizations. The volunteers were then trained to do preventive measures like well water chlorination, use of personal protective measures, application of antiseptic ointments on wounds, clearing of waterlogged areas, use of sanitation mixture to clean flood-affected households, provide leptospirosis prophylactic drugs based on the guidelines and promote use of boiled water as well as hygiene. The volunteers were also asked to conduct health awareness programs to propagate these preventive measures.

Areas were designated to the volunteers. The health workers supervised preventive activities. Random houses were visited by the medical officers to ensure the quality of preventive measures. Corrections were made wherever necessary. The health staff advised those who were unwilling for preventive measures.

The volunteers promoted clearing of waterlogged areas, the use of personal protective measures, provide weekly dose of 200 mg doxycycline, use of sanitation mixture to clean flood-affected households, well water chlorination, Application of antiseptic ointments on wounds and promote the use of boiled water as well as personal hygiene.

Response of community health volunteers - my responsibility is to protect my people

The community health volunteers (CHV) were selected from the community based on their social commitment by the health system. These socially committed workers considered themselves as protectors of the community from infectious diseases. They carried out various healths' promotion activities that showed results. This impressed the community, and they were willing to follow their advice.

"If a communicable disease pops up in my community, it will be considered as a disgrace on me." CHV 1

"Because of our inactivity, no one should get affected" CHV2

"Our children, our people- they are not aware of the disease that hides behind the floods - So I took over and educated them" CHV 2

"Daily, I see these faces. How can I ever turn them down? CHV3

"I am the protector of people from infectious diseases. Because of my inactivity, no one should succumb to any illness." CHV 4

Compassionate and committed minds

The disaster enlightened the community to express their solidarity with the affected population. When they found that their brothers and sisters were in trouble, they opened up their hearts and helped each other. It was a rare show of unity and committed efforts beyond considerations. Disasters often create windows into what communities can do for each other. The self-motivation, which was enlightened by the pictures of the misery and the psychological state that tomorrow cannot be predicted, made the community volunteer for the flood relief work. The helping each other phenomenon ignited the community participation.

"All we know is that our fellow brothers and sisters are in distress. We need to help them out. If it was for someone in our family - What we will do; that came into our mind." Community member 1
"Kerala fishermen left the seas and moved inland. Sea is vast, and so are the flood afflicted territories. It was beyond what we could manage, but we need to help our fellowmen." Community member 3
"Some kind of energy and satisfaction we had." Community member 1
"We cannot be destroyed again" Community member 2
"We lost everything - But we know we can build it again" Community member 2

Non-governmental civilian efforts

When the government invited and made provisions for joining with the local community, there was support beyond the government's expectations. The Chief Minister's relief fund received funds more than expected. The community members donated food, clothes, and other necessities through the government machinery. The media instilled support to the government by encouraging the community to work with the government. Spontaneous leadership emerged, which supported the government machinery to work for the flood relief activities.

"We all came together, stood together and helped the government" Community member 1
"It was more than the State Govt. could handle" Community member 3
"Citizens took over collating information and helped the government in controlling a serious situation. Spontaneous leadership emerged." Community member 3

DISCUSSION

This audit has documented only a very minimal number of leptospirosis cases following the floods. From the population who received prophylaxis, only 13 (0.02) cases of leptospirosis were identified when the cumulative rainfall was around 2307 mm of rainfall.

High proportion of leptospirosis cases in the region as observed by various studies shows indirectly that this region is endemic for leptospirosis.[26-29] The positive correlation between leptospirosis rates and rainfall levels, has been verified by various studies from different regions of the World.[30-32] Even after a heavy rainfall in this endemic area, the number of leptospirosis cases didn't rise to alarming levels which we account for the prophylactic efforts done using community participation. We acknowledge the limitation that we didn't compare this data from the present study with data from regions with similar rainfall and topography without any prophylactic efforts, which would have been the ideal method.

Schneider, Hernandez et al found in their systematic review that the post-exposure prophylaxis with Doxycycline had a protective effect on the morbidity and mortality of leptospirosis.[25,33] A study done by Supe Khatarpal et al demonstrated that there was a decrease in Leptospirosis cases after prophylaxis with doxycycline and mass awareness campaigns following flooding in Mumbai slums.[33] Another study done by Kirkpatrick et al among US military officials who were deployed in a high-risk setting for Leptospirosis has demonstrated that Doxycycline, along with other non-pharmacological preventive measures for Leptospirosis was highly beneficial.[34] Sehgal et al in their study in leptospirosis high endemic zone of Andaman islands of India demonstrated that the mortality was less following prophylaxis with Doxycycline; however, the study showed no effect on morbidity pattern.[35] A case-control study done by Bhardwaj et al have found that if preventive measures are followed up, the protective effect of doxycycline prophylaxis increases and help in reducing the burden of leptospirosis.[36] This study reiterates and confirms with other studies from within and outside India that promotion of preventive activities along with Doxycycline is beneficial in reducing the morbidity and mortality due to leptospirosis. The decisive role of Community participation in preventive efforts against leptospirosis is demonstrated in the present study.

In the present study, 81% of the total population (80631) were given prophylaxis with help from community volunteers. In India, Community health volunteers (CHVs) are called as Accredited Social Health Activists (ASHA). The ASHAs are lay individuals of varied backgrounds active socially, coming from, or based in the communities they serve, who have received brief training on a health problem they have volunteered to engage with.[37] They have demonstrated to act as an interface between the community and the public health system.[38] A case report done in rural South Africa published by Van Niekerk has shown that community participation improves the overall results of a program.[39] Wiwanitkit et al in a survey done in Rural Thailand have noted that the knowledge level of the study participants were poor in a leptospirosis control program with no community involvement.[39] In this study, the knowledge was put into action, which was demonstrated by the reduction in the leptospirosis morbidity. As depicted through the interviews (my people, their positive health lies with me), the attitude and practice of the community health volunteers further add to the strength of community participation in health promotion.

When these health volunteers provide the knowledge to tackle the diseases, they take into consideration the constraints in the community's attitude and practices. A cross sectional study from rural Uttar Pradesh, India done by Thacker, Choudhary et al has demonstrated that a volunteer from the community will face less resistance (<5%) in provision of health services than others.[38]

A cross sectional study by Samarakoon, Gunawardena et al has in their study from Sri Lanka have found that the mere knowledge on leptospirosis is not translated into practice in majority of the participants.[40] In the present study, the community participation has helped in putting the knowledge and attitude of the community regarding the illness into practice. As recited by the Community volunteer *"Our children, our people- they are not aware of the disease that hides behind the floods - So I took over and educated them"*

As their community members have invested labor, time, money and materials in health-promoting activities, the health interventions become more acceptable to the community. Yang et al reports from South Korea that Community participation helps the communities to develop problem-solving skills, making them take responsibility for their health and welfare, ensuring that the needs and problems of the community are adequately addressed, ensuring that the strategies and methods used are culturally and socially appropriate or acceptable and it enhances sustainability.[41] This phenomenon was demonstrated in the present study. By getting involved in the health of the people, the communities begin to improve their health status objectively rather than fatalistically. As said by one of the community members, *"We cannot be destroyed again" "We lost everything - But we know we can build it again".*

As the Government system sought help from these volunteers, the system did not have to go for strict law enforcements as the community took it up as their responsibility. Also, the resource-constrained health system reduced the burden on them by utilizing these volunteers. It is the government's responsibility at various levels, non-governmental organizations, international health agencies and health care program planners and providers to help the community organize them and be involved in their health care and development. As depicted by the community member *"We all came together, stood together and helped the government".*

The benefits of community participation has been reviewed by Zakus et al and several reports have reiterated that it is highly effective.[42,43] Community capacity is the strength of Kerala that enabled the public health system in the formation of community coalitions through community health volunteers. This in turn has helped in successful control of the much-expected outbreak of Leptospirosis.

CONCLUSION

Community participation was effectively used by the Public health system in disaster mitigation and control during the Kerala floods of 2018. The current study envisages and promotes a change to "Government-led people powered strategy" for fighting future epidemics following disasters.

Limitation

We acknowledge the limitation that we didn't compare this data from the present study with data from regions with similar rainfall and topography without any prophylactic efforts, which would have been the ideal method. But the researchers couldn't identify a similar region for comparison.

ACKNOWLEDGEMENTS

The authors would like to thank the Community Volunteers and health workers of the study area for their contributions to the study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Cherian MP, Johnson AKS, Joseph MR, John J, Cherian KM. Promoting community participation in prophylactic measures against Leptospirosis outbreak following devastating floods in central Kerala: an exploratory study. Int J Community Med Public Health 2020;7:3568-74.

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