

Opinion

POOR GARBAGE MANAGEMENT: A MAJOR SOURCE OF EMERGENCE OF LEPTOSPIROSIS AND OTHER INFECTIOUS DISEASES

PRABHU Saran N^{1*}, NATARAJASEENIVASAN K², JOSEPH Pushpa Innocent D³

¹Postgraduate and Research Department of Microbiology, Chennai Medical College Hospital and Research Centre (SRM Group), Tiruchirapalli, INDIA and D.Sc. Research Scholar in Microbiology, The Tamilnadu Dr. M.G.R. Medical University, Chennai, INDIA

²Department of Microbiology, School of life Sciences, Bharathidasan University, Tiruchirapalli, INDIA

³Department of Microbiology, Karpaga Vinayaga Institute of Medical Sciences, Kancheepuram, INDIA

ABSTRACT

Received 19 June, 2015

Revised on the 22 June, 2015

Accepted 24 June, 2015

*Corresponding Author's Email:
leptoprabhu@gmail.com

The poor garbage management plays a crucial role in providing lodgment for the rodents that mainly spread the disease leptospirosis. The decomposing organic waste attracts animals, vermins and flies that are transmitting faecal oral diseases, leptospirosis, salmonellosis and also attracts the snakes to waste heaps. There are thousands of people, most of them children, wearing no protective gear such as boots, gloves or eye glasses who are exposed to wastes in India and are prone to get more infections. Health experts had repeatedly gave awareness training and repeated lectures to the municipal scavengers on wearing protective clothing, and the risk of bare exposure to infectious garbages leading to severe health hazards. Like sewage, much solid waste or refuse produced by man is contaminated with biological agents from infectious pathogens, animals, insects, etc., causing severe infections to humans. Uncleared garbage raise the risk of leptospirosis due to the lodgment of rats, bandicoots, mice, etc., which spread the disease. In India, due to the lowering performances of garbage disposal, the epidemic of deaths due to leptospirosis and other infectious diseases associated with human waste are also on the rise. Thus proper solid waste management should be channelized and performed without any further hesitations.

Key words: Poor Garbage management, infectious diseases, leptospirosis.

INTRODUCTION

Environmental factors revealed to influence the epidemiology of leptospirosis include heavy rainfall and flooding (Pappachan *et al.*, 2004), high temperatures, animal exposures, poor sanitation and poor waste disposal (Levett, 2001; Maskey *et al.*,

2006; Vanasco *et al.*, 2008). With worldwide climate change and urbanization, many of these most important risk factors are expected to occur with larger occurrence and strength (Patz and Kovats, 2002). This leads to the potentially upsurge in the incidence of leptospirosis and the frequency of outbreaks, particularly in combination with the

urbanization trends are described (Maskey *et al.*, 2006). Urban slums in tropical developing countries are at particularly high risk for leptospirosis outbreaks due to the combination of frequent flooding, warm temperatures, poverty, high population density, poor hygiene standards, poor sanitation, inadequate sewage facilities and waste disposal, poor drainage and the abundance of rats that transmit the bacteria. When these conditions occur in small islands, the burden of disease is likely to increase, but exacerbated by rising sea levels and increases in surface temperature also modify or mutate the infectious agents to survive and cause severe and uncontrolled problems to human exposures (Ebi and Schmier, 2005).

Etiology of Leptospirosis

Leptospirosis, a fatal disease that spread by poor garbage management/improper municipal solid waste management (MSWM), an important observation that raise the case fatality and mortality in India. Deaths resulting from the disease have increased by five times in 2013. In all, 1,293 cases of leptospirosis were reported across the state of Karnataka in 2013, with the disease claiming 40 lives. In 2012, only eight people died of leptospirosis. The incidence is 2.8 times that in the previous year, when 462 cases were registered by Health authorities (Sharadha, 2013). Leptospirosis is a bacterial disease caused by *Leptospira interrogans*, transmitted from animals to humans through contaminated soil and water. It spreads when contaminated water or food is consumed, or if open wounds come in contact with infected soil and water and most of the time spreads through rodents such as rats, bandicoots, etc., (Palaniappan *et al.*, 2007; Prabhu *et al.*, 2015).

Clinical manifestations, Co-infections and Risk factors

Symptoms of leptospirosis include high fever, severe headache, chills, myalgia and vomiting, and may include jaundice, conjunctival suffusion, abdominal pain, diarrhea and rash (Natarajaseenivasan *et al.*, 2004). The core initial clinical presentation may resemble flu like pneumonia and the symptoms in humans appear after 4 to 14 days incubation period. Up to 10% of infected persons may develop a serious systemic illness, Weil's disease, which can result in high fever, jaundice, aseptic meningitis, acute renal failure, internal bleeding and occasionally death (Prabhu *et al.*, 2008, 2010, 2014). In most of the cases,

leptospirosis can be confused with Dengue fever because of the similarity in symptoms and it urges clinicians to consider the diagnosis of leptospirosis in patients who complain of flu-like symptoms especially those who could have been exposed to the urine of rats or to pools of infected water (Prabhu *et al.*, 2014). Thrombocytopenia also provides certain confusion to exclude dengue cases; further specific serology supports the confirmation (Prabhu *et al.*, 2010). A special request to all clinicians is that interview the patients about their animal contacts, exposure to rodents, etc., when febrile cases observed. In INDIA the most common carriers are rats, dogs and livestock that transmit the diseases but humans do not transmit the infection to others. People who are at the highest risk for leptospirosis are sanitation and sewer workers, farmers, veterinarians, laboratory workers, etc. The people who are exposed to rodent contaminated surroundings when hygienic measures are unsatisfactory, as well as persons involved in recreational activities and also have at greater risk in acquiring leptospirosis (Shafei *et al.*, 2012).

South India perspective

Karnataka is one of only five states in the country where leptospirosis is endemic; previously the highest incidence in 2013 was recorded in Tamil Nadu. Karnataka is a close second, followed by Kerala. Even though Karnataka places second in infection, but the mortality rate was observed higher in Karnataka than in other five states of South India. The major reason may be the non-standardization of early diagnosis, misdiagnosis, no proper awareness among risk groups, non-implementation of antibiotic policy and unawareness about crystalline penicillin and doxycycline chemotherapy among young clinicians even in some serious conditions too. The early doxycycline therapy and dialysis (if acute renal failure observed) may save the life. Further counter interventions support the patient to recover earlier.

Poor garbage management and infections

Poor garbage disposal and inadequate waste management are the major factor that could increase the cases on leptospirosis in India. The garbage dump provides the best habitat for the animals and rodents (Fig. 1) that spread the disease to humans by its urinary excreta (Socolovschi *et al.*, 2011). The infection is commonly transmitted to humans by allowing water and environmental samples that has

been contaminated by animal urine which come in contact with unhealed breaks in the skin, the eyes, or with the mucous membranes (Hartskeerl *et al.*, 2011).

The garbage problem in the residential areas has led to a huge population of rats, which routinely raid homes (Fig. 2). In more places of the town garbages are disposed in the canals and sewage also polluting the same (Fig. 3). The animals search the food for survival in the garbage dump transmitting various diseases (Fig 4). Rats multiply rapidly living in garbage as it provides them with food and a temperature conducive for reproduction (Fig 5). Rat excreta and urine also tend to increase around these areas and in shops and closed spaces where food or canned drinks are stored. When these substances get contaminated with rat excreta, they could cause leptospirosis contamination and infection. Furthermore, the urine excreta of the rodents may spread the infection when humans are exposed (Krojgaard *et al.*, 2009).



Fig 1: Garbage dump where animals lodge



Fig 2: Garbage in human flow areas



Fig 3: Garbage and sewage pollute the canals



Fig 4: Birds and animals searching food in garbage dumps

Rodent control

Rodent control was also one of the strategies along with early diagnosis of infected patients and preventive treatment. The incidence of the disease is also high in regions where huge quantities of food grains are stored in mills and godowns. South India especially Karnataka recorded 148 cases of the disease in 2012 but has risen almost tenfold in just three years. In addition, open sewers and poor drainage serve as thriving grounds for rodents to breed. The more affluent areas including solid waste dumping had the reasonable number of rats captured. This result could be explained by better sanitary conditions and garbage management practices in this affluent area (Benacer *et al.*, 2013).



Fig 5: Rats and mice often feed on garbage and excrete urine

The risk factors of the poor garbage management include:

1. Animals having access to the organic wastes
2. Environmental pollution due to irregular collections

The dumping of the garbages leads to the lodgment of rodents including rats, breeding of domestic flies and cockroaches, mosquito breeding, refuse accumulates, containers in refuse (wastes), refuse blocks drainage, water pollution due to organic wastes and excreta in refuse. So, proper garbage management and environmental cleaning help to reduce infectious diseases.

Three types of actions are recommended for the garbage management to avoid the spread of such infectious diseases (Reed and Dean, 1994).

1. Immediate action
Clearing the scattered waste, burning and burial of waste on site, temporary communal pits and off site disposals and repairing or upgrading of existing facilities.
2. Short term measures
Communal pits, family pits and the combinations of communal bins and offsite disposal
3. Long term measures
Communal pits, family bins, combinations of communal bins and offsite disposal, repairing or upgrading of existing facilities and improve recycling of the waste for multiple utilization.

Need of policy implementation

To manage such environmental hazardous conditions to reduce the infectious diseases further, the corporation of Tiruchirapalli, INDIA, had made

several proposals to curtail air pollution from the garbage yard. Several council meetings had even passed resolutions on the issue and spent considerable amount to curb pollution. Proposals such as starting a bio-reactor, increasing the capacity of the solid waste management centre and finding an alternative site are yet to be executed. For long untimely collection of garbage within the city limits has been creating discomfort to residents. Garbage-stuffed vehicles are often found at traffic signals leaving a trail of odour and even litter falling off from them. So, the residents and health authorities requested the civic authorities to clear garbage at night so as not to inconvenience anyone.

Since the 1970s, major changes in waste disposal had taken place around the world. Recycling has become a representative component of garbage pickup, and in some places mandatory. Compost pickup, clean incineration and proper disposal in high-tech environmentally friendly industrial centres are common practice in industrialized countries (Adewumi *et al.*, 2005). The observation contrasts from other parts of the world where poor garbage management continues spreading diseases and polluting the air, land and water. At stake is the life and health of our world, and the endangerment of many plant and animal species which are at risk of extinction. Makoni *et al.* (2004) reported that diarrheal diseases were the most prevalent disease (50%) related to the poor sanitation including waste disposal and management (Makoni *et al.*, 2004).

Health hazards and leptospirosis

One of the most adverse impacts of poor waste management especially municipal waste is the incidence of various diseases including respiratory problems, gastrointestinal disorders, leptospirosis, malaria and other illness through the contamination of ground water. More than 20% of the biomedical waste dumped in the municipal area is highly infectious and constitute a health hazard since it is often disposed of into the sewage system. In developing countries, it is common for municipalities to spend 20 – 50% of their available recurrent budget on solid waste management (Ajani, 2007). The overall goal of urban solid waste management is to collect, treat and dispose of solid wastes generated by all urban population groups in an environmentally and socially satisfactory manner using the most economic means available (Lawuo *et al.*, 2014; Abel, 2009).

Innovative practices

The two leading innovative mechanisms of waste disposal being adopted in India included composting and waste to energy. The different methods for the disposal and treatment of wastes have been described as landfilling; recycling of organic waste – aerobic composting, vermicomposting, and bimethanation; thermal treatment techniques – incineration, gasification technology, refuse derived fuel; recovery of recyclable materials. The public encouragement to separate the municipal solid waste and market it directly to the network appears to be a better option. Public awareness should be created among masses to be inoculated against the health hazards of the wastes. Littering and dumping of wastes may lead to lodgment of rodents and further more infectious diseases spread.

The current regulations of solid waste management are very stringent. Norms have been developed to ensure a proper MSWM system. Unfortunately, there is a large gap between policy and implementation. The producer responsibility is to avoid having products on the market that cannot be handled effectively and environmentally correctly when they become waste products. The increase of service demands combined with the lack of resources for municipalities are putting a huge strain on the capacity of existing MSWM system to reduce or avoid the increasing strength of rodents, mosquitoes and other large and small animals that spread the infections.

CONCLUSION

Government has to take necessary action towards this issue and makes South India, an infection free state. The individuals also activated themselves in avoiding dumping and throwing of wastes in the roadsides. Proper garbage collection also plays a vital role in avoiding all the above issue. The trolley using by the municipal workers for collecting house hold garbages should be reconstructed and redesigned because in most of the places, the lower part of the trolley break and leakage found that create bad odor environment as well as attracts the rodents to travel on the leak-prints and reach the solid waste dumping area.

REFERENCES

1. Abel OA (2009). An analysis of solid waste generation in a traditional African city: the example of Ogbomoso, Nigeria, *Environment and Urbanization*. *SAGE J* 19:527-537.
2. Adewumi IK, Ogedengbe MO, Adapter JA and Fabiyi YZ (2005). Planning organic fertilizer for municipal waste management. *J Appl Sci Res* 1:285-291.
3. Ajani OIY (2007). Determination of an effective solid waste management in Ibadan metropolis, Oyo state, Nigeria. *Z J Food Agri Env* 6: 152-157.
4. Benacer D, Siti NMZ, Fairuz A, Renee LG and Kwai LT (2013). Isolation and molecular characterization of *Leptospira interrogans* and *Leptospira borgpetersenii* isolates from the urban rat populations of Kuala Lumpur, Malaysia. *Am J Trop Med Hyg* 88: 704-709.
5. Ebi KL and Schmier JK (2005). A stitch in time: improving public health early warning systems for extreme weather events. *Epidemiol Rev* 27:115-121.
6. Hartskeerl RA, Collares-Pereira M and Ellis WA (2011). Emergence, control and re-emerging leptospirosis: dynamics of infection in the changing world. *Clin Microbiol Infect* 17:494-501.
7. Krojgaard LH, Villumsen S, Markussen MDK, Jensen JS and Leirs H, Heiberg AC (2009). High prevalence of *Leptospira* sp in sewer rats (*Rattus norvegicus*). *Epidemiol Infect* 137:1586-1592.
8. Lawuo AZ, Malugu D and Mnyawi SP (2014). Perseverance of poor solid waste management system in urban areas; a case of Dodoma municipality, Tanzania. *Int J Innov Sci Res* 8:112-117.
9. Levett PN (2001). Leptospirosis. *Clin Microbiol Rev* 14:296-326.
10. Makoni FS, Ndamba J, Mbatia PA and Manase G (2004). Impact of waste disposal on health of a poor urban community in Zimbabwe. *East Afr Med J* 81:422-426.
11. Maskey M, Sashtri JS, Saraswathi K, Surpam R, Vaidya N (2006). Leptospirosis in Mumbai: post deluge outbreak. *Indian J Med Microbiol* 24:337-338.
12. Natarajaseenivasan K, Prabhu N, Selvanayagi K, Raja SSS and Ratnam S (2004). Human leptospirosis in Erode, South India: Serology, isolation and characterization of the isolates by randomly amplified polymorphic DNA (RAPD) fingerprinting. *Jpn J Infect Dis* 57:193-197.
13. Palaniappan RU, Ramanujam S and Chang YF (2007). Leptospirosis: pathogenesis, immunity and diagnosis. *Curr Opin Infect Dis* 20:284-292.
14. Pappachan MJ, Sheela M and Aravindan KP (2004). Relation of rainfall pattern and epidemic leptospirosis in the Indian state of Kerala. *J Epidemiol Comm Hlth* 58:1054-1061.
15. Patz JA and Kovats RS (2002). Hotspots in climate change and human health. *BMJ* 325:1094-1098.
16. Prabhu N, Joseph PID and Chinnaswamy P (2008). Leptospirosis in Coimbatore, Manchester of South

- India: assessment of clinical presentation of 93 cases. *Bombay Hosp J* 50:434-438.
17. Prabhu N, Joseph PID and Chinnaswamy P (2010). Thrombocytopenia on leptospirosis and role of oral amoxicillin and doxycycline in patient management. *Int J Pharm Sci Biotechnol* 1:25-29.
 18. Prabhu N, Natarajaseenivasan K and Joseph PID (2014). Importance of serological analysis – an interpreter of identifying infecting serovar in patients with leptospirosis. *Med Sci* 8:27-31.
 19. Prabhu N, Natarajaseenivasan K and Joseph PID (2015). Survey of leptospiral pathogens carried by rodents at different areas of Tiruchirapalli, INDIA. *Int J Ext Res* 6:26-31.
 20. Reed R, Dean PT (1994). Recommended methods for the disposal of sanitary wastes from temporary field medical facilities. *Disasters* 18:267-273.
 21. Shafei MN, Sulong MR, Yaacob NA, Hassan H, Wan MohdZahiruddin WM, Daud A, Ismail Z and Abdullah MR (2012). Seroprevalence of leptospirosis among town service workers on North-eastern state of Malaysia. *Int J Coll Res Int Med Pub Hlth* 4:395-403.
 22. Sharadha K (2013). Garbage increases epidemic deaths by 5 times in one year. Available at: [www.newindianexpress.com/states/Karnataka/garbage-increases-epidemic-deaths by 5 times](http://www.newindianexpress.com/states/Karnataka/garbage-increases-epidemic-deaths-by-5-times). [Accessed 18.06.2015]
 23. Socolovschi C, Angelakis E, Renvoise A, Fournier PE, Marie JL, Davoust B, Stein A and Raoult D (2011). Strikes, flooding, rats and leptospirosis in Marseille, France. *Int J Infect Dis* 15:710-715.
 24. Vanasco NB, Schmeling MF, Lottersberger J, Costa F, Ko AI and Tarabla HD (2008). Clinical characteristics and risk factors of human leptospirosis in Argentina (1999-2005). *Acta Trop* 107:255-258.

Article's Citation:

Prabhu SN, Natarajaseenivasan K and Joseph PID (2015). Poor Garbage Management: A major source of emergence of Leptospirosis and other infectious diseases. *Ew J Epidemiol & Clin Med* 1(1): 1-6.