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Guest Editorial

Can Shigellosis be Considered as a Reverse Zoonosis?

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Zoonotic diseases that cause high morbidity as well as mortality in susceptible hosts, pose a serious threat to human and animal health worldwide [1,2]. Due to close association of humans with animals, there is a cross-species transmission of pathogen [3]. Reverse zoonosis also known as zooanthroponosis, is an infectious disease, which involves multiple aetiologies including the virus (measles, severe acute respiratory syndrome-CoV-2, poliomyelitis, influenza A (H1N1, infectious hepatitis), bacteria (*Streptococcus pneumonia, Mycobacterium tuberculosis*, methicillin resistant *Staphylococcus aureus* (MRSA), *Escherichia coli*, *Shigella, Campylobacter, Salmonella*), fungi (*Candida albicans*, *Trichophyton rubrum*), protozoa (*Cryptosporidium parvum*, *Entamoeba histolytica*, *Giardia duodenalis*), and helminths (*Trichuris trichiura*, *Dracunculus medinensis*, *Ascaris lumbricoides*); and are transmitted from humans to animals by several routes [4-9].

Shigellosis (bacillary dysentery) is a highly infectious bacterial disease of global significance; and is caused by several species of *Shigella*, such as *S. boydii, S. dysenteriae, S. flexneri, S. sonnei* [3]. The etiologic agent is Gram-negative, non-capsulated, non-sporulated, short rod-shaped bacterium that can survive in moist environment for days. Life threatening disease is caused by *S. dysenteriae* and *S. flexneri* in the susceptible individuals [3]. In the United States, *Shigella sonnei* is the most commonly isolated species [10] whereas in India, *Shigella flexneri* is the main species that has been isolated more frequently [11]. The disease occurs in endemic and epidemic form. Children of less than 5 years of age are most vulnerable to get infection [10]. It is commonly reported in AIDS patients. Some strains of *Shigella* can result in 10 to 15 percent mortality rates [3]. In addition to humans, the infection has been encountered in bat, dog, horse, monkey, and rattlesnake [3]. It is reported that around 450,000 people are affected with shigellosis every year in the United States [10]. Moreover, an estimated $93 million in direct medical costs are attributed due to antimicrobial resistant infections [9]. Human to human transmission is reported in *Shigella* infection [10]. It is pertinent to mention that people suffering from malnutrition have the potential to shed the microorganisms, and therefore, may increase the risk of reverse zoonotic transmission to animals [12]. Hence, it is suggested that good nutrition plays a significant role to boost the immunity, thereby, help to prevent the infection.

Transmission of *Shigella* infection occurs through faecal-oral route [3]. Humans can acquire the infection directly from sick person or indirectly from contaminated fomites like lavatory seats, water taps, and door handles [3,11]. Humans can accidently transmit the infection to the susceptible animals [3]. Sex with a sick person can also transmit the infection [10]. Consumption of contaminated food or water can also cause infection [10]. The role of flies as a mechanical vector to spread the infection is also documented [3].

The incubation period of shigellosis in humans is 1 to 4 days [3]. Disease is manifested in various clinical forms, such as mild or catarrhal dysentery, acute dysentery, fulminant dysentery, relapsing dysentery and chronic dysentery [3]. Patient shows fever, abdominal pain, mucoid, bloody diarrhoea, tenesmus, thirst, weakness, dehydration, dirty tongue, malaise, prostration, besides dry sallow skin. Shigellosis is more severe in children as many thousand children succumb to death from the disease each year in developing countries [3].

Clinical symptoms in primates include diarrhoea, abdominal cramps, and dehydration. Inapparent infection is described in other animals [3].

Clinical symptoms are not very characteristic to make the diagnosis. Hence, laboratory help is required to make an unequivocal diagnosis of shigellosis. The bacterium can be easily isolated from stool of affected patients on several microbial media, such as Deoxycholate citrate agar, Mac Conkey agar, *Salmonella-Shigella* agar and Hektoen enteric agar [3]. Pulse-field gel electrophoresis can be employed for phage typing. Serologic typing of clinical isolates is important from epidemiological point of view [3]. Molecular tools are employed to detect and characterize bacterium in the children suffering from diarrhoea [13]. Shigellosis should be included in the differential diagnosis of diarrhoeal diseases, such as campylobacteriosis, vibriosis, and colibacillosis [11].

The importance of antibiotic therapy in shigellosis has been described by Williams and co-workers [14]. These authors suggested that antibiotic treatment is very useful to curtail the risk of transmission, check the serious complications, and also to reduce the course of disease. Several antibacterial antibiotics, such as ampicillin 2g daily in adult and 50-100 mg/kg/PO daily in children; Trimethoprim-Sulfamethoxazole 8-40 mg/kg PO per day in children for 5d; Nalidixic acid 55 mg/kg PO for 5 days are recommended [3]. In severe case, electrolyte solution should be given by intravenous route to check dehydration [3].

Currently, no effective vaccine for shigellosis is commercially available [11]. Therefore, some effective measures, such as Isolation of patient, sanitary sewage disposal, protection of food, purification of water, elimination of flies, establishment of clean and wholesome water supply, proper pasteurization of milk and milk products, sterilization of clothing, bedding and other articles, which have come in contact of patient, supervision of food handlers, avoid eating unwashed fruits and vegetables, and strict personal hygiene can help to combat the disease. In addition, health education should be imparted to people about the significance of personal and environmental hygiene besides good nutritious diet [3]. It is advised that sex must be avoided from *Shigella* infected person [10].

The isolation of *Shigella* from the free-ranging human-habituated mountain gorillas of Uganda is strong evidence of human-to- animal transmission of *Shigella* [15], and thus confirms that shigellosis is a reverse zoonosis. There is a need to undertake comprehensive studies to delineate the role of *Shigella* species in various species of animals. Attempts must be made to develop a safe, potent, and low- cost vaccine that can be easily affordable by the poor resource nations to immunize the high- risk population. One Health approach, which involves the experts from medical, veterinary, and environment is recommended to mitigate the incidence and prevalence of zoonoses.

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This article is dedicated to all the freedom fighters who scarified their life for the nation.

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