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An Overview of Priority Prevalent Zoonoses in India

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Abstract

Globally, over the last two decades zoonotic diseases are causing significant effects on national income and public health. Owing to human activity, urbanization, industrialization and deforestation these diseases transcended natural boundaries and caused tremendous impact on man especially in developing countries like India where societies live close to animals for their livelihood. In comparison, the impact of zoonotic diseases in developing countries is more severe than developed countries due to poverty, lack of medical facilities and surveillance at rural part, poor sanitation, improper personal hygiene and farming practices. Therefore, it is important to have a look at zoonotic diseases which are in top priority in the country so that they get proper attention towards control and prevention of these diseases by the stakeholders viz., medical, veterinary, wildlife, agriculture professionals, and policy makers. This article gives brief insight about these diseases and measures to prevent them.

Introduction

Zoonoses are amongst the most frequent and dreaded diseases to mankind. The World Health Organization defined zoonoses as those diseases or infections which are naturally transmitted between humans and vertebrate animals. It is true to believe that 60% of human pathogens are zoonotic in nature and over 800 pathogens are defined as zoonoses. Moreover, 75% of emerging pathogens are zoonotic in origin which is transmitted either through zoonotic reservoirs or vectors (Woolhouse and Gowtage, 2005). In nature, animals maintain the infection and play an important role in transmission to animal and human population by direct or indirect ways (Figure 1). These diseases have variety of transmission mechanism that may be direct by contact, air-borne, scratch or bite and indirect by food, vector, water and

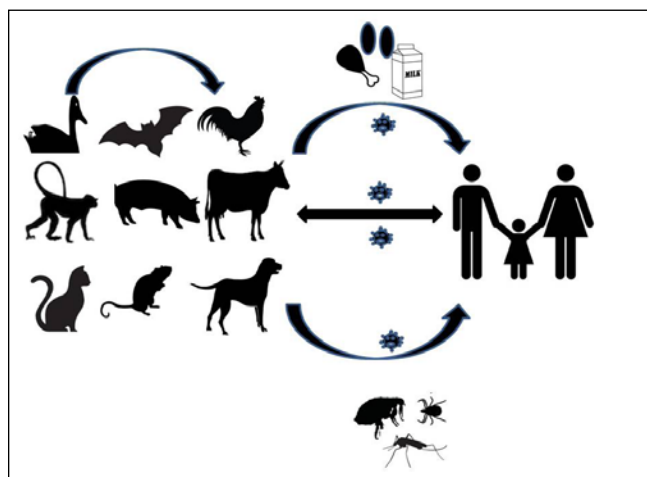


Figure 1: A diagrammatic representation of zoonoses

environment.

The outbreaks of zoonotic diseases have surfaced in recent decades and acquired notoriety as those causing chronic disability in populations particularly dependent on livestock for livelihood. The effects of these diseases are severe in India because 65-70 % of human population are dependent on agriculture and allied sector especially animal husbandry. There are many zoonotic diseases which are in top priority and disproportionately affecting marginal and rural communities in India. The zoonotic diseases which are of utmost priority in India are rabies, brucellosis, bovine tuberculosis, leptospirosis, Japanese encephalitis, salmonellosis, pandemic flu (H1N1 and H5N1), plague, anthrax, Covid-19 (Das *et al.*, 2019) and discussed herewith.

Rabies

Rabies is one of the highly fatal viral zoonotic disease in India that infects all warm blooded vertebrates especially carnivores (dogs, cats, fox, jackal, etc.) and human beings. The disease is caused by Lyssavirus which is transmitted from bites of carnivores and globally, 55,000 humans die because of rabies, of which India contributes the maximum deaths of 20,000 per year. This is mainly due to increased stray dog population, lack of knowledge about prevention measure and occasionally by spill over of virus from wildlife. The most dreaded part is that the death of human is very painful with progressive paralysis leading to photophobia, aerophobia, hydrophobia and a slow death which the patient can feel and had to die eventually. The disease is not curable but 99% preventable in humans and animals if regular vaccination of pet dogs, control of stray dog population by animal birth control programmes and post-bite human rabies vaccination is followed.

Brucellosis

Brucellosis is the most wide spread infectious zoonotic disease caused by members of genus brucella namely *B. abortus* and *B. melitensis*. The disease primarily infects livestock and transmitted to human beings through ingestion of contaminated raw milk, dairy products, and occasionally through conjunctiva, close contact, laboratory accidents and airborne. Majority of cases are reported in veterinarians, animal handlers and slaughter house workers due to occupational exposure by handling material of abortions and carcasses of infected animals. In animals, the disease causes abortions in third trimester of pregnancy, placentitis and testicular abnormalities. On the other hand, in humans it produces characteristic undulant fever, chills, profuse sweating, orchitis, lymphadenopathy and arthritis. An overall prevalence of around 12% is estimated among bovine population in India. India with enormous livestock wealth has incurred an economic loss of 24 crores and 30 million man days per year due to this disease (Kumar *et al.*, 2020). The

main ways of preventing brucellosis are improving hygiene in producing milk and milk products, vaccination in animals, screening and removal of reactors in herds, hygienic handling and disposal of aborted fetuses and infected carcasses.

Bovine Tuberculosis

Tuberculosis is an ancient disease caused by members of *Mycobacterium tuberculosis* bacillus complex (MTBC) namely *M. tuberculosis* and *M. bovis*. Among these two, *M. tuberculosis* is human pathogen and *M. bovis* is zoonotic pathogen which causes bovine tuberculosis. *M. bovis* has exceptionally wide host range, hence there are varieties of animal species playing a major role in the maintenance of it in wildlife and spread to domestic animals. Bovine tuberculosis is primarily a chronic debilitating bacterial zoonotic disease of cattle transmitted to humans through ingestion of contaminated raw milk and inhalation of infectious droplet nuclei. In animals it is spread through respiratory secretions, closed contact, urine, milk, vaginal secretions and semen. Initially for about 4-6 weeks the disease is asymptomatic in both animals and humans but gradually symptoms like weight loss, cough, sputum production, and tubercular formation are developed. The disease causes lymphadenitis in children (primarily cervical lymph nodes) and pulmonary tuberculosis in middle and old age people. Bovine tuberculosis among Indian cattle population is estimated to a prevalence of 7.3% which means an estimated 21.8 million cattle are infected in India. In order to control and prevent this potential zoonotic disease it is necessary to adopt measures like pasteurization before marketing, proper screening of carcasses in abattoirs, regular surveillance of humans and animals.

Leptospirosis

Leptospirosis is most wide spread zoonoses in the world caused by a pathogenic spirochete of genus *Leptospira*. In India, leptospirosis remained as one of major public health problem particularly during post ecological disturbances like earthquakes, floods etc. The disease is naturally carried by more than dozen species of wildlife, rats, and domestic animals. Man is the incidental or accidental dead end host whereas dogs and rodents are potential spreaders and principle reservoirs. It is primarily a contagious disease of animal's occasionally communicable to humans through contact with an environment contaminated by urine, aborted fetus and uterine discharge of reservoir host or infected animals. It is an occupational disease transmitted by contaminated flood plains, wet agricultural settings and recreational activities like bathing, swimming in stagnant water polluted with urine of infected animal or reservoir through contact, abraded skin mucosa, cutaneous penetration and conjunctiva. In animals it causes jaundice in dogs, abortions in cattle and periodic opthalmia in horse whereas in humans it mainly produces jaundice, conjunctivitis, hepatomegaly and also renal insufficiency, non-suppurative

meningitis in mild forms. Vaccination of animals particularly dogs and cattle, rodent control, personal protection and hygiene by drinking pasteurized milk, use of protective clothing etc., sanitation and hygiene of environment like proper chlorination of swimming pools etc. and health education will eventually control the disease.

Japanese Encephalitis

Japanese encephalitis is one of a group of mosquito-borne viral zoonotic disease caused by JE virus which belongs to genus Flavi virus of family Flaviviridae. The disease has high epidemic potential with majority of cases reported from rural, semi-urban and agricultural areas where mosquitoes (mainly *Culex tritaeniorhynchus*) proliferate and live in paddy fields and stray pig roaming regions. The disease burden in India is high due to temperate climate with incidence reaching peak in August-October due to heavy rainfall and floods favouring for increase of vector population. Human, cattle, horses being dead end hosts acquire infection by bite of mosquito containing virus which is picked up from amplifying hosts (pigs) or reservoirs hosts (wild birds). In humans the onset of disease is rapid and usually starts as flu like illness, high fever, chills gradually developing cerebral and meningeal infestations like stiff neck, convulsions (especially in children) finally progressing to coma. Many suffer from lifelong neurological defects such as deafness, motor deformities, etc. are seen as sequelae. On the other hand, in cattle and horse it causes fatal encephalitis. Prompt reporting of JE incidence to local authority, sero-surveillance in JE prone areas, vaccination of susceptible population, interruption of transmission by following anti-larval and anti-adult measures against mosquitoes, health education will help in control of the disease.

Salmonellosis

Salmonellosis is a global problem as it covers a complex group of food-borne infections affecting both animals and humans. The zoonotic salmonellosis which is showing an increased trend is caused by non-typhoidal serotypes *Salmonella* Enteritidis and *Salmonella* Typhimurium. The disease is transmitted to humans through faeco-oral route by ingestion of contaminated food and water, meat or unpasteurized milk and environmental contamination (water sources and sewage). The severity of infection depends upon level of infecting dose in humans and animals which causes dehydration, vomiting, fever, severe abdominal pain and diarrhoea. Prevention of zoonotic salmonellosis can be achieved by maintaining proper hygiene starting from farm level to all elements of food chain through live animals, animal products, and food processing to consumption.

Pandemic Influenza

Influenza is an acute viral contagious disease of birds and mammals caused by serotypes of Influenza A virus which belongs to family Orthomyxoviridae. The serotypes

confirmed to be responsible for pandemic human deaths are H1N1 (Spanish flu & Swine flu) and H5N1 (bird flu). The viruses are maintained in species-specific hosts such as wild and domestic birds, pigs and transmitted to humans mainly through inhalation of droplets produced by coughing and sneezing, especially in crowded places or in direct contact with infected animal populations. Moreover, new influenza viruses' emergence is mainly due to antigenic variation, mutations or by reassortment. In humans it causes acute respiratory tract infection with fever lasting for 1-5 days, headache, cough, respiratory distress which eventually end in death (particularly in cardiopulmonary disease persons). On the other hand, animals have mucous nasal discharge, coughing followed by rapid recovery in most of cases. In order to prevent and control influenza type pandemics, measures should be directed towards maintenance of strict bio-security measures during suspected flu outbreaks which includes mass culling of birds and swine, disinfection and sanitation and restricted movement between farms. Apart from above, control can be done by following personal hygiene, food hygiene and quarantine of all imports and exports including human beings.

Plague

Plague is an ancient disease but still continues to be a re-emerging infectious threat for human beings and animals. It is highly fatal zoonosis caused by bacterium *Yersinia pestis* which is maintained in nature by rodent (wild and domestic) – rat flea (*Xenopsylla cheopis*) cycle. Human plague is most frequently contracted through bite of an infected flea, contact with infected rodent or occasionally by droplet infection or direct contact with infected tissues. In humans the disease causes painful enlargement of lymph nodes making them swollen and tender (characteristically called “buboes”), disseminated intravascular coagulation resulting in necrosis on certain areas of skin (black death), septicaemia and pneumonia. On the other hand it causes self-limiting illness in dogs and severe infection in rats and cats. Control and isolation of cases by early diagnosis, blocking the transmission chain by elimination of fleas and use of rodenticides, disinfection of contaminated surfaces, surveillance of rodent and human plague in endemic areas will help in prevention and control of the disease.

Anthrax

Anthrax is an acute infectious disease primarily of herbivorous animals, occasionally affecting humans. The disease is enzootic in Southern India but it is less frequent to absent in northern states. It is caused by *Bacillus anthracis*, a gram positive, aerobic spore forming pathogenic bacilli. Spores which are mainly responsible for transmission of infection are viable in soil for many years and transmitted to humans through inhalation (respiratory route) during wool sorting, contact (cutaneous route) with contaminated

carcasses, wool, hide or hair, ingestion (oral route) of under cooked infected meat. Animals acquire mainly by ingestion of soil containing viable spores and infected feeds. Human infection is characterized clinically by pulmonary form, cutaneous form and intestinal form. In animals, anthrax is characterized by septicaemia and sudden death accompanied by exudation of tarry coloured unclotted blood from natural orifices and absence of rigor mortis. Vaccination of animals, disinfection of wool or hide in endemic areas, proper disposal of carcasses, protective measures while handling of infected wool and hide will help in prevention of disease.

COVID-19

CCOVID-19 is a communicable viral zoonotic disease caused by new strain of corona virus named Severe acute respiratory syndrome- corona virus 2 (SARS-Cov-2) by WHO. As on Nov 2020 it had spread to 212 UN reporting countries causing 12 lakh human deaths and 5 crores cases globally. In India it was responsible for 1.2 lakh death and 85 lakh cases. It is very unique in its ease and spread due to short incubation period even though the exact movement of virus from animal to human population is not determined but several studies on environmental samples and animals in Wuhan live market are found to be positive for SARS-Cov-2. Human to human transmission appears to be through direct contact or indirect contact of mucus membranes of eyes, mouth or nose with respiratory droplets or fomites. In humans the most common symptoms are sore throat, fever, dry cough and running nose but in some cases there will be rapid deterioration with low oxygen

saturation and acute respiratory distress eventually leading to death. Personal hygiene measures like hand washing, use of appropriate masks, effective isolation of SARS patients, prompt identification of persons with SARS and restriction of their movement will further control the disease.

Conclusion

Zoonotic diseases are always a threat to human beings because animals, humans and environment are always dependent on each other and we don't know how many challenges like SARS-Cov-2, Pandemic Influenza etc. will confront humans in future. Therefore, it is necessary to develop a good communication, co-operation between medical, veterinary, wildlife sciences and ecologists including sharing knowledge and laboratory facilities which will add an immense strength to control diseases and their emergence, re-emergence in future.

References

- Das, S., Milton, A.A.P., Ghatak, S., Chendu, B.P., Shakuntala, I., 2019. Prioritization of Zoonotic Disease Using Social Instant Messenger Group. *Indian Journal of Extension Education*, 55(4), 207-210.
- Kumar, S., Swain, S., Preetha, G.S., Singh, B.S., Aggarwal, D., 2020. Zoonotic Diseases in India. *Indian Journal of Community Medicine*, 45(Suppl 1), S1-S2.
- Woolhouse, M.E., Gowtage, S., 2005. Host range and emerging and re-emerging pathogens. *Emerging Infectious Diseases*, 11, 1842-7.