

Current Status of Food Borne Parasitic Zoonoses in India: A Concern for Public Health

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Abstract—Zoonotic diseases are those diseases which are naturally transmitted from animals to human beings. In the group of zoonotic diseases parasitic zoonotic diseases constitute many infectious diseases with vast host range and different modes of transmission. The prevalence, distribution and transmission pattern of these parasitic diseases were exaggerated by influence of both human and environment factors. Impact of such diseases warrants human public health for appropriate surveillance so that proper measures should be taken by the government to check their transmission. This paper summarizes the reports of zoonotic parasitic infections encountered in various parts of India which are classified as meat borne, food borne, water borne, fish borne, crustaceans borne and raw vegetables borne diseases. The transmission of these zoonotic diseases can be decreased by increasing the awareness programs among the stakeholder's like animal handlers, veterinarians, medical officers, farmers, livestock owners and butchers. There should be a need of superior with rapid diagnostic techniques, proper surveillance and monitoring tools for forecasting and evaluation of a number of zoonotic parasitic diseases.

Introduction

India is the second largest populated country of the world having disparity in food, religion, education, geography, personal hygiene and habits of people. Since most of the population in India is living in rural areas depending on the livestock for their daily needs, their regular touch with livestock round the day make them prone to infection with zoonotic parasitic diseases. Zoonotic parasitic diseases are those which are naturally transmitted between human from vertebrate animals (Acha and Szyfres, 2006) and in India their prevalence is at varying rates [26]. In India mostly the protozoan infections are prevalent followed by helminth infection [8]. Various factors which affect prevalence of zoonotic parasitic diseases are: population growth, poverty, religious taboos, open space defecation, migration of people from rural areas to cities, lack of personal hygiene, reduced awareness on zoonotic diseases and destructive use of land causing ecological changes [32]. Present paper deals with current status and reports of food borne parasitic zoonoses in India.

Mode of Transmission of Food Borne Zoonoses

Incidences of zoonotic infection are increasing day by day round the globe due to changing habits of living and food consumption. There are different modes of transmission of food borne parasitic zoonoses which can be classified into five types:

- Meat borne zoonoses: This may be due to the ingestion of raw or uncooked meat of livestock like pig, buffalo, goat and sheep by humans. Eg. Sarcocystosis, Trichinellosis, Toxoplasmosis, Hydatidosis and Cysticercosis.
- Fish borne zoonoses: Fish act as an intermediate host in the life cycle of many parasites, hence act as a potential source of infection when eat in raw form by humans. E.g. Gnathostomiasis and Sparganosis.
- Snail and crustacean borne: Snails and other crustaceans like prawn act as a first intermediate host of many parasitic life cycles, and by eating in raw form they transmit parasitic infection to humans. E.g. Paragonimiasis and Angiostrongylosis
- Water borne: Impure water act as a highly potential source of transmitting infection to humans, as it may be contaminated with sporulated oocyst/ cyst/ embryonated eggs etc. e.g. Cryptosporidiosis and Toxocariasis.
- Raw vegetables borne: Metacercariae cyst may be deposited over the vegetables nearby water bodies. Due to consumption of such contaminated raw vegetables by humans lead to the zoonoses. E.g. Fasciolopsiasis and Gastrodiscoidiasis.

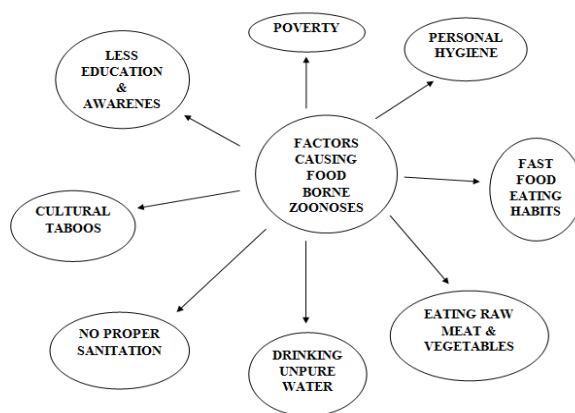


Figure 1: Factors causing Food Borne Zoonoses

TABLE 1: PREVALANCE OF FOOD BORNE ZOONOTIC PARASITIC DISEASES IN INDIA

S.NO.	NAME OF DISEASE	CAUSING AGENT	MODE OF TRANSMISSION	CLINICAL SIGN AND SYMPTOMS	DIAGNOSTIC METHODS	REFERENCE
A. MEAT BORNE						
1.	Sarcocystosis	<i>Sarcocystis hominis</i> and <i>Sarcocystis suihominis</i>	Ingestion of raw meat having tissue cyst or food and water contaminated with oocyst	Mild fever, diarrhoea, vomiting, chills and respiratory problems, myalgia and muscle weakness	Observation of oocysts in stool, Ziehl- Neelsen staining, real time PCR	[21],[3]
2.	Toxoplasmosis	<i>Toxoplasma gondii</i>	Ingestion of raw meat having tissue cyst or food and water contaminated with oocyst	Encephalitis, meningoencephalitis, fever, night sweat	Sabin Feldman dye test, Ag-Ab detection by ELISA	[7],[33]
3.	Trichinellosis	<i>Trichinella spiralis</i>	Eating raw or inadequately cooked meat (pig) contaminated with larvae of <i>Trichinella</i> sps.	Serious illness, difficulties with coordinating movements as well as heart and breathing problems, cardio-neurological syndrome, nephritis glomerulonephritis and pneumonitis.	PCR, Trichinoscopy of muscles at slaughter	[29]
4.	Cysticercosis (Neurocysticercosis)	<i>Cysticercus cellulosae</i> (metacestode stage of <i>Taenia solium</i>)	Ingestion of food and water contaminated with <i>T. solium</i> eggs	Headaches, seizures, visual disturbances, loss of vision	Giemsa and trichome stained smears and culture	[26],[31],[5]
5.	Hydatidosis	Metacestode stage of <i>Echinococcus</i> spp.	Ingestion of food and water contaminated with <i>E. granulosus</i> eggs	Abdominal pain, abnormal abdominal tenderness, hepatomegaly, jaundice, fever	Ultrasonography, MRI and CT scans, histopathology, or nucleic acid detection and serology	[23],[27],[11],[19]

B. FISH BORNE						
6.	Sparganosis	<i>Spirometra mansoni</i> and <i>Spirometra mansonioides</i>	Ingestion of drinking water contaminated with infected copepods or ingestion of raw/ uncooked fish or reptiles or amphibians	Weakness, headache, seizure and abnormal skin sensation like tingling and numbness. Symptoms depend on side of invasion of organs by spargana	Recovery of sparagnum from infected tissue	[36],[25],[10]
7.	Gnathostomiasis	<i>Gnathostoma spinigerum</i>	Eating uncooked and raw meat of crab, fish and frog.	Causes Visceral Larvae Migrans	ELISA, demonstration of larvae in the surgical specimen.	[28],[4]
C. SNAIL AND CRUSTACEAN BORNE						
8.	Paragonimiasis	<i>Paragonimus westermanii</i>	Eating raw and undercooked meat of crab and cray fish	Bronchitis, hemoptysis, dyspnea, night sweats, fever, diarrhea, eosinophilia	Demonstration of eggs in stool and sputum, X Ray, MRI and CT Scan of lungs for detection of adult parasite.	[17],[15],[18]
9.	Angiostrongylosis	<i>Angiostrongylus cantonensis</i>	Ingestion of raw or uncooked snails; paratenic host like prawns, contaminated vegetables	Severe headache, vomiting, eosinophilic meningitis	Eosinophilia, ELISA, IHA and IFA	[28],[16]
D. WATER BORNE						
10.	Cryptosporidiosis	<i>Cryptosporidium parvum</i>	Ingestion of food and water contaminated with sporulated oocyst	Nausea, fever, abdominal pain, diarrhoea	Oocyst detection in faeces by modified acid fast staining	[2],[14]
11.	Toxocariasis	<i>Toxocara canis</i> and <i>Toxocara cati</i>	Ingestion of water/ milk/ soil contaminated with embryonated eggs	Ocular larva migrans, cerebral larva migrans, cutaneous larva migrans and visceral larva migrans (mainly in lungs and liver). Weight loss, fever, cough and shortness of breath.	Detection of Antibody in serum using ELISA. Eosinophil cell count	[35],[6],[22]
E. RAW VEGETABLES						
12.	Fasciolopsiasis	<i>Fasciolopsis buski</i>	Eating of contaminated water chest nuts (<i>Trapa natans</i>) with metacercariae cyst.	Diarrhoea, abdominal pain, crumps, fever, ascites, intestinal obstruction and anasarca	Detection of eggs in stool	[13],[34],[20]
13.	Gastrodiscoidiasis	<i>Gastrodiscoides hominis</i>	Eating of contaminated aquatic plants with metacercariae cyst.	Fever, ascites, abdominal crumps and pain, diarrhoea.	Detection of eggs in stool	[30],[34]

PREVENTION AND CONTROL

There are many factors which lead to an increased risk for the incidence of food borne zoonotic parasites. Increased in the food trade and climate change have increased the risk of food borne parasitic zoonoses. Gajadhar *et al.*, 2006 reported that increased population and rapid urbanization has increased the demand of food which leads to more emphasis on the food safety. Dorny *et al.*, 2009 documented that for the betterment of food safety some strategic control measures should be applied in the country like regular monitoring and surveillance of diseases, people should be aware about the food safety and hygiene, use of superior diagnostic techniques with rapid treatment to check the spreading of disease. Prevention to check these food borne parasitic diseases can be done by using the following steps:

- Cooking of meat products to more than 70°C and avoid eating raw or uncooked meat.
- Rearing of pigs, cats and other pet animals should be away from kitchen area.
- Proper deworming of pet animal should be done at regular intervals.
- Human population should be educated about the diseases.
- Veterinary inspection should be strictly followed in the slaughter houses.
- Eating of raw vegetables should be avoided especially for woman while cooking.
- Disinfection of local water supply.

Conclusion

The prevalence of parasitic zoonotic diseases has been amplified in recent decades to an alarming point in India. Development of superior diagnostic techniques, proper surveillance and monitoring tools for forecasting and evaluation of a number of zoonotic parasitic diseases is the need of the hour. There should be proper steps to be followed for early assessment and control of the zoonotic parasitic diseases like development of newer early diagnostic tools, organization of public awareness camps about zoonotic parasitic diseases, actual assessments of disease conditions and proper management strategies to control any emerging or re-emerging diseases According to the World Organization for Animal Health (OIE), 75% of the zoonotic diseases originate from domestic or wild animals which calls for a close collaboration between animal and public health authorities and i.e. a proper coordination between veterinary officer, medical officer, ecologists, biologists and public health officers. Increased awareness among the stakeholders especially among the venerable class viz. animal handlers, veterinarians, butchers and in fact the veterinarians can definitely reduce the menace of zoonotic diseases.

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