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Original Article

Prospect of microbial food borne diseases in Pakistan: a review

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(With 6 figures)

Abstract

Nowadays food borne illness is most common in people due to their epidemic nature. These diseases affect the human digestive system through bacteria, viruses and parasites. The agents of illness are transmitted in our body through various types of food items, water and uncooked. Pathogens show drastic changes in immunosuppressant people. This review gives general insights to harmful microbial life. Pakistan is a developed country and because of its improper food management, a lot of gastrointestinal problems are noted in many patients. Bacteria are most common agents to spread diarrhoea, villi infection, constipation and dysenteric disease in human and induce the rejection of organ transplant. Enhancement of their lifestyle, properly cooked food should be used and to overcome the outbreak of the diseases.

Keywords: introduction, viral foodborne diseases, bacterial foodborne diseases, parasitic foodborne diseases, prospect of Pakistan, preventive measures.

Perspectiva de doenças microbianas transmitidas por alimentos no Paquistão: uma revisão

Resumo

Hoje em dia, as doenças transmitidas por alimentos são mais comuns em pessoas devido à sua natureza epidêmica. Essas doenças afetam o sistema digestivo humano por meio de bactérias, vírus e parasitas. Os agentes das doenças são transmitidos em nosso corpo por meio de diversos tipos de alimentos, água e crus. Os patógenos mostram mudanças drásticas em pessoas imunossupressoras. Esta revisão fornece uma visão geral da vida microbiana prejudicial. O Paquistão é um país desenvolvido e, devido ao seu manejo alimentar inadequado, muitos problemas gastrointestinais são observados em muitos pacientes. As bactérias são os agentes mais comuns para espalhar diarreia, infecção de vilosidades, obstipação e doença disentérica em humanos e induzem a rejeição de transplantes de órgãos. Melhoria de seu estilo de vida, alimentos devidamente cozidos devem ser utilizados e para superar o aparecimento de doenças.

Palavras-chave: introdução, doenças virais transmitidas por alimentos, doenças bacterianas transmitidas por alimentos, doenças parasitárias transmitidas por alimentos, perspectiva do Paquistão, medidas preventivas.

1. Introduction

Foodborne disease (FBD) has emerged as an important and growing public health and economic problem in many countries during the last two decades. Frequent outbreaks caused by new pathogens, the use of antibiotics in animal husbandry and the transfer of antibiotic resistance to human, as well as the ongoing concerns about bovine spongiform encephalitis (BSE) are just a few examples. Food borne diseases universally are caused by various types of bacteria, viral pathogens (disease causing agents), parasites, prions and fungi (Rodríguez-Morales et al., 2016; Stein et al., 2007) as shown in Figure 1. Some marine dinoflagellates produce the harmful bio toxins in edible food. Such contaminated nutrients produce physiological disturbances concluding considerably monetary, indisposition and mortality cost (Tauxe, 2002). To take filthy water, nutrients or their derivatives that are richest agents to cause food killing syndrome in an organism. Transmission of pathogens in organisms' body creates serious metabolic problems such as diarrhea, vomiting, abdominal pains, headaches, nausea, dehydrated mouth and not feeling calm when swallowing

and fluke-like symptoms (fever, chills, backache). Foodborne diseases must be deep-rooted after three days with indications of gastrointestinal or neurological disorder in two or more persons that attach their activity or meal (Adams and Moss, 2008). Intoxication or infections are two unlikely terms. Harmful chemicals (Toxins) are secreted by pathogens that spoil the food to describe intoxication. Although ingestion of food with pathogens causes infection based on infection severity, pathogens need substrate to run up their metabolism for their growth (Addis and Sisay, 2015). Only a small proportion of chemicals have been fully characterized in terms of the potential toxicities to animals and humans, particularly in relation to their long-term effects. Furthermore, prevention and control of adverse health effects due to chemicals in food are highly dependent on adequate and reliable data on levels of these chemicals in food and the total diet (Baht and Moy, 1997). In addition, new contaminants continue to be discovered. For example, acrylamide, a neurotoxin and probable human carcinogen, has recently been identified in a range of foods at relatively high levels (WHO, 2000). This review provides us new insights to understand the mechanism of microbial infections such as Norovirus, *Campylobacter* sp., *Listeria* sp. and *Cryptosporidium* sp. example of diseases. Selection of pathogens is based on the understanding of pathophysiology in host that's why we select only single specimen to elaborate the epidemiology Overall microbial disease-causing major agents shown in following Table 1.

2. Viral Food Borne Diseases

Viruses are microscopic that is much smaller than bacteria also cause infections in all types of living organisms. Classification of viruses is based on their enveloped (Lipid), Nucleic acid (DNA/RNA) and Size that are transmitted in human body through food and water with less than 50 nm size with few exceptions. These viruses may be spherical, un enveloped and RNA that's why they have no DNA due to this also no code for transcriptase enzymes in their replicative host cycle (Domingo et al., 2008). Viruses are fully dependent on their host due to lack of biosynthetic machinery (Containing Ribosomes or cytoplasm mostly) and its replication process happens within the host by operating the host's biosynthetic machinery that's why viruses cannot nurture in separate medium such as artificial medium (Nishio et al., 2004; Wilkinson et al., 2001). Obviously, their transmission depends on the host as well as external environmental interaction. Due to this longer contact viruses with infectious environment will increase the spreading and broad cast rate in any biotic medium (Wilkinson et al., 2001). Viral food borne disease-causing agents are fecal or vomit material, contact with infected person or blood, aerosol and un careful sexual contact (El Sayed Zaki et al., 2014) which process shown in Figure 2.

3. Norovirus-induced Gastroenteritis

Norovirus is a fecal virus and is also a stomach bug that causes vomiting and diarrhea, firstly exposed from fecal specimens through electron microscope (Karst et al., 2015). Norovirus is a small, round, single positive strand-RNA and enclosed in a non-protein coat with vast varieties of its strain that are associated with human such as GI, GII and GIV (Kabue et al., 2016). Most Researchers believed that Norovirus in human which spreads through fecal-oral mode and vomitus (material that is ejected through vomiting) induced to cause infection. Its spreading rate is explosive in a way that in every minute several viruses approximated at

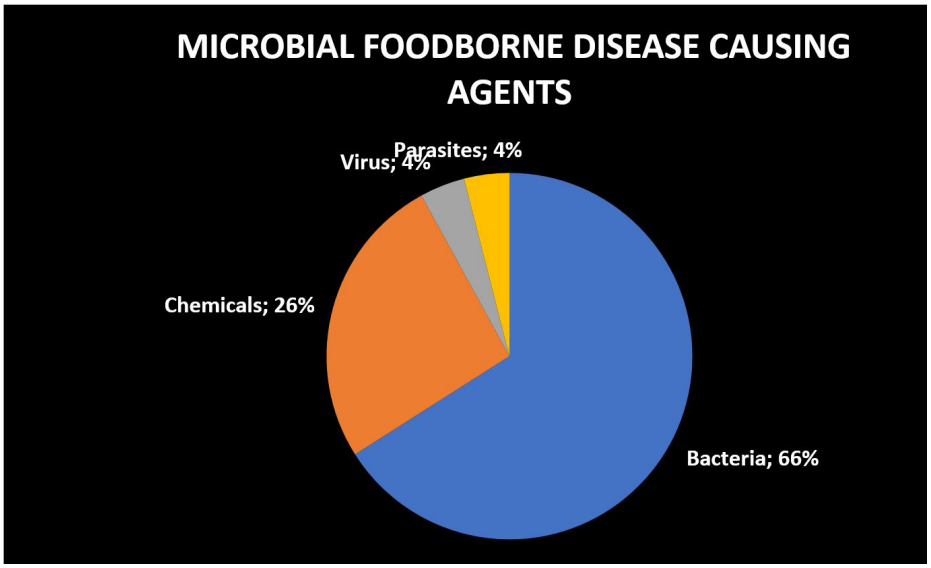

Figure 1. Pathogenicity of microbial lethal life for human beings.

Table 1. Clinical features of various microbial life.

Pathogens	Diseases	Morphology	Isolation	Toxins (Virulent Factors)	Optimum Temperature for Infections	References
Campylobacter sp.	Diarrhoea, Acute intestinal infections and Necrotic infections	Gram negative 0.5-1 by 4µm Spiral to Rod Shape	Oral Cavity (Saliva)	Flagellin protein (FlaB, FlbA)	04	(Bouzid, Hunter, Chalmers, & Tyler, 2013; Karmali & Fleming, 1979; Lemos et al., 2015; Liu, Ma, Wang, & Zhang, 2018; Percival & Williams, 2014; Tzipori et al., 1983)
Cryptosporidium sp.	Diarrhoea, Nausea, vomiting, low-grade fever, Myalgia, Weakness, Malaise, Headache and anorexia	Gram negative4. 2-4.6 µm Rounded and spindle shaped	Intestines	Serine Protein, Aminopeptidase, cytokines, Hemolysin H4 and Phospholipase		(Bouzid et al., 2013; Tzipori et al., 1983)
Shigella sp.	Diarrhoea	Gram negative 750µm Rod-Shaped	Epithelial Lining of intestine	Shiga toxins	37	(Hailegebriel, Petros, & Endeshaw, 2017; Percival & Williams, 2014; Radostits, Gay, Hinchcliff, & Constable, 2006; Thomas et al., 2013)
Clostridium perfringens	Acute Abdominal Pain and Diarrhoea Enterotoxin	Gram + 0.3-2.0µm Rod-Shaped	Intestine	Enterotoxin A produce alpha toxins and theta toxins	41	(Aguilera, Stagnitta, Micalizzi, & de Guzmán, 2005; Guo, Zhang, Ma, & He, 2020; Labbe & Nolan, 1981; Newstead et al., 2008; Omernik & Płusa, 2015; Radostits et al., 2006; Willardsen, Busta, Allen, & Smith, 1978)
Staphylococcus aureus	Vomiting, Diarrhoea	Gram – 1µm Round-Shaped	Intestine and Nervous system	Enterotoxins (A, B, C1, C2, D and E)	8-30	(Hirsh, Maclachian, & Wlaker, 2004; Notermans & Heuvelman, 1983; Quinn et al., 2001; Smith, Peter, Daniela, & Melchior, 2007)
Clostridium botulinum	Botulism	Gram + 2µm Rod-Shaped	Fresh stomach contents	Neurotoxins Proteolytic and non-proteolytic toxins	6-30	(Hall, McCroskey, Pincomb, & Hatheway, 1985; Lund, Graham, George, & Brown, 1990)
Hepatitis A virus	Invasive enteric	+ strand RNA Virus 27nm	Liver, Bile	Immunoglobulin M	35	(Binn et al., 1984; Lozano et al., 2012)

Table 1. Continued...

Pathogens	Diseases	Morphology	Isolation	Toxins (Virulent Factors)	Optimum Temperature for Infections	References
Brucella inopinata	Chronic pneumonia in human	Gram – 1.5mm Globular and Rod Shaped	Lungs	Urease and positive H_2S Production	35-37	(Tiller et al., 2010)
Listeria monocytogenes	Listeriosis, Febrile gastroenteritis, CNS infection (Non-perinatal case), Septicaemia, Maternofetal infections	Gram + 1-1.5µm Rod-Shaped	Blood and Cerebrospinal Fluid	Hemolysin (Intestine), Cytokines (Liver), Internalin Protein (Binding protein), listeriolysin and Two phosphate (PLcA and PLcB)	10-25	(Cossart et al., 1989; de Noordhout et al., 2014; Gregory & Wing, 1990; Vázquez-Boland et al., 2001)
Myobacterium bovis	Invasive enteric diseases and Bovine type of tuberculosis	Gram -/+ About 1 micron Rod-Shaped	Gastrointestinal Tract Calmette and Guérin, African ancestry	Contagium vivum Mycolic acid, Glycolipids in cell envelope, mycocerosic acid	37	(Dürr et al., 2013; Forrellad et al., 2013; Müller et al., 2013; Young, Gormley, & Wellington, 2005; Zhang & Groves, 1988)
Brucella sp.	Invasive enteric diseases	Gram- 0.5-0.7 µ Rod-Shaped	Stomach	Th1-type cell Interleukin 12 Interferon Urease	37	(Dean, Crump, Greter, Schelling, & Zinsstag, 2012; Thacker, Parikh, Shouche, & Madamwar, 2007)
Escherichia coli	Diarrhea	Gram – 3µm Rod-Shaped	Faecal matter	Cytotoxins Shiga -like toxins	20-30	(Adler, 1973; Bryan, McKinley, & Mixon, 1971)
Listeria sp.	Invasive enteric diseases	Gram + 0.5-4.0µm Rod-Shaped	Blood	B-hemolytic Catalase esculin hydrolysis	37.8	(de Noordhout et al., 2014; Guillet et al., 2010)

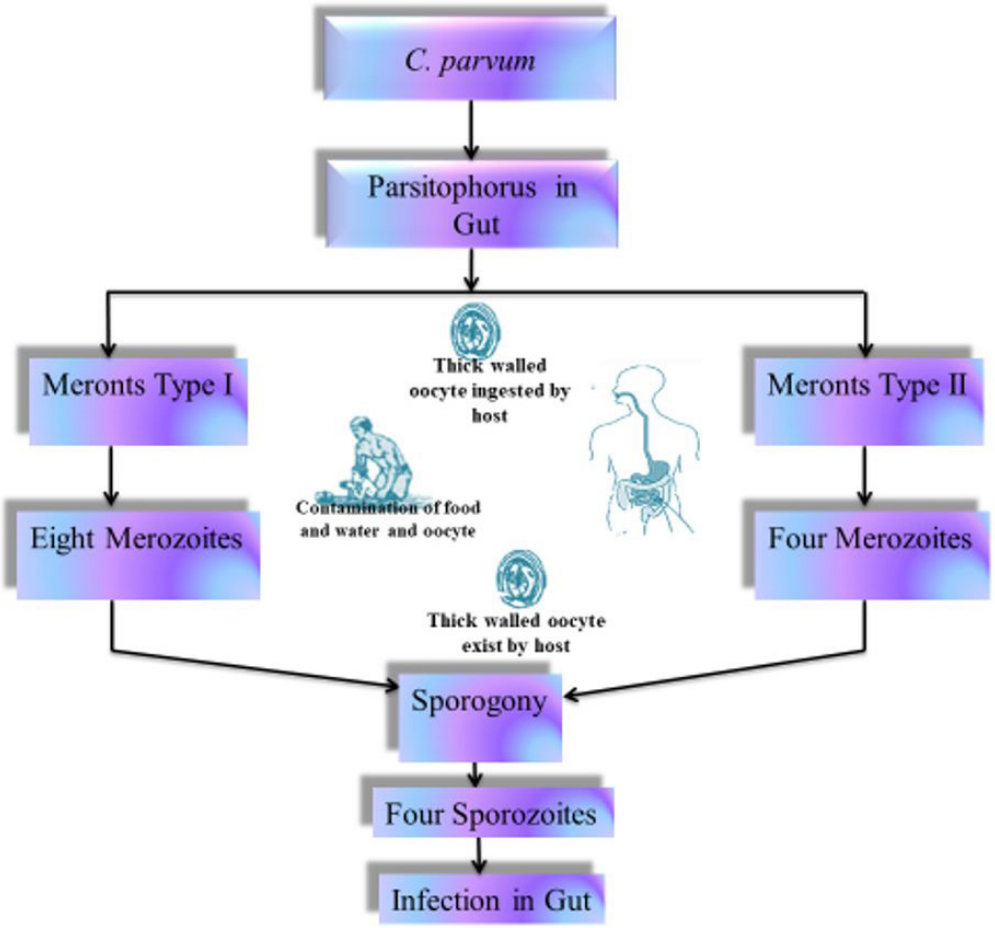

Figure 2. Diagrammatic Representation of disease Spreading in Gut Viruses arrive in human body through food, air with toxic resource. They settle down in intestine for controlling the metabolic activity of intestinal cells, invasion of viruses in cells to control the genome of cell. By which, viruses induce the cells to make abnormal protein to express the viral pathogenicity.

18-1000 is required for contamination of environment, food items and water tank. Secondly, Norovirus is extremophile that is why it can be tolerated at a wide range of temperature about 60 °C. At this condition, it continues to contaminate drinking water, fruits, vegetables and other daily life using items (Teunis et al., 2008). Norovirus has greater varieties of strains that cause infections in humans. It cannot develop immunity and antibodies so, if antibodies just started to kill the virus than virus mutated its genome for forming new strain than this new strain has also capability to cause infection in humans. This type of mimics is helping the virus to cause metabolic disturbance. Presence of norovirus in fecal specimens is much low but antibodies produced by adult against frequent infection of gastrointestinal illness are at elevated level. Norovirus distinguished from food and effected the 5-31% from diarrhea or gastrointestinal illness (Patel et al., 2008).

Antrum and colon (especially mucosal region) do not show any drastic abnormality but proximal jejunal biopsy of a patient reveals that a greater blunting of villi, cytoplasmic vacuolization and infiltration of polymorphic nuclear cells converted into lamina propria while mucosal cells remain in contact with intestinal wall. Mal-absorption and steatorrhea occur due to enzymatic activity decrease at villi. Although adenylate cyclase (Teunis et al.) activity and other secretion such as gastric, HCl, pepsin cannot reach at an elevated level on the jejunum. Major symptoms are nauseas and vomiting, because of the reduction in gastric juice activity although specific replication site of virus could not be identified (Meeroff et al., 1980).

Some persons have high level of antibodies in their body but are more susceptible to Norovirus infection although some others with low level of antibodies do not develop symptoms of Norovirus just because of natural immunity. The chances of the event of occurrence depend on the presence of the histo-blood group antigens that are specific for strain specific. These diverse carbohydrate families such as oligosaccharide bind with other macromolecules such as protein and lipids superficially present on digestive tract, villi, salvia and milk. Histo-blood group antigens

have three families such as ABO, Lewis and Secretor cells (Marionneau et al., 2002).

Norovirus is associated with contaminated water and food which requires screening the food products before using them. We should recommend the industries to give jobs to those people who are not suffering from chronic diseases because viruses are continuously shedding off during handling the food items. We should take care in case of self-hygiene, more attentive in hospital wards and avoid alcohol consumption (Ozawa et al., 2007).

4. Bacterial Food Borne Diseases

Soil, water, plants and animals are primary sites for growth of bacteria and many of them are useful in fermentation processing or Medicine industry, but some are harmful for health/ normal metabolism. About 400 species counted in gastrointestinal cavity or skin such as *Staphylococcus aureus* settle on human skin or nasal cavity that produces toxin for causing infections. These harmful bacteria can be transmitted through contaminated food/ water, inhalation, waste disposal of animal or birds etc (Ishaq et al., 2020).

4.1. Campylobacter sp.

Escherichia (1886) grabbed the stool samples of children and pragmatic deeply so, he perceived some organism with campylobacter. Researchers recognized campylobacter that looks like with Vibrio as of aborted sheep fatal tissues. Vibrio was isolated in 1957 from diarrheal children by King and First isolating campylobacter from stool samples of diarrheal patient in 1972 by clinical microbiologist Belgium (Tauxe et al., 2010). Campylobacter sp. roots the campylobacterosis which has almost 16 species but most infectious species that interrelated with human is *C. jejune*. As well as Campylobacter is allied with food borne illness linked by means of hospitalization about 15% and food borne illness with death about 6% (Inglis and Kalischuk, 2003)

Gastroenteritis Campylobacter is a large animal reservoir, poultry, chickens and waterfowls that causes symptomatic infections in the intestine (Rosenquist et al., 2003). Approximately, 109 bacteria present in 25g of infected/ contaminated chicken due to this bacterium contaminate the other chickens (Quinn et al., 2001). Disease causing ability can be considered by its pathogenic life cycle as shown in Figure 3.

Warning signs are giving the impression within 2-5 days subsequently infection such as vomiting, fever, nausea, abdominal pain, enteritis, diarrhoea and malaise (Behravesh et al., 2012) due to this later 7-10 days illness will be exhibited and recurrences must be captivating three months for usual functioning of metabolism. Meningitis, infections related to urinary system, minor arthritis and Guillain Barre (GB-persuaded the muscles dimness and paralysis of limbs) syndrome must be developed in 1-person of 1000 people with campylobacterosis are lethal hitches of this infections (Williams et al., 2009).

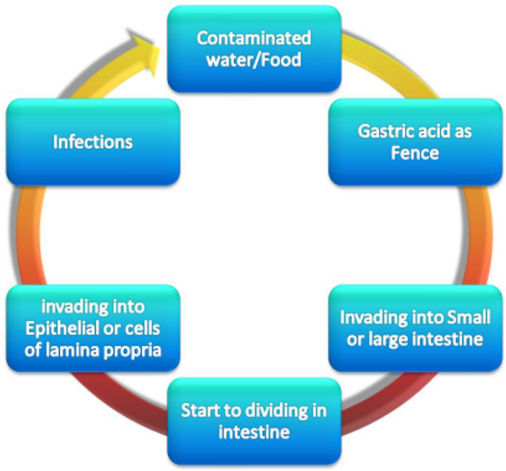

Figure 3. Pathogenesis of *Campylobacter sp.*

Cleanliness and sterility in livestock roughages will moderate the bacterial population and appropriate management or dispensation the food or suitable cooking of uncooked meat such as poultry to temperature about 82 °C will reduce the microorganisms so these are entirely governing strictures for overwhelming the diseases (Ivanova et al., 2010).

4.2. Listeria sp.

Listeriosis is cause by *Listeria monocytogenes* which is gram+, rod-shaped, non-spore forming (Vázquez-Boland et al., 2001) facultative anaerobic virulent pathogens for triggering infection in host cell by duplicating or growing within the host by which 20-30% death is public in individual (Norwood and Gilmour, 2000). Listeria can be endured in great array of capricious environment but must be remote from the soil, plants, putrefying shrubbery/grass with 5.5pH and at extreme temperature that is most suitable for its growth or also conducts through asymptomatic faecal material in human beings (Pexara et al., 2010). Advances in processing, preservation, packaging, shipping and storage technologies on a global scale have enabled the food industry to supply a greater variety of foods, especially ready-to-eat foods. The increased use of refrigeration to prolong shelf-life has contributed to the emergence of *Listeria monocytogenes* (Cordano and Rocourt, 2001). Most of these new pathogens have an animal reservoir but they do not often cause illness in the infected animal as shown in Figure 4.

Therefore, these new foodborne hazards often escape traditional food inspection systems, often relying on the presence of visual signs of disease. It is thus important to realize that these foodborne diseases require new food control strategies. These characteristics associated with changes in food production and distribution have generated a new outbreak scenario. Traditional outbreaks were characterized by an acute and locally limited number of cases, with a high inoculums dose and a high attack

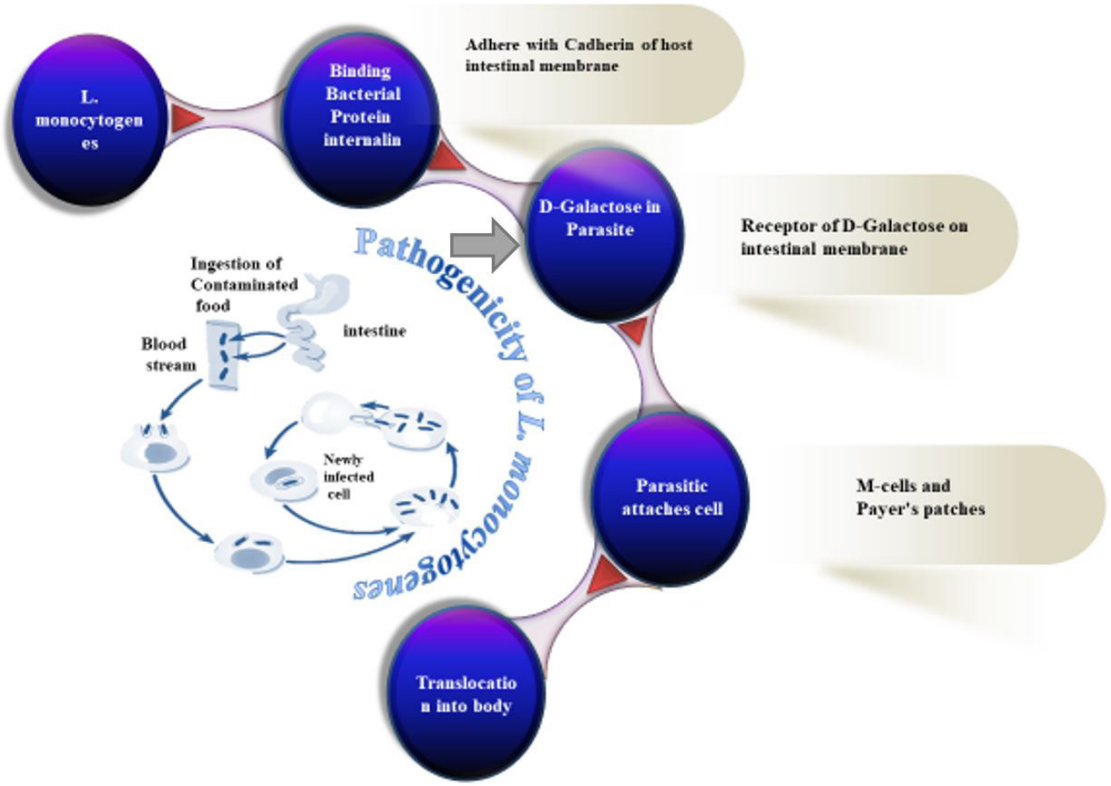

Figure 4. Pathogenicity of L. monocytogenes.

rate sometimes because of a food handler error in a small kitchen shortly before consumption, often after a social event (Fallah et al., 2012).

5. Parasitic Foodborne Diseases

As compared to viruses and bacteria role of parasites in food borne diseases is neglected for a long period of time due to their long incubation period and recently has gained attention due to an emerging issue of public health (Robertson, 2018). Consumption of food contaminated with helminths and protozoans mainly contribute to parasitic food borne diseases (Bai et al., 2017). Mammals, birds and fishes could be possible intermediate or final host for food borne parasites (Liu et al., 2011). According to WHO parasitic food borne diseases contribute 7% of food borne diseases and is serious health and economic burden for world (Bai et al., 2017). Improper hygienic practices during food processing and production and consumption of raw and uncooked food usually lead to parasitic food borne diseases. Parasitic species Cryptosporidium, Giardia, Trypanosoma cruzi, Entamoeba, Cyclospora, Toxoplasma, Echinococcus, Anisakis, Taenia, and Trichinella species are common causative agents in parasitic food borne diseases (Bhunia, 2018).

Cyclospora cayetanensis cause nausea, vomiting, nonbloody diarrhea, abdominal cramping, malaise, anorexia, bloating, fever, and fatigue (Sofos, 2014). Toxoplasmosis symptoms include headache, muscle aches and pain, fever, rash, and swelling of the lymph nodes mental retardation, blindness, seizures, and death. *Trichinella spiralis* cause nonspecific gastroenteritis, vomiting, headaches, difficulty breathing, chills, fever, visual deficiencies, night sweating, myalgia, eosinophilia, and circumorbital edema (Sofos, 2014).

A huge literature supports direct relationship between climate change, globalization and food borne parasites (Pozio, 2020). Like other food borne pathogens parasitic food borne diseases also cause diarrhoea, fever, abdominal pain, vomiting, headache, dehydration and other deformities (Sofos, 2014).

5.1. Cryptosporidium sp.

Cryptosporidium sp. was identified in 1976 that kerbed as intestinal protozoans' coccidian parasites having six parasitic species, *C. parvum* cause disease in human-being (O'Donoghue, 1995). *Cryptosporidium sp.* cause incurable diseases in immune-negotiated individual through assaulting in respiratory structures or gut of chordate host with major symptoms of acute diarrhoea but other secondary symptoms such as loss of water, sickness, anorexia and paleness (Fayer & Ungar, 1986; O'Donoghue, 1995; Sturdee et al., 1999).

C. parvum is monoxenous to complete its life cycle in 2 days for triggering infection by ingesting oocysts excyst to produce infective sporozoites in the gut after this; these

sporozoites settle down or may be attached in the epithelial cell for enclosing in a vacuole as parasito-phorous (Sevinc et al., 2003). Further development in parasito-phorous gives us trophozoites, this trophozoites undergoes proliferation cycle for forming two types of meronts such as Type I or Type II. Further developmental changes occurred in meronts Type I that forms eight merozoites for invading in epithelial cell releasing from vacuole to continue another cycle of Type I so, Type II is a root of four merozoites not in merogony although produce gamonts (sexual reproductive stages) as shown in Figure 5. Micro-gametes and Macro-gametes fusion forming zygote and further develop divisions to form sporogony. Sporulated has four sporozoites in its structure that cause both chronic and acute infections in human beings (O'Donoghue, 1995). Sporozoites attack through their anterior pole after their survival rates against antigen-antibodies depend on internal host conditions such as pH or ion concentration.

However, other parameters are also involved in case of spreading infections or motility rate such galactose-N-acetyl galactosamine (Joe et al., 1998) and cytoskeleton of parasites and host (Chen et al., 1998). The attachment of sporozoites with the host cell is an unknown process at molecular level but according to my point of view there are some chemical interactions between these two elements which cause inflammation through production of cytokines or chemokine which induce the number of gram positive/ negative bacteria. By releasing of these chemicals, they also enhance the level of IL-8 that causes inflammation in monolayer of epithelial cell of intestine.

C. parvum has limited site in the host for spreading infections such as respiratory sites, bile duct, intestine (has receptor or sensitive for C. parvum) although in most cases the stomach is less infected by this parasite. Subsequently, upper small bowel including colon rectum are less suspectible for this disease as compared to mid small bowel (O'Donoghue, 1995; Upton et al., 1994).

Infections rate can be varied in different conditions such age, metabolic activity and environment for example in children 10-15%, individual with AIDS has 10-16% (Colford Junior et al., 1996) but in the world it is 20-65%. A person that is immune-competent (HIV/AIDS) has more chances for getting this disease this type of disease known as biliary cryptosporidiosis or AIDS-cholangiopathy (Sánchez-Mejorada and Ponce-de-Leon, 1994; Vakil et al., 1996).

C. parvum may be transmitted through blood transfusion, untreated water, patient dealing, family member, homosexuality, heterosexuality, faecal matter, animal handlers, organ transplantation and hypogammaglobulinemia (Fayer and Ungar, 1986). Primary changes that are correlated with cryptosporidiosis such as blunting of villi, hyperplasia of cells, cryptitis, neutrophilic filtrate, interstitial oedema and expansion of periductal gland (Teare et al., 1997).

Diagnosis of cryptosporidiosis is not acceptable yet now, but microscopic studies, ultrasonography and computerized tomography of faecal material show their

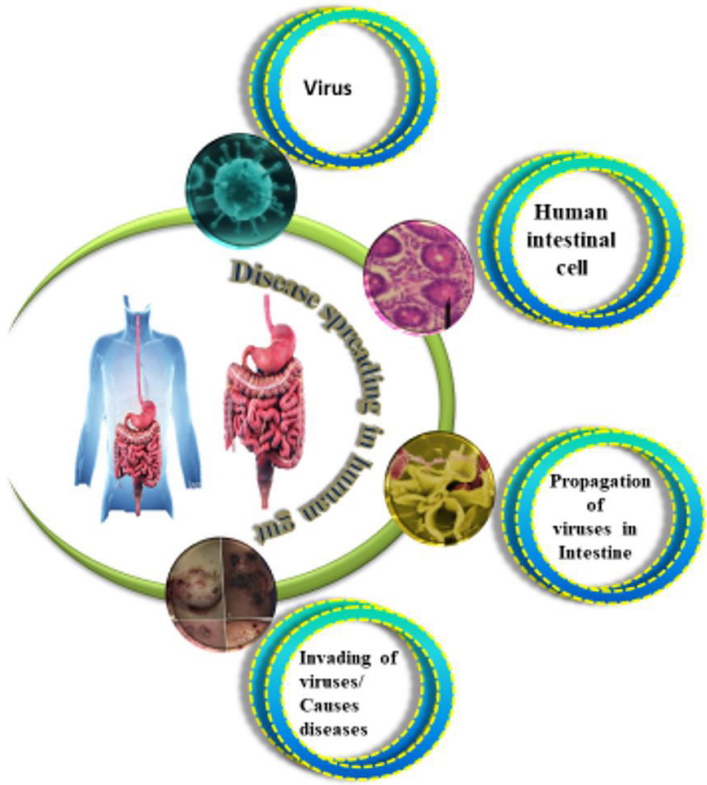

Figure 5. Life cycle of *C. parvum*.

existence sign of this parasite that reveals the oocysts excretion coincides of *C. parvum* and oocysts of this parasite is much smaller than other or also differ in staining techniques and resilience properties. Most suitable technique for its detection is acid-fast technique which gives bright red colour to oocysts (Aldras et al., 1994).

Therapies are also preferable for its diagnosis because antimicrobial treatment is not effective for cryptosporidiosis. Specific therapy is not known but oral or intravenous fluids can be replaced for acute diarrheal. Cryptosporidiosis with AIDs can be cured by antiretroviral therapy plus the number of severities of disease and its receptor CD4+ (Scaglia et al., 1994) although an amino glycoside antibiotic known as Paromomycin (Bissuel et al., 1994) is most beneficial for treating cryptosporidiosis (White Junior et al., 1994).

Diagnosis, treatment and therapies are most critical or difficult for overcoming the diseases so as to move towards the preventions/recommendations about the awareness of cryptosporidiosis which are given below treating water, food product, cleaning the hospitals/laboratories/care centres and by using disinfectant such as aldehydes, alcohols and chlorine (O'Donoghue, 1995).

6. Prospect of Pakistan

Food borne illnesses are mainly due to ingestion of microbial contaminated food and other toxicant contact foods by which all over the world these types of diseases are more common neither climate dependent nor region dependent. Hepatitis, typhoid, animal contact disease, influenza and aerosolized dust along with soil contact diseases are common in Pakistan (Javed, 2016). Un hygienic conditions, absence of proper food standards, poor sanitation, poverty and illiteracy are major causes in spreading of food borne diseases as shown in Figure 6.

The estimation of different food borne diseases is depended on pathogens (virus, bacteria and parasites) which contaminate food items (Fu and Fu-Liu, 2002). The outcome of exposure to Foodborne diarrheal pathogens depends on several host factors including pre-existing immunity, the ability to elicit an immune response, nutrition, age and non-specific host factors. As a result, the incidence, the severity and the lethality of Foodborne diarrheal is much higher in some particularly vulnerable segments of the population, including children under five years of age, pregnant women, immunocompromised people (patients undergoing organ transplantation or cancer chemotherapy, AIDS) and the elderly. In addition to these well-known predisposing conditions, new ones are regularly identified {liver disease for *V. paraheamoliticus* septicaemia, thalassemia for *Yersina enterocolitica* infections (Ali et al., 2012).

In Pakistan, there are many bases for microbial diseases like poor packaging of edible items. Hussain and colleagues revealed in 2007, the occurrence of *Campylobacter* in different food items like meat and milk in Pakistan. By testing the meat sample, the highest prevalence (48%) of *Campylobacter* was observed in raw chicken meat than in raw beef (10.9%) and raw mutton (5.1%). In other food stuff, vegetables, fruits salad (40.9%), sandwiches (32%), cheese (11%) and raw milk bulk samples (10.2%), exhibiting the leading rates.

In another sample, a total of 282 food samples of different varieties were analysed for microbial contamination. High microbial load and presence of pathogenic organisms renders the poor hygienic standards of the foods examined (Panwhar and Fiedler, 2018). Food from street side shops and vendors were heavily contaminated (70%). Middle- and upper-class restaurants also indicated a high rate (40%) of microbial contamination (Quraishi et al., 2018).

7. Preventive Measures

Age, immunosuppressant, pregnancy and lifestyle, these factors increase the disastrous effect of infections or diseases through microbial attack. If a person is ill, the

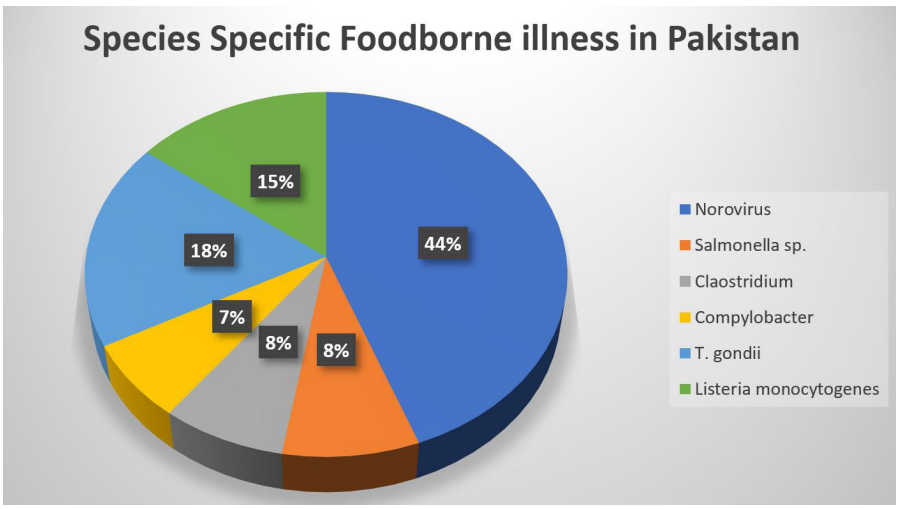

Figure 6. Percentage of Species-Specific Foodborne illness in Pakistan.

outbreak of these diseases through the hospital during the treatment is so high and the poor hygienic tools that are used in a day to day life of the people. These unhygienic conditions are due to poor food management, diet with low microbes, unhygienic water and ice are Antimicrobial prophylaxis. Our food should be properly cooked because most of microbes remain in food items that cause major disastrous problems of human dysentery and diarrheal. So, food items should be cooked well to completely disinfect and free it from germs (Mank and Davies, 2008). If the diet is with low microbes, then there are minimum chances to affect the immunosuppressant person or those people who do any transplant to affect these patients. Unlikely, the rejection of organ transplant would be enhanced due to microbial attack (Fu and Fu-Liu, 2002).

8. Conclusion

There are a considerable number of causative agents, disease characteristics, and vehicles of transmission, and mishandling errors which have been often successfully used to decrease the incidence. However, the burden of Foodborne disease is still very high and certainly needs to be reduced significantly. Foodborne diseases are preventable diseases but, very rare diseases accepted (typhoid fever, hepatitis A, rotavirus infection), effective vaccines are not available despite substantial researches. The challenge is therefore to use a multidisciplinary approach to identify the best mitigation strategies (including consumer information and education) along the food-chain to prevent these diseases, especially at the primary production level, and then implement appropriate prevention programmes.

As we know microbial lives provide us with a lot of advantages in various fields of science such as beverage industry, food industry and medicinal industry but they also provide many disadvantages in living system. If we encounter microbes, they attack on our immune system to disturb the metabolic process and this causes diseases. These microbes enter our bodies through the respiratory tract, uncooked food, polluted water and food items. These microbes also mutate our genes that control cell division for causing disastrous disease such as cancer. So, we must adopt proper hygienic conditions and standard lifestyle in order to avoid being in contact from these microbes to live in wholesomely health life.

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List of abbreviation

GB: Guillain Barre
FBD: Food borne diseases
AIDS: Acquired Immuno deficiency syndrome