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An Overview of Bacterial Diseases

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SHORT COMMUNICATION

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INTRODUCTION

An infection is the invasion of any organism's tissue by disease causing agents such as bacteria, viruses, fungi or parasites etc. These disease causing agents are also called as infectious agents [1-5]. Infectious disease is also known as communicable disease. Most, not all, of the infectious agents are micro-organisms. These micro-organisms are microscopic living organisms that can be seen through microscope. These may be single or multicellular and are very diverse. Many micro-organisms live in and on our bodies. These are normally harmless or even helpful, but under certain conditions, some organisms may cause disease [5-10].

Some infectious diseases can be passed from person to person. Some are transmitted by bites from insects or animals. And others are acquired by ingesting contaminated food or water or being exposed to organisms in the environment [11-13]. The Signs and symptoms vary depending on the organism causing the infection. Most of the developing nations are prone to infectious diseases [14].

Major infectious diseases include bacterial and viral diseases. In this article some of the most common bacterial and viral diseases are discussed [15,16].

BACTERIAL DISEASES

Bacteria is a prokaryotic microorganism typically a few μm in length and varying shapes [17,18]. These bacteria are named according to their shapes like bacillus (rod shaped), coccus (spherical shaped) and vibrio (comma shaped) etc [19-23].

Some of the common bacterial diseases include:

- Anthrax
- Cholera
- Diphtheria
- Leprosy
- Tetanus
- Tuberculosis
- Salmonellosis

ANTHRAX

Anthrax is caused by *Bacillus anthracis* is a disease which is mostly lethal and affects animals. Anthrax commonly infects herbivorous animals that ingest or inhale the spores while grazing. Carnivores may become infected by consuming infected animals [23-27]. Diseased animals can spread anthrax to

humans, either by direct contact or by consumption of a diseased animal's flesh. Actually in direct contact spores are transferred to other animals. *Bacillus anthracis* forms dormant spores in the harsh conditions and thus they are able to survive in harsh conditions for decades or even centuries. Once the bacterium is inside the body, it begins to multiply and kills the host within weeks of infection. Actually, bacteria produce two exotoxins (known as anthrax toxins) which are lethal and are the main cause of death. Anthrax mainly affects lungs, intestine and skin of humans. Respiratory infection in humans is relatively rare and initially has cold or flu-like symptoms for several days which are followed by pneumonia and severe (and often fatal) respiratory collapse [28-32]. Gastrointestinal infection in human beings is most often caused by consuming anthrax-infected meat and is characterized by serious gastrointestinal disorders like vomiting of blood, severe diarrhea, acute inflammation of the intestinal tract, and loss of appetite. Cutaneous anthrax or skin infection is characterized by boil-like skin lesion that eventually forms an ulcer with a black center. The black eschar often presents as a large, painless necrotic ulcer. Skin anthrax is rarely fatal [33-36].

Vaccines are available for the prevention of Anthrax. Currently administered human anthrax vaccines include acellular and live spore varieties. These induce the immune system to develop antibodies against bacteria and thus prevent the disease. New second-generation vaccines currently being researched include recombinant live vaccines and recombinant subunit vaccines.

Treatment for anthrax infection includes large doses of intravenous and oral antibiotics, such as fluoroquinolones, doxycycline, erythromycin, vancomycin, or penicillin. Early antibiotic treatment is essential otherwise delay in treatment will lessen the chance of survival [37-40].

CHOLERA

Cholera is a dreadful disease caused as an effect of by the bacterium *Vibrio cholerae*.

It is an infectious disease which can lead to death if left untreated. The most common and lethal symptom of the cholera is sever watery Diarrhea, dehydration, vomiting, fever, etc.

Basically, this disease occurs due to poor sanitation where food and water get contaminated of this bacteria and leads to this fatal disease [41-46].

This disease cases are majorly reported from less developed countries, famine places, huge populated slums.

A potential toxin is released by the bacterium vibrio cholera on getting in contact with food and water these germs lead to this dreadful disease.

So it is better to take precautions with eateries which may get affected easily with these germs.

As we have understood the main symptom of this disease sever watery diarrhea, dehydration, etc. which can lead to fatal effects. So it is better to use the boiled water, chemically disinfected water, etc.

There is also a vaccine for the treatment of cholera. Cholera resulting death of many people became a global issue and a wide range of vaccine were designed and produced. Vaccines to prevent cholera are provided free of cost funded by WHO and respective states [47-51].

Two kind of vaccines are in practice 1.intravenous; 2. Oral

Example of oral vaccine is Dukoral, inactivated whole vaccine.

So be cautious and maintain hygiene, proper sanitation and drink boiled water to prevent this disease [52].

LEPROSY

Leprosy is also known as Hansen's disease. It is an infection which is caused by *Mycobacterium leprae*. *Mycobacterium leprae* is aerobic and rod-shaped bacteria which has waxy cell membrane coating. Leprosy is basically a granulomatous disease affecting peripheral nerves and mucosa of the upper respiratory tract [53-58]. Skin lesions are the primary and most important sign of leprosy. If left untreated, leprosy can permanently damage to the skin, nerves, limbs, and eyes. Leprosy is spread through a cough or contact with fluid from the nose of an infected person. It occurs more commonly among the people living in poverty and is believed to be transmitted by respiratory droplets [59-61]. However, if a person starts the medication, leprosy will not spread from that person to other. There are no prescribed preventive measures for leprosy however it is curable and can be treated with the

administration of antibiotics for certain time period. Treatment with daily dapsone/clofazimine and monthly rifampicin for six months is recommended to fully cure the disease [62,63].

TETANUS

Tetanus is also known as lockjaw. It is mainly characterized by muscle spasms. It is caused by infection of *Clostridium tetani*, an anaerobic bacterium. Tetanus is often associated with rust, especially rusty nails or other objects. Rust itself does not cause tetanus nor does it contain more *C. tetani* bacteria but, the rough surface of rusty metal provides a prime habitat for *C. tetani* endospores to reside and the nail affords a means to puncture skin and deliver endospores deep within the body at the site of the wound. Tetanus affects voluntary as well as non-voluntary muscles. Spasms may be so severe that bone fractures may occur. The tetanus toxin initially binds to peripheral nerve terminals. It is then transported within the axons and across synaptic junctions until it reaches the central nervous system. There it becomes fixed to gangliosides at the presynaptic inhibitory motor nerve endings, and is taken up into the axon by endocytosis. The effect of the toxin blocks the release of inhibitory neurotransmitters glycine and gamma-aminobutyric acid (GABA) across the synaptic cleft thereby causing the generalized muscular spasms, which is characteristic of tetanus. The toxin appears to act by selective cleavage of a protein component of synaptic vesicles, synaptobrevin II, and this prevents the release of neurotransmitters by the cells. Tetanus can be prevented by vaccination with tetanus toxoid. However, antibiotic treatment is required if person is not immunized by vaccine. Tetanus often begins with mild spasms in the jaw muscles known as lockjaw or trismus. Back muscle spasms often cause arching, called opisthotonos. Sometime it may affect muscles that help with breathing. Mortality rates of tetanus are high and are not limited to developing countries only [64-69].

TUBERCULOSIS

Tuberculosis generally worldwide known as TB is a fatal bacterial infection. This disease is a result of various strains of mycobacterium which attacks the lungs and weakens the immune system.

The bacteria causing tuberculosis is transmitted generally through air and remains inactive in most of the people throughout the life. If immune system gets weaken like in HIV the chances of these bacteria getting activated and causing disease are more [70-76].

Because of these germs inactive form people with these germs mostly do not show any kind of symptoms. As person start aging or his/her immune system starts weaken leads to latent infection.

In 1950's TB was a wide spread which was eliminated with the help of antibiotics. As time passed this strains started developing resistance against antibiotics. As of 2011 scientist have developed a new vaccine namely bacillus Calmette-Guérin. This vaccine is mostly effective on children and widely used across the world to vaccinate the children's

Wide spread of the disease made organization like WHO and governments to provide vaccines and antibiotic free of cost to prevent it [76-79].

Use of this vaccine reported less number of tuberculosis cases across the world. Tuberculosis widely occurs in a under developed countries. Prevention is a better than cure so the new born children are vaccinated to prevent this disease.

NGO's are also making people aware of the tuberculosis prevention and treatment through various ways.

Research is going on in throughout the world to develop an effective and cheap vaccine to prevent the disease [80-84].

SALMONELLOSIS

Salmonellosis is caused by Salmonella bacteria. Infected persons may develop diarrhea, fever, vomiting, and abdominal cramps within 12 hours of infection. In some of the cases diarrhea may be so severe that the patient becomes dangerously dehydrated. IV (intravenous) fluids may be used to counter dehydration [85-89].

The genus Salmonella was named after Daniel Elmer Salmon. Salmon first reported the isolation of Salmonella from a pig in the year 1885. Salmonella is considered as one of the most wide spread foodborne zoonosis in industrialized as well as developing countries.

Genus Salmonella belongs to family Enterobacteriaceae and are facultative anaerobes. It is sensitive to heat and does not survive at temperature above 70°C. It is resistant to drying especially if present in feaces [90-93].

The main disease that is caused by salmonella bacteria is Typhiod. It is caused by bactria *Salmonella typhi*. Typhiod is also known as Typhoid fever. It can also be caused by *Salmonella paratyphi*, a related bacterium that usually causes a less severe illness. The bacteria are deposited in water or food by a human carrier and are then spread to other people in the area. The incidence of typhoid fever is very high in developing nations due to poor sanitation and hygiene conditions [94-97].

The incubation period is usually 1-2 weeks, and the duration of the illness is about 3-4 weeks. Symptoms include Poor appetite, headaches, generalized aches and pains, fever as high as 104 degrees Farenheit, lethargy and diarrhea. After the ingestion of contaminated food or water, the bacteria invade the small intestine and enter the bloodstream. They are then carried by white blood cells in the liver, spleen, and bone marrow, where they multiply and reenter the bloodstream. The bacteria pass into the intestinal tract and can be identified in stool samples, also blood samples can be taken to diagnose the disease. Widal test is one of the most easily available tools for the diagnosis of Typhoid in the developing countries. The classic Widal test measures antibodies against O and H antigens of S typhi. The main principle of Widal test is antibodies in the sera which can react and agglutinate serial doubling dilutions of killed, coloured Salmonella antigens in a tube agglutination test.

The prevention of typhoid fever lies in providing safe and clean water, sanitation, clean food providing, better medical and vaccination. Vaccines available are Live Ty21a which is orally administered and Vi capsular which is administered IM.

Management of Typhoid includes:

- Rapid diagnosis and institution of appropriate antibiotic treatment.
- Adequate rest, hydration, and correction of fluid-electrolyte imbalance.
- Antipyretic therapy as required (such as paracetamol 120-750 mg taken orally every 4-6 hours).
- Adequate nutrition: a soft, easily digestible diet should be continued unless the patient has abdominal distension or ileus.
- Close attention to hand washing and limitation of close contact with susceptible individuals during acute phase of infection.
- Regular follow-up and monitoring for complications and clinical relapse (this may include confirmation of stool clearance in non-endemic areas or in high risk groups such as food handlers) [97-100].

CONCLUSION

Infectious diseases are the main cause of mortality in the developing nations and still there are no effective and confirmed preventive measures available. Knowledge of some of the common bacterial disease may be beneficial in preventing and knowing the course of disease [6,7].

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