A Survey of General Bacterial Diseases in Rural Population of Bassi, Near Jaipur

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Abstract Bacterial diseases are contagious and can result in many serious or life-threatening complications, such as blood poisoning (bacteremia), kidney failure, and toxic shock syndrome. In diagnosing bacterial infections, the rapid identification of bacteremia at an early stage of the disease is critical for a favorable outcome. Furthermore, it is important that exact information be obtained on the stage of the disease rapidly in order to choose and initiate the appropriate therapy. In recent years many new techniques have been added in the diagnostic tools. The observations were based on a survey carried out in population of Bassi village near Jaipur. It was found that many people were prone to bacterial infections due to unhygienic conditions and improper sanitation. The patients affected which died were basically unconcerned, careless and ignorant. Many patients got hospitalization and some were prescribed oral antibacterials at home. The data showed that maximum number of patients had Salmonellosis, followed by Botulism. 6 Bacterial diseases were common in the human population of Bassi village, near Jaipur. Knowledge of the disease outbreaks further leads to treatment techniques and prevention of deaths in the population. Different types of antibiotics were effective for treating specific types of bacteria. Antibiotics may be given orally, intravenously, or by intramuscular injection, depending on the type and severity of bacterial disease in patients. General types of antibiotics included -Aminoglycosides, Cephalosporins, Macrolides, Quinolones, Penicillins and tetracyclines.

Keywords Bacterial, Diseases, Antibiotics, Survey, Population, Therapy, Bassi

1. Introduction

Bacterial diseases include any type of illness caused by bacteria. Bacteria are a type of microorganism, which are tiny forms of life that can only be seen with a microscope. Other types of microorganisms include viruses, some fungi, and some parasites. Millions of bacteria normally live on the skin, in the intestines, and on the genitalia. The vast majority of bacteria do not cause disease, and many bacteria are actually helpful and even necessary for good health. These bacteria are sometimes referred to as “good bacteria” or “healthy bacteria.” Harmful bacteria that cause bacterial infections and disease are called pathogenic bacteria. Bacterial diseases occur when pathogenic bacteria get into the body and begin to reproduce and crowd out healthy bacteria, or to grow in tissues that are normally sterile. Harmful bacteria may also emit toxins that damage the body. Bacterial diseases are contagious and can result in many serious or life-threatening complications, such as blood poisoning (bacteremia), kidney failure, and toxic shock syndrome (Ferguson et al, 2001).

Symptoms of bacterial diseases vary depending on the type of bacterial infection, the area of the body that is infected, and other factors, such as the patient’s age and health history. The symptoms of bacterial diseases can also resemble symptoms of other diseases, such as colitis, influenza, and viral infections.

Bacterial diseases are treated with antibiotics. Antibiotics work by killing the harmful bacteria or by stopping them from reproducing and spreading. Different types of antibiotics are effective for treating specific types of bacteria. Antibiotics may be given orally, intravenously, or by intramuscular injection, depending on the type and severity of bacterial disease and other factors (Thomas et al. 2009).

2. Methodologies of Diagnosis of Bacterial Ailments

In diagnosing bacterial infections, the rapid identification of bacteremia at an early stage of the disease is critical for a favorable outcome. Furthermore, it is important that exact information be obtained on the stage of the disease rapidly in order to choose and initiate the appropriate therapy. In recent years many new techniques have been added in the diagnostic tools.

Diagnosis of infectious disease is nearly always initiated by medical history and physical examination. Some techniques (such as X-rays, CAT scans, PET scans or NMR)
are used to produce images of internal abnormalities resulting from the growth of an infectious agent. The images are useful in detection of, for example, a bone abscess caused by bacteria.

Bacterial culture is a principal tool used to diagnose infectious disease. In a culture, a growth medium is provided for a specific agent. A sample taken from potentially diseased tissue or fluid is then tested for the presence of an infectious agent able to grow within that medium. Most pathogenic bacteria are easily grown on nutrient agar, a form of solid medium that supplies carbohydrates and proteins necessary for growth of a bacterium, along with copious amounts of water. A single bacterium will grow into a visible mound on the surface of the plate called a colony, which may be separated from other colonies or melded together into a "lawn". The size, color, shape and form of a colony is characteristic of the bacterial species, its specific genetic makeup (its strain), and the environment which supports its growth.

Other ingredients are often added to the plate to aid in identification. Plates may contain substances that permit the growth of some bacteria and not others, or that change color in response to certain bacteria and not others. Bacteriological plates such as these are commonly used in the clinical identification of infectious bacterium.

In the absence of suitable plate culture techniques, some microbes require culture within live animals. Bacteria such as *Mycobacterium leprae* and *Treponema pallidum* can be grown in animals, although serological and microscopic techniques make the use of live animals unnecessary (Dobson et al., 1996).

Another principal tool in the diagnosis of infectious disease is microscopy. Virtually all of the culture techniques discussed above rely, at some point, on microscopic examination for definitive identification of the infectious agent. Microscopy may be carried out with simple instruments, such as the compound light microscope, or with instruments as complex as an electron microscope. Samples obtained from patients may be viewed directly under the light microscope, and can often rapidly lead to identification. Microscopy is often also used in conjunction with biochemical staining techniques, and can be made exquisitely specific when used in combination with antibody based techniques. For example, the use of antibodies made artificially fluorescent (fluorescently labeled antibodies) can be directed to bind to and identify a specific antigens present on a pathogen.

Other microscopic procedures may also aid in identifying infectious agents. Almost all cells readily stain with a number of basic dyes due to the electrostatic attraction between negatively charged cellular molecules and the positive charge on the dye. A cell is normally transparent under a microscope, and using a stain increases the contrast of a cell with its background. Staining a cell with a dye such as Giemsa stain or crystal violet allows a microscopist to describe its size, shape, internal and external components and its associations with other cells. The response of bacteria to different staining procedures is used in the taxonomic classification of microbes as well. Two methods, the Gram stain and the acid-fast stain, are the standard approaches used to classify bacteria and to diagnosis of disease. The Gram stain identifies the bacterial groups Firmicutes and Actinobacteria, both of which contain many significant human pathogens. The acid-fast staining procedure identifies the Actinobacterial genera *Mycobacterium* and *Nocardia*.

Biochemical tests used in the identification of infectious agents include the detection of metabolic or enzymatic products characteristic of a particular infectious agent. Since bacteria ferment carbohydrates in patterns characteristic of their genus and species, the detection of fermentation products is commonly used in bacterial identification. Acids, alcohols and gases are usually detected in these tests when bacteria are grown in selective liquid or solid media.

The isolation of enzymes from infected tissue can also provide the basis of a biochemical diagnosis of an infectious disease. For example, humans can make neither RNA replicases nor reverse transcriptase, and the presences of these enzymes are characteristic of specific types of viral infections. The ability of the viral protein hemagglutinin to bind red blood cells together into a detectable matrix may also be characterized as a biochemical test for viral infection, although strictly speaking hemagglutinin is not an enzyme and has no metabolic function.

Serological methods are highly sensitive, specific and often extremely rapid tests used to identify microorganisms. These tests are based upon the ability of an antibody to bind specifically to an antigen. The antigen, usually a protein or carbohydrate made by an infectious agent, is bound by the antibody. This binding then sets off a chain of events that can be visibly obvious in various ways, dependent upon the test. For example, "Strep throat" is often diagnosed within minutes, and is based on the appearance of antigens made by the causative agent, *S. pyogenes*, that is retrieved from a patients throat with a cotton swab.

Complex serological techniques have been developed into what are known as Immunoassays. Immunoassays can use the basic antibody – antigen binding as the basis to produce an electromagnetic or particle radiation signal, which can be detected by some form of instrumentation. Signal of unknowns can be compared to that of standards allowing quantitation of the target antigen. To aid in the diagnosis of infectious diseases, immunoassays can detect or measure antigens from either infectious agents or proteins generated by an infected organism in response to a foreign bacterial agent.

Instrumentation can be used to read extremely small signals created by secondary reactions linked to the antibody – antigen binding. Instrumentation can control sampling, reagent use, reaction times, signal detection, calculation of results, and data management to yield a cost effective automated process for diagnosis of infectious disease.
...technologies based upon the polymerase chain reaction (PCR) method will become nearly ubiquitous gold standards of diagnostics of the near future, for several reasons. First, the catalog of infectious agents has grown to the point that virtually all of the significant infectious agents of the human population have been identified. Second, an infectious agent must grow within the human body to cause disease; essentially it must amplify its own nucleic acids in order to cause a disease. This amplification of nucleic acid in infected tissue offers an opportunity to detect the infectious agent by using PCR. Third, the essential tools for detecting PCR, primers, are derived from the genomes of infectious agents, and with time those genomes will be known, if they are not already.

Thus, the technological ability to detect any infectious agent rapidly and specifically are currently available.

3. Observations

The observations were based on a survey carried out in population of Bassi village near Jaipur. It was found that many people were prone to bacterial infections due to unhygienic conditions and improper sanitation. The patients affected which died were basically unconcerned, careless and ignorant. Many patients got hospitalization and some were prescribed oral antibacterials at home. The data showed that maximum number of patients had Salmonellosis, followed by Botulism.

Table 1. Showing data by survey of affected population in Bassi

<table>
<thead>
<tr>
<th>Bacterial disease</th>
<th>No. of people affected</th>
<th>No. of people treated and survived</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toxic shock syndrome</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Salmonellosis</td>
<td>21</td>
<td>20</td>
</tr>
<tr>
<td>Cholera</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Botulism</td>
<td>17</td>
<td>16</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>14</td>
<td>9</td>
</tr>
<tr>
<td>Syphilis</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

4. Results and Discussion

4.1. Bacterial Diseases in Rural Population of Bassi Village near Jaipur

Toxic Shock Syndrome (TSS): was a common disorder in men in general.

In this, the main pathogenic species is Staphylococcus aureus (aure = gold, golden), which causes most hospital-acquired infections. Multiple-drug-resistant strains have become such a problem due to overuse of antibiotics, that medical workers now refer to this by the nickname “M-D-R-S-A.” In July, 2013, following botched out-patient surgery on a male patient, he was put on a ventilator which was contaminated and introduced a massive M-D-R-S-A infection into his lungs. He died after a couple of months in ICU. In October 2013, in the last couple months of another rural worker, battled M-D-R-S-A in bedsores on his heels, acquired during an immediately-previous hospitalization. These two incidents occurred in different hospitals where the patients were admitted.

Salmonellosis: was another infection which causes a type of food poisoning in both men and women by eating contaminated eggs. Washing of eggs caused the bacillus Salmonella to penetrate the egg shell. The cause was that eggs have been washed just after the hen laid them, then packaged into egg cartons at the egg factory, where they sit for a while until shipped to a grocery store, then sit for a while at the grocery store until purchased, then sit for a while in refrigerator until used, that gave any Salmonella that did enter the egg a chance to grow and multiply, so by the time the eggs were used, the bacterial count was significantly higher, perhaps enough to make people sick (Preston, 1995).

Cholera: This was common among children by ingestion of some of the bacteria either from one’s own hands or from drinking the water was a common source of exposure. One main symptom was diarrhea, and most victims died of dehydration. Many adults among travelers ate locally-caught fish, or fresh vegetables washed in the local water to avoid the possibility of contracting cholera (among other diseases). Usually boiling the water and/or eating vegetables cooked in boiling water are often OK because the boiling kills the cholera bacteria (Duncan, 2003).

Botulism (botulus = sausage) was also observed in general population which is a type of food poisoning, and is often found in undercooked meats. The bacteria secrete toxins which are made of proteins which are resistant to digestion by our GI tract, so are absorbed through the intestinal wall, and are toxic to humans. Under adverse conditions, botulism bacteria (and other bacteria) can form spores, a dormant stage that is resistant to dry heat (roasting, broiling), but killed by moist heat (steaming, boiling, etc.). Also, typically microwaving does not provide enough heat for a long enough time to kill these bacteria. These bacteria grow well at body temperature and warm room temperature (summer temperature), thus it is important to beware of slowly-cooking soup with meat in it or left-over turkey stuffing (chill these quickly in the refrigerator, not sitting in the pot on the stove until they “cool” and egg (especially raw) and/or meat-containing foods at picnics on hot day (deviled eggs containing mayonnaise are especially suspect, but any foods containing mayonnaise may be a problem)(Ryan and Ray, 2004) In general, vegetables, especially fresh/raw, are OK. Honey can contain small numbers of botulism spores which our bodies can effectively combat, so it’s generally not a concern.

Tuberculosis: (tuberculum = a little knob, swelling) This disease was at a low for a long time in Bassi village, but now has become a problem again because of multiple-drug-resistant strains that have evolved due to the...
overuse of antibiotics. These bacteria live in the lungs and destroy lung tissue.

Syphilis: was another common disease found among men and women. The bacterium is spread by intercourse (it is an STD). The initial symptoms observed were sore on the genitalia followed later by a serious, general infection. Some babies became blind by getting syphilis in their eyes as being born.

5. Conclusion

6 Bacterial diseases were common in the human population of Bassi village, near Jaipur. Knowledge of the disease outbreaks further leads to treatment techniques and prevention of deaths in the population. Different types of antibiotics were effective for treating specific types of bacteria. Antibiotics may be given orally, intravenously, or by intramuscular injection, depending on the type and severity of bacterial disease in patients. General types of antibiotics included - Aminoglycosides, Cephalosporins, Macrolides, Quinolones, Penicillins and tetracyclines.

Treatment of bacterial infections also included - Good nutrition, Hospitalization and intensive care in some cases, especially if complications occur, Increased fluids and Rest for patients. The surviving population either were not infected or were treated on time by hospitalization.

REFERENCES


[3] This section incorporates public domain materials included in the text: Medical Microbiology Fourth Edition: Chapter 8 (1996) - Baron, Samuel MD. The University of Texas Medical Branch at Galveston.


[9] World Health Organization (February 2009). "Age-standardized DALYs per 100,000 by cause, and Member State, 2004".

[10] "The World Health Report (Annex Table 2)" (PDF). 2004. Diarrheal diseases are caused by many different organisms, including cholera, botulism, and E. coli to name a few. See also: Intestinal infectious diseases