

A STUDY OF BACTERIAL DISEASE AMONG THE SUSPECTED CASES OF LUMBINI PROVINCIAL HOSPITAL, BUTWAL, RUPANDEHI, NEPAL

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ABSTRACT

The bacterial disease is a major health problem in Nepal. This study has been done in the Lumbini provincial hospital from January 2021 to June 2021. In a study of bacterial disease among the suspected cases of Lumbini provincial hospital, four types of bacterial diseases were found; TB, pneumonia, leprosy, and meningitis. Among the four diseases, the cases of TB and pneumonia are found higher than that of leprosy and meningitis. The highest cases of TB i.e., 2.5% show in between the age group of 20-30 and 40-50 years of age. The highest cases of pneumonia show in between the age group of 0-10 years i.e., 5.75%. The highest cases of leprosy were found in above 70 years of age group i.e., 2.25% and that of meningitis were found in between the age group of 40-50 years of age i.e., 1%.

Keywords: age group – leprosy - meningitis - pneumonia - prevalence - TB.

INTRODUCTION

Nepal is a small developing country which is located in South Asia with infectious diseases. The total area of Nepal is 1,47,516 km² (Kathmandupost.com, 2020). Topographically, Nepal is divided into three geographical regions; Mountains, Hills, and Terai. In the northern part of the country, the summer season is cool while in winter, it is severely cold. In southern Nepal, the summer temperature exceeds to 37°C and in winter it ranges between 7°C and 23°C. In high mountainous regions, hills and valleys the winter

temperature is too cold and in the summer it is temperate. Most of the people of Nepal are poor and uneducated. So, they are unaware of infectious diseases like bacterial disease which is caused due to unhealthy habits, poor sanitation, polluted environment, high temperature, poverty, etc. due to these reasons most people are dying every year from bacterial disease.

Brief introduction about bacteria and bacterial diseases

Bacteria are prokaryotic unicellular microscopic organism which is divided by binary fission. The size of bacteria varies from 0.5 to 1.5 μ in length and 0.2 to 2 μ in breadth. They have several shapes like spheres, rods, and spirals. They are found in the soil, the ocean, and inside the gut of human beings (Rudolfs et al.,1950). The relationship of bacteria with a human is very complex. Sometimes, bacteria play an important role in the scheduling of milk and also help indigestion. The bacteria are also destructive and cause various diseases like pneumonia, diarrhea, dysentery, typhus fever, Tuberculosis, meningitis, etc. The diseases caused by bacteria are called bacterial diseases.

Tuberculosis

It is a chronic infectious disease caused by the bacillus bacterium called *Mycobacterium tuberculosis* or Tubercle bacilli. It causes a major health problem and existed for thousands of years ago. The bacteria which caused TB were discovered by Robert Koch in 1882. It is a dreadful disease and is easily transmitted by the inhalation of the aerosol droplet discharges from the TB infected person when coughing, talking, sneezing, spitting, singing, etc. (Park, 2015). This disease is mainly affecting the lungs and caused pulmonary tuberculosis. However, it can also affect the other parts of the body like the intestine, bones, meninges, lymph glands, skin, and other tissues of the body (Geiter et al., 2000). There are more than 70 species of *Mycobacterium* that are the pathogens of human beings but two of them are considered as the main causative organism of TB. In the PTB, the organism enters into the alveoli of the lungs which leads to primary infection. The probability of transmission from one person to another depends upon several factors including the number of infectious droplets expelled by the carrier, the types of ventilation, the duration of exposure, the virulence of the *M. tuberculosis* strain, and the level of immunity found in the uninfected person.

It is estimated that one-third of the world's population is infected with *Mycobacterium tuberculosis*. Two billion people are believed to be the carrier of non-

eradicated intra-granulomatous TB bacilli as latent tuberculosis infection and one in ten of them will become sick with TB during their lifetime (WHO, 2010). New infection added to about 1% of the population each year (WHO, 2016). In 2016, there are more than 10 million cases of active TB which resulted in 1.3 million deaths. More than 95% of death occurred in developing countries and more than 59% in India, China, Indonesia, Pakistan, and the Philippines (WHO, 2017).

TB is a major health problem in Nepal, which causes a significant burden of morbidity and mortality. Here, 45% of the population is infected with TB, of which 60% are of the reproductive age group. Moreover, every year 40,000 people develop active TB, among them, 20,000 of them are of the infectious type of TB. Every year, about 5000 to 7000 populations are dying off due to TB (Banstola & Banstola, 2013). According to NTP/Annual Report, 2018-19, the total death from tuberculosis in Nepal was 5500. The death rate compared to 1990 has significantly decreased. In 2075/76, 1013 death were reported because of TB, indicating the need to strengthen and link to the vital registration system of the country. The active cases of TB were reported in the working-age group between 15-65 years. The highest number of cases was reported in the age group between 15-24 years. The active case of TB in children was 5.5%. Men where 1.77 times more suffer from TB than women.

Extra-pulmonary tuberculosis (EPTB) mainly occurs in the lymph nodes, skin, genital organs, pericardial region bones and joint larynx, meningitis, etc. Extra-pulmonary tuberculosis occurs in isolation or along with pulmonary TB in case of disseminated TB. Co-infection with HIV has changed the epidemiology and brought extra-pulmonary TB into focus again. EPTB contains 15-20% of the cases in immune-competent individuals and constituents for more than 50% of the cases in individuals with HIV infection. (Sharma & Mohan, 2004)

Leprosy

Leprosy is an infectious disease that causes severe, disfiguring skin sore and nerve damage in the arms, legs, and skin areas around the body. this disease has been around since ancient times, often surrounded by terrifying, negative stigmas and tales of leprosy patient beings shunned as outcasts. Outbreaks of leprosy have affected and panicked human beings on each continent. The oldest civilizations of China, Egypt, and India feared leprosy as an incurable, mutilating, and contagious disease. It is a chronic infectious disease caused by a slow-growing gram-positive *Bacillus* bacterium called

Mycobacterium leprae. It is also known as Hansen's disease. It was first described by Hansen in 1874 in Norway. It affects the peripheral nerves mainly in the skin, muscles, eyes bones, etc. It is arranged in clumps resembling cigarette ends and is often found in the endothelial cells of blood vessels.

Leprosy is still considered a serious public health concern with social stigma in a developing country like Nepal. However, it was declared eliminated from Nepal by the government of Nepal in 2009. The globally registered prevalence of leprosy at the beginning of 2011 stood at 192,246 cases (0.34/10,000) with 113,750 cases (0.64/10,000) from South-East Asia and the number of new cases detected globally during 2010 was 228,474 out of which 68.4% belonged to South-East Asia (Jha, 2012).

In Nepal, a leprosy survey was done with the collaboration of WHO in 1960. In 1966, a pilot project was launched to control leprosy with Dapsone monotherapy with an estimated number of 1,00,000 leprosy cases. The most important development in the leprosy control program has been the introduction of Multidrug Therapy (MDT) in 1982. In 1996, the coverage with MDT reached 100% and the prevalence gradually declined from 2.2/10,000 population in 2005 to 0.79/10,000 population in July 2011. However, the prevalence is uneven in different parts of the country which is higher in the Terai, 1-2/10,000 population. More than 83% of cases are from the Terai regions. This means that concerted effort is required to control leprosy in Terai even though it is declared eliminated nationally. There has been a significant reduction in leprosy cases in Nepal, for the past few years in 119 (2007), 93 (2008), 105 (2009), 127 (2010), and 136 (2011). The leprosy prevalence rate is high in Banke, Bardiya, Nawalparasi, and other districts of the Terai. It is said that the prevalence of leprosy is high in Madesh Province.

Meningitis

Meningitis is a fatal bacterial infection that results in the inflammation of the meninges of the spinal cord and brain. Meningococcal meningitis was first discovered in 1805 during an outbreak in Switzerland by Vieusseux. The infection involves the arachnoid, the intervening cerebrospinal fluid (CSF). The inflammatory process extends throughout the subarachnoid space of the brain and spinal cord. It can cause necrosis, decrease blood and CSF flow which impaired the function of the CNS. The early symptoms are headache, fever, and chills; however, a combination of 2 to 4 symptoms like headache, fever, stiff neck, and altered mental status is found in 95% of patients.

Death occurs due to shock and other serious complications within hours of the appearance of the symptoms.

This disease occurs worldwide with the highest incidence of disease found in the 'meningitis belt' of Sub-Saharan Africa. In these areas, a major epidemic occurs 5 to 12 years. In Nepal, this disease was also found in epidemic form in the year 1983 with 875 cases and 95 deaths occurring in the Kathmandu valley. Acute bacterial meningitis is a major public health problem with mortality and morbidity in children with an annual 5,00,000 cases worldwide with at least 50,000 deaths and an equal number of neurological disabilities. The case fatality rates remain 5 to 10% in industrial countries and 20% in developing countries with the efforts of best care and antibiotics therapy. Between 10% and 30% of survivors develop permanent neurological sequelae such as paralysis, cognitive deficit, or sensor neural deafness (Mishra et al., 2013).

Pneumonia

Pneumonia is an inflammation of the lungs due to bacterial infection. In 1875, German pathologist Edwin Klebs observed pneumonia bacteria under the microscope for the first time and this was the first step in the fight against the monary disease. Then, in the 1880s, Carl Friedlier and Albert Frankel identified two of the types of pneumonia caused by bacteria. It is caused by Gram-positive, lancet-shaped cocci called *Streptococcus pneumoniae*. This bacterium lives in the throat of a young and healthy person without causing harm but the defense system of the person becomes weak due to some reason then these bacteria move down to the lungs and get an infection which caused inflammation. The initial symptoms of the pneumonia are sneezing, sore throat, and cough due to a cold which is followed by a high fever with a temperature of 104°F, shaking chills, and coughs with discolored and bloody sputum.

Bacterial pneumonia is the major cause of mortality and morbidity. It kills children less than five years of age in the world. Globally, every year, it kills about 1.2 million children under five, with 18% of all deaths of this age group (WHO). In Nepal, according to the recent annual report of the Department of Health Services (DoHS), Ministry of Health and Population, out of a total of 2,752,266 ARI cases among children under five years, 822,352 were reported as pneumonia from July 17, 2010, to July 17, 2011 (Banstola and Banstola 2013). Pneumonia is a form of acute respiratory infection that affects the lungs. Pneumonia accounts for 15% of all deaths of children under 5 years old, killing 808,694 children in 2017. Pneumonia affects children and families everywhere

but is most prevalent in South Asia and sub-Saharan Africa. (WHO, 2019). The WHO (2014) has reported that indoor air pollution caused by cooking and heating with biomass fuel, living in crowded homes, and parenting smoking are the risk factors of pneumonia (Karki, 2014).

LITERATURE REVIEW

TB has occurred in humans for thousands of years with archeological findings from several Neolithic sites of Egypt, Europe, Greek, and Roman empires, which have shown evidence of disease consistent with modern TB (Mathema et al., 2006). The patients exhibit different of TB such as persistent cough for 2-3 weeks, chest pain, blood-tinged sputum, breathlessness, weight loss, loss of appetite, chills, fever, and night sweating (Lawn & Zumla, 2011). Extra-pulmonary tuberculosis occurs in the lymph nodes, skin urinogenital organs, pericardium, bone and joint, larynx, and tuberculosis meningitis (Sharma & Mohan, 2004).

Isoniazid, which is a prodrug, requires activation by bacterial catalase peroxide enzyme Karg and enters the mycobacterial cell wall by passive diffusion (Zhang et al., 1992; Bardou et al., 1998). It inhibits the synthesis of mycolic acids through the NADH-dependent enoyl-acyl carrier protein ACP-reductase, encoded by *inhA* (Rawat et al., 2003)

Community knowledge, attitude, and perceived stigma of leprosy amongst community members living in Dhanusha and Parsa district of Southern Nepal (Singh et al., 2019). The chronic infectious granulomatous disease is caused by *M. leprae* (Shrestha et al., 2017). Adequate clinical information combined with bacilloscopic and histopathology is helpful not only in the classification of different types of leprosy but also useful for the management of the cases.

Shah et al. (2010) studied to obtain comprehensive insight into the bacteriological and clinical profile of community-acquired pneumonia consisting of 100 patients admitted with the diagnosis of community-acquired pneumonia, as defined by the British Thoracic Society, from December 1998 to December 2000, in India. Pneumonia is responsible for high morbidity and mortality amongst children under five years of age. India accounts for one-third of the total WHO southeast Asia burden of under-five mortality (Gothankar et al., 2018).

The prevalence of bacterial meningitis, its causative organisms, and their antibiotic sensitivity patterns was studied in cerebrospinal fluid of 448 suspected cases. The prevalence of acute bacterial meningitis was 8.3% conducted at TU, Teaching Hospital in Nepal from January 2001 to March 2002 (Tiwari et al., 2007).

There are several etiologies of meningitis and encephalitis which must be considered in any patient presenting with fever, headache, neck stiffness, and vomiting (Kafle, 2017). Bacterial meningitis and viral encephalitis are medical emergencies and need urgent attention and treatment. Any delay in diagnosis and treatment has been shown to increase morbidity and mortality. Some of the survivors also have a neurological sequel with a need for long-term physical and occupational rehabilitation.

METHOD AND METHODOLOGY

Study area

Rupandehi is one of the endemic districts for the bacterial disease is located in Lumbini Province of Nepal. This district lies in the Southern and Western parts of Nepal. On the East, it lies in the border with Nawalparasi district, on West Kapilvastu district, on North with Palpa district, and South with India. The elevation of the district lies between 100m and 1229m from sea level. The total area of the district is 1,360 km² with 16.1% in the Siwalik range and the rest in the Terai region. The average temperature of Rupandehi in summer exceeds 35oC and in winter it is from 15°C to 25°C.

Selected hospital

The Lumbini Provincial hospital was selected for the study of bacterial disease. It is situated at the junction of Mahendra and Siddhartha highway in Butwal sub-metropolitan city of Rupandehi district in the western part of Nepal near to the birthplace of Lord Buddha i.e., Lumbini. Globally, the position is latitude 27° 41'52''N and longitude 83° 27'51''E and 865 m above sea level. It lies at the bottom of Siwalik hill of Palpa and Rupandehi district. It is the biggest Governmental hospital in the Lumbini province of Nepal. This hospital covers the entire district of the previous Lumbini Zone. It is one of the oldest hospitals in this region and is the backbone for the health service to poor citizens who cannot afford private hospitals. This hospital provides outpatient and inpatient services such as general medicine, general surgery, immunization, nutrition, safe motherhood, TB control program, DOTS, etc. Apart from curative, preventive, promotive,

and rehabilitative services, this hospital also prove Early Warning Reporting System. There is also the facility of Laboratory examination, Radiography, CT scans, X-rays, etc.

Duration of study

The study was carried out for six months i.e., from January 2021 to June 2021 for the collection of data. The collected data of the suspected cases were examined with the help of the health workers and laboratory support of the Lumbini Provincial hospital.

Method of data collection

The primary data was collected by direct observation of suspected cases of the patients on different days of the study period by a blood sample, sputum, X-rays, CT scan, etc. with the help of Health workers in the study area. The data was also collected by taking direct interviews with the help of the questionnaire survey to collect the information regarding the bacterial disease among the suspected cases.

The secondary data was collected from the review of different journal papers, different published and unpublished related literature of the study disease, from the previous record of the hospital, etc.

Sampling procedure

A different method was applied for the collection of samples for the identification of different bacterial diseases.

For tuberculosis

Sputum collection

The patients were asked to submit the sample of sputum for two consecutive days, i.e., spot and morning. During the collection of sputum samples, the patients were instructed to inhale deeply 2-3 times and coughed up deeply from the chest, and spit closer to the mouth. It was made sure that the collected sample is of good quality i.e., thick, purulent, and avoid saliva. About 5ml of sputum sample was collected in a disposable container of suspected 400 patients.

Staining of sputum sample by Ziehl-Neelsen (Z-N) method

The following procedures were applied for the identification of bacteria that caused TB:

1. The slide containing sputum were placed on the staining bridges.
2. The smear was flooded with Carbofuchsin stain and heated from below with spirit cotton until the vapor just begins to rise. It was noted that Carbofuchsin was not allowed to boil and keep on heating for about 10 minutes.
3. The smear was covered with 20% sulphuric acid solution for about 5 minutes or until the smear was sufficiently decolorized.
4. The smear was covered with 0.1% methylene blue for about 2 minutes.
5. The smear was washed off by tap water and tipped to drain off the water.
6. The backside of the slide was wiped out by cotton and placed at the draining rack.
7. The slide is kept under the microscope for the observation of the related bacteria which caused TB.
8. A red-colored rod-shaped bacillus bacterium was seen scattered in the slide.

For Pneumonia

Blood test: Blood tests are done to confirm the infection of pneumonia and try to identify the types of organisms causing the infection.

Chest X-ray: It is done to determine the extent and location of the infection.

Sputum test: A sample of fluid from the lungs i.e., sputum is taken after a deep cough and analyzed to identify the causes of the infection by pneumonia.

CT scan: If pneumonia is not seen then doctors recommend a chest CT scan to obtain a detailed image of the lungs.

For pneumonia 400 samples were collected from the suspected cases.

For meningitis

Blood cultures: Blood samples from the suspected cases of 400 meningitis patients are collected in a special disc to see the growth of microorganisms that caused meningitis. These samples are also placed on a slide and stained with Gram's stain, then studied under the microscope to see the bacteria which caused meningitis.

Imaging: Computerized Tomography (CT) or magnetic resonance imaging (MRI) scans of the head also show swelling of inflammation. x-rays or CT scans of the chest or sinuses also show the infection in other parts that may be associated with meningitis.

For leprosy:

Blood test: Blood samples from the 400 suspected cases of leprosy patients were collected from the affected area. These samples are examined under the microscope to confirm the microorganisms caused by leprosy.

Calculation of prevalence

The total number of individuals who have the disease at a particular time divided by the population at risk of having the disease is called prevalence. There are two types of prevalence. They are point prevalence and period prevalence. Here in this study, the only period prevalence was calculated. Period prevalence measures the frequency of all current cases existing during a definite period expressed about a definite population. It is calculated by the given formula (Park, 2015):

$$\text{Period prevalence} = \frac{\text{No. of existing cases of specific disease}}{\text{Estimated mid-year population at risk}} \quad \dots(1)$$

RESULTS AND DISCUSSION

The present data were collected at the Lumbini Provincial Hospital. Different types of bacterial diseases are found in the human body which is more contagious or less contagious to people. In the present study, 400 samples are collected each for Tuberculosis, pneumonia, meningitis, and leprosy.

Bacteria are single-celled microbes. The cellular structure is simpler than that of other organisms as there is no nucleus or membrane-bound organelles. Bacteria are destructive, causing diseases. They are harmful and cause diseases and illnesses like tuberculosis, food poisoning, pneumonia, etc. It affects not only human health but also other organisms, aquatic plants, and animals.

According to the WHO, one of the greatest challenges is the continuing global impact of infectious diseases which cause roughly 20% of all human death each year. Bacteria cause a high burden of diseases worldwide, especially in low- and middle-income countries.

Study results with respect to Tuberculosis

TB causes high burden of disease worldwide, especially in low- and middle-income countries (Dye et al., 1999). On March 24, 1882, Dr. Robert Koch announced the discovery of *Mycobacterium tuberculosis*, the bacteria which caused TB. From this time onward, many people were suffered from this disease. Later, March 24 was declared as World TB Day, which is a day to educate the public about the impact of TB around the world. The Tuberculosis Control Programmed was also launched by the Government of Nepal to control TB.

In the contest of the present study, 400 samples of suspected cases of TB patients were collected of which 48 patients were found positive. The most affected age group which caused TB is found in between 20-30 and 40-50 years i.e., 2.5%. According to sex, males are affected more than females i.e., 7% and 5% respectively.

Table 1: Number of positive cases and prevalence based on age group

Total No. of the sample examined in a suspected patient	Age (Year)	Group	No. of positive cases	Prevalence
400	10-20		5	1.25%
	20-30		10	2.5%
	30-40		8	2%
	40-50		9	2.5%
	50-60		6	1.5%
	60-70		6	1.5%
	Above 70		4	1%
	Total		48	100

Table 2: Number of positive cases and prevalence based on sex group

Total No. of the sample examined in a suspected patient	Sex Group	No. of positive cases	Prevalence
400	Male	28	7%
	Female	20	5%
	Total	48	100

Study results with respect to Pneumonia

Pneumonia is the leading cause of death worldwide. It is more common in certain age groups. Children under 5 years of age and people older than 65 years are mostly infected with pneumonia due to the presence of a weak immune system of the body.

In the present study, a total of 400 samples of suspected cases of pneumonia patients were collected, among them, 77 were found positive i.e., 19.25%. The most affected age group was found in between 0-10 years. This age group was highly affected by bacterial pneumonia, i.e., 5.75%. Females are more affected than males i.e., 10% and 9.25% respectively.

Table 3: Number of positive cases and prevalence based on age group

Total No. of the sample examined in a suspected patient	Age Group (Year)	No. of positive cases	Prevalence
400	0-10	23	5.75%
	10-20	20	5%
	20-30	12	3%
	30-40	4	1%
	40-50	10	2.5%
	50-60	4	1%
	Above 60	4	1%
	Total	77	100

Table 4: Number of positive cases and prevalence based on sex group

Total No. of the sample examined in a suspected patient	Sex Group	No. of positive cases	Prevalence
400	Male	37	9.25%
	Female	40	10%
	Total	77	100

Study results with respect to Meningitis

The prevalence of bacterial meningitis was studied in Lumbini Provincial Hospital. 400 samples were collected to detect the presence of meningitis, among them 15 patients were found positive. The highest prevalence was found in the age group between 40-50 years. The prevalence of females is higher than the male i.e., 2% and 1.75% respectively.

Table 5: Number of positive cases and prevalence based on sex group

Total No. of the sample examined in a suspected patient	Sex Group	No. of positive cases	Prevalence
400	Male	7	1.75%
	Female	8	2%
	Total	15	100

Table 6: Number of positive cases and prevalence based on age group

Total No. of the sample examined in a suspected patient	Age Group (Year)	No. of positive cases	Prevalence
400	10-20	1	0.25%
	20-30	-	-
	30-40	2	0.5%
	40-50	4	1%
	50-60	3	0.75%
	60-70	2	0.5%
	Above 70	3	0.75%
	Total	15	100

Study results with respect to Leprosy

Leprosy is a chronic infectious disease caused by *Mycobacterium leprae* representing a public health issue in some countries. In the context of the present study, 400 samples of suspected cases of leprosy patients were collected among them, 41 patients were found positive i.e., 10.25%. The above 70 years of age group was found highest affected by leprosy. In the present data Males are more affected than females i.e., 60.97% and 39.024% respectively.

Table 7: Number of positive cases and prevalence based on age group

Total No. of the sample examined in a suspected patient	Age Group (Year)	No. of positive cases	Prevalence
400	10-20	1	0.25%
	20-30	3	0.74
	30-40	7	1.75%
	40-50	5	1.25%
	50-60	8	2%
	60-70	8	2%
	Above 70	9	2.25%
	Total	41	100

In Lumbini Provincial Hospital, the case study of bacterial disease has not been conducted so far. So, this work will provide reference work for further study among bacterial diseases.

Table 8: Number of positive cases and prevalence based on sex group

Total No. of the sample examined in a suspected patient	Sex Group	No. of positive cases	Prevalence
400	Male	25	6.25%
	Female	16	4%
	Total	41	100

CONCLUSION

The present research on “A study on Bacterial Disease among the Suspected Cases of Lumbini Provincial Hospital” has been carried out for six months i.e., from January 2021 to June 2021. The main objective of this research was to detect the different kinds of bacterial diseases found in human beings and to know which age group and sex are mainly affected by these bacterial diseases. The study shows that different bacterial diseases are present in human beings. Some of them are less dangerous or more contagious to human beings. Despite newer modalities for diagnosis and treatment of TB, pneumonia, leprosy, and meningitis, millions of people are still suffering and dying from these diseases.

A total of 1600 samples were collected each containing 400 samples for the diagnosis of four different types of bacterial diseases, i.e., TB, pneumonia, leprosy, and meningitis. The various test was done to detect these diseases like blood test, chest X-rays, and sputum test. In the present study, among the four types of diseases, the highest infection was found in the case of TB and pneumonia. Leprosy and meningitis were found in less in comparison to the above diseases. People get infected from bacterial disease through the infected person which may be either due to direct contact or through contaminated food and drinking. So far, no effective measures have been taken towards the control and eradication of bacterial diseases in Nepal except in a few places. The knowledge of bacterial disease is concerned which is likely to deteriorate further if effective control measures are not taken in the patients suffering from these bacterial diseases in time.

On the basis of study findings, following measures are recommended:

1. Patients should be made aware of the negative effect of irregularly taking medicine.
2. In case of emergency, the urgent transfer to the hospital is not possible due to the geographical location or adverse weather condition, give first aid treatment to the children and young patients with suspected bacterial disease.

3. Active tuberculosis should be treated with multidrug regimes to avoid the development of bacterial resistance.
4. People should be avoided to drink alcohol and smoking.
5. The drinking water should be boiled or filtered before consumption to avoid the infection of bacterial diseases.
6. It is critical that leprosy patients are integrated into the general health and eye care program during their anti-leprosy treatment.
7. Practicing good hygiene, such as regular handwashing with antibacterial soap, and maintaining a balanced and healthy diet to keep the immune system of the body strong.
8. Government should implement rules and public awareness programs related to the causative agents, route of transmission, clinical features through television and mass media to the public level. These types of awareness programs should also be included in the textbooks of the school.

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