I

INTRODUCTION

Tuberculosis (TB) is a potentially fatal contagious bacterial disease that can affect almost any part of the body but it is mainly an infection of the lungs. It is caused by a bacterial micro-organism, the tubercle bacillus or *Mycobacterium tuberculosis*.

TB in man is caused predominantly by *Mycobacterium tuberculosis* and occasionally by *M. bovis* and *M. africanum*. These organisms are also known as tubercle bacilli (acid fast bacilli) because they cause lesions called tuberculosis. Tubercle bacilli can remain dormant in tissues and persists for many years.

TB is an infectious disease which spread through air. When TB patient cough, sneeze and spit the TB bacilli escape into the environment. A healthy person inhales those bacilli and later develop into TB diseases. It is an opportunistic disease which severely infect the people when the immunity is low.

Around 60% of HIV/AIDS patient in the world die due to TB. Therefore, there is a holy alliance between TB and HIV/AIDS. TB is one of the ten leading cause of death in the world. HIV (the virus that causes AIDS) and TB have been described as the 'Diabolical Duet". The reason is that when HIV infection increases, so does TB. When someone is infected with HIV, the virus weakens their immune system. The immune system usually helps to fight disease, so, when the immune system is damage people are more susceptible to infection. This means that people previously infected with TB will then develop the disease. (WHO Report, Global TB Control)

Tuberculosis of the lung (The most frequently infected organ) is called pulmonary tuberculosis (PTB) the most common form of tuberculosis. PTB is also called as "Open case" of tuberculosis. The term open tuberculosis is applied to those cases in which bacilli are detectable in sputum. Hence it is the most infectious form of tuberculosis. Tuberculosis outside the lung is called extra-pulmonary tuberculosis. Extra-pulmonary tuberculosis although less common in comparison with PTB is nevertheless important public health problem in many tropical countries. It affects intestine, meaninges, bones and joints, lymph glands, skin and other tissues of the body.

The disease also affects animals like cattle, this is known as "bovine tuberculosis" which may sometime be communicated to man (Park 1994) and hence tuberculosis is considered as zoonotic disease.

M. tuberculosis is the most likely etiological agent of chronic lower respiratory tract infection, pulmonary tuberculosis. Infection is spread from person to person by inhalation of air borne droplet through coughing, sneezing, speaking or singing. The organisms are inhaled in very small particles into the terminal bronchioles or alveoli, and the primary lesion may occur in any part of the lungs. Later, one or more lung lesions progress to cessation and cavitation of the bronchial tree. Elderly patients, alcoholics are most likely to develop disease. Disease usually occurs some years after the initial infection, when the patients' immune system breaks down for some reason. The main symptoms of pulmonary TB in adult are chronic cough with the production of mucoid or mucopurulent sputum, which may contain blood.

The risk of contracting TB increases with the frequency of contact with people who have the disease and with crowded or unsanitary living conditions and poor nutrition.

Christopher *et al.*, (1997) estimated that the number of new cases of 212 countries in 1997 was 7.96 million (range, 6.3 million -11.1 million) and there were 16.2 million (12.1 million -22.5 million) existing cases of diseases while an estimated 1.87 million (1.4 million -2.8 million) people died from TB. Eighty percent of all incident TB cases were found in 22 countries with more than half the cases occurring in 5 South East Asian countries.

According to WHO (2004) largest no of TB cases occurred in South-East Asia Region, which accounted for 33% of incident cases. However, the estimated incidence per capital in sub-saharan Africa is nearly twice that of the South-East Asia Region; at nearly 400 cases per 1,00,000 population. It is estimated that 1.7 million deaths resulted from TB in 2004. Both the highest no. of deaths and highest mortality per capita are in the WHO Africa region where HIV has led to rapid growth of the TB epidemic and increases the likelihood of dying from TB. After the introduction of effective antibiotics and prophylactic measures (BCG vaccine) the prevalence of TB declined in many countries but now TB has become reemergent problem in many countries due to several factors like HIV/AIDS, social dislocations, poverty, overcrowding and the emergence of multidrug and the resistant tubercle bacilli (Bloom and Fine, 1994)

Seven South Asian countries bear 40 percent global burden of TB disease. These countries have formed the South Asian Association of Regional Co operation (SAARC). Considering TB control a priority, member countries have established SAARC TB center in Nepal. The objectives of this centre is to work for control of tuberculosis by Co-ordinating the efforts of member countries. Programme managers from the Seven SAARC countries of Bangladesh, Bhutan, India, Maldives,

Nepal, Pakistan and Srilanka meet annually to prepare action plans and to review recent progress. There are about 6 million TB patient living in SAARC member countries. More than 2.5 million new cases are added every year in this pool and about 0. 6 million people die due to TB every year in the region. Bangladesh, India and Pakistan have been included in the list of high burden countries.

WHO (1999) stated that proper medication is to be started immediately to the patient suffering from TB to achieve the following goals.

- To cure the patient of TB
- To prevent death from active TB
- To prevent relapse of TB
- To decrease transmission of TB to others.

The core of this strategy is DOTS, the TB control approach, introduced by WHO in 1995. Since then more than 22 million patients have been treated under DOTS based services.

Directly Observed Treatment Short-course (DOTS)is a popular strategy to combat TB now a days. It is short course chemotherapy given to the sputum positive patient under the direct supervision of the health workers. This strategy can cure more than 90 percent of new sputum positive cases and reduces spread of infection by breaking the chain of transmission. DOTS is the most cost effective intervention available at present, which can ensure high cure rate in detected TB patients.

TB and HIV are closely interlinked. TB is a leading cause of HIV related morbidity and mortality. HIV is the most important factor fueling the TB epidemic in populations with a high HIV prevalence. HIV is the most potent risk factor for progression to active TB. HIV increases a

person's susceptibility to infection with *M. tuberculosis*. An individual infected with HIV, has 30-50 times increase risk of developing TB, than person who is not infected with HIV (STC/NTC 2006).

A parallel epidemic of TB is following the AIDS pandemic. This is already occurring in many developing countries particularly in sub-Sharan Africa and Asia. WHO estimates that more than 7 million people, 90% of whom are in developing world co-infected with HIV and TB. Of the 33 million people world wide who were HIV positive in 1999, about one third were believed to be infected with TB (STC/NTC, 2003).

TB Situation in Nepal

Tuberculosis is still one of the major public health problem in Nepal; about 45 percent of populations is infected with tuberculosis. An estimated 44,000 new cases of TB occur each year, of which 20,000 are infections smear positive cases and 8-11,000 people die from TB each year (Bam, 2002)

Nepal a developing country, having only about 41 percent of its people literate but majority of people (59 percent) are illiterate who are not aware of health matters, they are always in the threat to infections caused by *Mycobacterium*. Tuberculosis cases are scattered all over the country but majority of cases are in rural areas. In Nepal the annual rate of infection is estimated at about 3 percent. It is about 1. 5 percent in hilly area, 4% in urban area, 25% in Terai area and less than 1 percent in mountain area. (Amatya, 1992).

About 60 percent of adults and 45 percent of general population have been infected with the disease. Nearly 2 percent of people are infected every year. The highest rates of infections have been found in most densely populated areas such as Kathmandu valley and the Urban

areas. Nearly 90,000 people currently have TB, half of these have infectious (sputum smear positive) and continue to chain of transmission. Over 2,20,000 people will develop TB during next five years. The majority of these patients will be people of economically active age groups of 15-45 years. The adult men are more frequently exposed to infection than women because women have less access to health care services than men (HMG/NTP, 2003).

About 45% of Nepalese people are infected with TB. Every year 40,000 people develop active TB, of whom 20,000 have infectious pulmonary disease. These 20,000 are able to spread the disease to others. Fortunately introduction of treatment by DOTS has already reduced the number s of deaths (STC, October, 2004).

According to the recent estimates by the WHO and Joint United Nations programme on HIV/AIDS (UNAIDS), nearly 39.4 million people were living with HIV/AIDS world wide, more than half of them in sub-sharan Africa and nearly about a fifth in south of South East Asia. By the end of 2000 about 11.5 million people were coinfected with HIV and *M. tuberculosis*. Seventy percent of co-infected people were in sub-sharan Africa, 20% South East Asia and 4% in Latin America and the Caribbean. TB accounts for about 13% of HIV related deaths world wide. Globally, 9% of all new TB cases (31% Africa) were attributable to HIV/AIDS (Sharma, *et al.*, 2005).

Joshi *et al.,* (2006), reported that among 208 patients, 110 (52.9%) were tuberculosis patients. Of 110 cases, 85 (77.3%) had pulmonary tuberculosis out of this, 62 (72.9%) were sputum smear positive and 23 (27.1%) were sputum negative and 25 (22.7%) were extra pulmonary tuberculosis cases. Non tuberculosis cases were 98. The pulmonary

tuberculosis patient were more likely to belong in young age group between 15-25 years.

Significance of Study

The study area has high prevalence and also low compliance comparatively in the region, however DOTS, treatment is improving day by day. It is very difficult to make patients to complete the full course of treatment. This creates drugs resistant and increase source of infection for incurable tuberculosis which is more dangerous than HIV/AIDS. TB can be controlled if we can encourage high compliance of TB patients with treatment. Therefore, it was necessary to study on compliance of TB, patient with treatment, especially where there is high prevalence of TB in urban as well as rural area.

Prevalence of PTB is seen at different places of Nepal. Government of Nepal is working to control TB. Al the medicines are provided free from government level. But due to poverty, socio-economic condition and unawareness among the people the number of PTB patients are increasing. Many do not know whether they are suffering from TB or not and if a few of them have started to take the medicine they do not continue to its full dozage. In view of this, it is highly pertinent to enquire into the status and situation of PTB so as to deal more efficiently with the problem to establish the epidemiology of the disease in Janakpur and to find the prevalence of the infection on the basis of age, sex, and attitude of the people. Regarding this view the present study has been undertaken.

MYCOBACTERIUM TUBERCULOSIS – THE CAUSATIVE AGENT OF PULMONARY TUBERCULOSIS

The causative organism (*Mycobacterium tuberculosis*)

The *Mycobacteria*

TB is the disease of clinical and veterinary importance and caused by the genus *Mycobacterium* of the group Mycobacteria. Mycobacteria are aerobic, small non motile, non sporing , slow growing, slightly curved and rod-shaped and non-capsulated bacilli with the dimension 2-3 x 0.2 x 0.4μ, and arranged either single or in groups. They are called as Mycobacteria as they resemble fungi in culture, this is due to unique cell-wall Which is composed of mycolic acids. They are Acid fast Bacilli (AFB) once stained by hot carbol-fuschin, they resist decolourizatrion by dilute mineral acids and are therefore referred to as acid fast bacilli.

Etiology

The genus *Mycobacterium* contains over 60 well defined species of which four most important species responsible for mammalian tuberculosis are

- *Mycobacterium tuberculosis*– Human tubercle bacillus, causes disease in human beings.
- *Mycobacterium bovis* – Bovine tubercle bacillus causes the disease in livestock and also responsible for human tuberculosis of bovine origin.
- *Mycobacterium microti* Vole tubercle bacillus causes disease in mouse and rat.
- *Mycobacterium africanum* (mainly found in Equatorial Africa) causes the similar lesions to those of *M. bovis* in rabbits.

All of the species of Mycobacteria are classified as *Mycobacterium tuberculosis* complex.

Other less important species are:

- *M. avium*- causes the natural infection in birds TB like disease in adults and children.
- *M. marinum*- causes infection in skin, may involve superficial lymph glands.
- *M. xenopi*- Causes lymphadenitis.
- *M. frotuitum* –Causes local absecesses at the site of trauma (Pelezar *et al.,* 1994)

Systematic and Taxonomy

TB caused by *M. tuberculosis* and leprosy caused by *M. leprae* are the diseases known since antiquity. Taxonomically, '*Mycobacteria'* belongs to genus Mycobacterium which is the single genus within the family *Mycobactericeae* in the order Actinomycetales, Members of this family are obligate parasite pathogenic to man, mammals, reptiles, birds and opportunistic pathogens and saprophytic varieties. Actinomycetales include diverse micro-organism, but *Mycobacteria* and allied taxa are easily distinguished on the basis of their ability to synthesize mycolic acids.

Mycobacteria are also leading cause of infection in various domesticated animals and wildlife. In addition to fate of pathogenic mycobacteria that have ability to grow inside the phagosomes and phagolysomes of infected host macrophages. The mycobacterial cell envelope which is complex structure containing a high proportions of lipids (approximately 30 % to 40 % of total weight) could play a crucial

role in the adaptation of Mycobacteria to intracellular growth and survivals, immune modulation and drug resistance (Rostogi, *et al*. 2001)

The characteristic features of tubercle bacilli include its slow growth, dormancy, complex cell envelope, intracellular pathogenesis and genetic homogeneity (Pelezar *et al.,* 1994). The cell envelope of *M. tuberculosis* a Gram-positive bacterium with G+C rich genome contains an additional layer beyond the peptidoglycan that is exceptionally rich in unusual lipid, glycolipids and polysaccharides. (Cole *et al;* 1998).

M. tuberculosis grows aerobically in specially enriched media containing egg, asparagines, potatoes, serum and meat extracts. The optimal temperature of growth is $35^{\circ c}$-$37^{\circ c}$, P^{H} 6.4 –7.0. The colony appears three weeks after inoculation. The colonies of *M. tuberculosis* appear as buff coloured (never yellow) and rough having the appearance of breadcrumbs or cauliflower.

The identifying characteristics of the identification of *M. tuberculosis* are accumulation of niacin an appropriate medium. *M. tuberculosis* is also one of the strongest reducer of nitrate among the mycobacteria.

Animal Susceptibility

M. tuberculosis causes natural TB in man, primates and dogs. They are highly infectious in laboratory animals like guinea pigs and hamsters but they are virtually non pathogenic to rabbits, cats, cattle, goats, and fowls. Mice exhibit moderate degree of susceptibility to *M. tuberculosis*.

M. bovis is generally more virulent for animals; they produce natural disease to cattle, man and other primates, dogs, cats and parrots. Experimentally, the organism is highly pathogenic for rabbits, guinea

pigs, and calves. Dogs, cats, horses and rats are moderately susceptible and fowls are resistant to *M. bovis*.

M. africanum cause similar lesion to those of *M. bovis* is in rabbit. *M. microti* does not naturally infected to man. It produces local lesions on experimental inoculation in man, guinea pigs, rabbits and calves.

M. avium and *M. microti* cause natural infection in birds and voles respectively. *M. avium* occasionally infects man, cattle and swine and on experimental inoculation into rats and mice, it produces slow growing proliferate microscopic tubercles. Guinea pigs and rabbits are resistant to *M. avium* infection (Chakraborty, 1998).

Modes of Infection:-

Chakraborty (1998) described that infection in man is mainly transmitted by inhalation of bacilli in moist droplets of respiratory secretions from the open pulmonary tuberculosis occasionally infection occurs by ingestion of infected milk *M. bovis* in the past was responsible for majority of cases of intestinal, glandular and bone tuberculosis in west due to drinking of infected milk.

Respiratory route is the mode of transmission. When air borne particles less than 3 μm in size are inhaled they are not trapped in nose but may reach the alveoli. One air borne particle 1-3 μm contains 1-10 bacilli. Patients who excrete 10,000 or more tubercle bacilli per ml of sputum are the main source of infection of others (Groothius *et al.*, 1991)

Treatment and Prophylaxis

Davidson and Bruce L. (1998) stated the comparative study of directly observed therapy (DOT) and self-administered therapy (SAT) of 319 active tuberculosis patients in the urban United States from July 1994 to June 1995 who began out patient drug therapy. DOT(N=113) and

SAT (N.=206) were assessed for treatment completion at prospectively determined times, 8 and 12 month. At eight months, 52 percent of DOT and 35 percent SAT patients had completed treatment (relative superiority of DOT, 49 % P=0.003). At 12 months completed rates were 70 % for DOT patient and 53% for SAT patients (relative superiority of DOT 30%, P = 0.006).

Treatment programs classify TB cases as follows:

- New case- A patient who never had treatment for TB or who has taken anti-tuberculosis drugs of less than 4 weeks.
- Relapse- A patient who has been declared cured of any form of TB in the past by a physicians after one full course of chemotherapy and has become sputum smear positive.
- Treatment failure- a patient while on treatment who remained or became again smear positive after completing a fully supervised re-treatment regimen.
- Drug treatment is the only effective method to control active disease of TB.

Today various potent anti-tuberculosis drugs are available to cure each and every case of tuberculosis. The anti-tuberculosis drugs include bacterial agents such as rifampicin, isoniazid (INH), pyrazinamide, streptomycin and bacteriostatic agents like ethambutol, ethionamide, thiacetazone, paraaminosalicylic acid (PAS) and cycloserine (Chakraborty, 1998)

The treatment regimens contain combined drugs to prevent the emergence of resistant strains. There are any different possible antituberculosis treatment regimens. The World Health Organization (WHO) and the International Union Against Tuberculosis and Lung

Disease (IUATLD) recommended standardized tuberculosis treatment regimens. The National Tuberculosis Programme (NTP) of Nepal has adopted 3 categories for treatment of TB as recommended by WHO (WHO, 1993).

Category I: 2HRHE/6HE

Contain rifampicin, isoniazid, pyrazinamide, and ethambutol for two months and followed by isoniazid and ethambutol for six months. This category is given to all the new infectious cases and severely ill pulmonary sputum negative cases.

Category II: 2SHRZE/HIRZE/5HRE

Contains streptomycin for two months with rifampicin, isoniazid, pyrazinamide and ethambutol for three months, and then followed by rifampicin, isoniazid and ethambutol for six months. This regimen is given to failure and relapse cases, which are smear positive

Category III 2HRZ/6HE

Conatins rifampicin, isoniazid, pyrazinamide for two months and followed by isoniazid and ethamputol for six months. This regimen is given to smear negative pulmonary and extra pulmonary TB cases (K.C, 1996).

II

OBJECTIVES

General Objective

To determine the prevalence of pulmonary tuberculosis in ward No. 8 and 9 of Janakpur in Dhanusha district.

Specific Objectives

- To determine the general prevalence of tuberculosis among suspected cases in Janakpur Municipality of Ward N. 8 and 9.
- To determine the prevalence of tuberculosis in gender and age group.
- To compare occupation-wise prevalence of PTB.
- To determine the knowledge, attitude, awareness and practices of local people in relation to its transmission.

III

LITERATURE REVIEW

Historical Background

Tuberculosis is an ancient disease. Tuberculosis was present in Egypt from early dynastic times, perhaps as early as 3700 BC (Morse *et al.,* 1964). From the various skulls and other bones which have been reserved from different parts of the world, tuberculosis was found to be evident in Neolithic man. It is evident that it was indicated as early as 5,000 BC man suffered from it. After that it was described in other way as Chinese literature "Laoping" and Susruta and five worshippers of Persia (Rao, 1981)

Certainly, tuberculosis was well recognized by the time of Hippocrates (460-377BC) who gave an excellent clinical description of the disease (Hippocrates, 1939). The Dutch physician, Franciscus Sylvius (1614-1672) deduced from autopsies that tuberculosis was characterized by the formation of nodules, which he named "tubercles" (Lowell *et al.,* 1669). After that Gaspard Laurent Bayle (1774-1816) introduced the term tuberculosis and traced the relation between pulmonary tuberculosis and tuberculosis of other organs (Lowel *et al.*, 1969, Rao, 1981).

The modern knowledge of tuberculosis started from the work of Rene Theodore Laennec (1781-1826), a French clinician who himself was consumptive and succumbed to the disease .In 1819, he invented the stethoscope and accurate description of tuberculosis lesions (Rao, 1981; Dey and Dey, 1982).

The transmissible nature of tuberculosis was clearly established by Jean–Antonie Villemin (`1827-1892), a French military surgeon.

In 1868 Villemin published the results of a series of studies in which he convincingly demonstrated that tuberculosis could be produced in rabbits by inoculating them with tuberculosis materials from man or cattle. The disease could be passed from animal to animal and different in virulence was observed between human and bovine materials (Topley and Wilson, 1990) .

Robert Koch, March 24, 1882, announced the discovery of the tubercle bacillus and succeeded in culturing it on inspected serum (The Rising Nepal March 24, 1996). Robert Koch maintained that there was only one mammalian *Mycobacterium tuberculosis*. In December 1890, Koch produced tuberculin and described "Koch's Phenomena" (Rao 1981). The credit of distinguishing human and bovine type lies in the work of Theobald Smith (1898) and Coni (1884) found the chicken tubercle bacillus then avian bacillus was isolated by Maguci (1890) (Dey and Dey 1982) .

The acid fast nature of the organism was discovered by Ehrlich in 1882 and the present method of acid fast staining was developed by Ziehl (1882) and subsequently modified by Neelsen and hence the name Ziehl –Neelsen stain (Dey and Dey 1982).

X-rays, discovered in 1895 by Professor Roentgen, were put to clinical use by 1904. Clemens Von-Priquent (1874-1929) described in 1907 his cutaneous reaction and introduced the term allergy to explain the altered reaction. Calmette (1836-1933) and Guerin had been studying the effect of vaccinating animals since 1913. Their Bacilli Calmette Guerin (BCG) was described as an attenuated tubercle bacillus after thirteen years of sub-culturing about 230 times. It was only in the year that BCG vaccination was used in earnest (Rao, 1981).

A variety of remedies had been used to treat tuberculosis, prior to the development of effective chemotherapy in the 1950s, but none-showed significant efficacy. Koch's early effort to develop an effective immunotherapy i.e., by the injection of tuberculin was an embarrassing development of the tuberculin, it did lead to the development of the tuberculin skin test. The intradermal skin test method developed by Mantoux (Mantoux, 1910) is still preferred method for identifying persons infected with *M. tuberculosis*.

Koch's failure did not; however dampen enthusiasm for controlling the disease. A few years before Koch's discovery of the tubercle bacillus, bed rest had been advocated as treatment of tuberculosis and the sanatorium movement began in both Europe and the United States (Burke, 1955) .

Schenk had used chemotherapy in tuberculosis cod liver oil in 1822. Koch in 1890 found gold cyanide 1/20,00,000 lethal to tubercle bacillus in vitro and of no value in vivo. In 1927, Peroy Moxcy introduced as antimony preparation to be used through the intra muscular route. In the modern period the search for chemotherapeutic drugs was activated by Domagks introduction of pronotosil, promin, promizole, sulphetron etc, have been found useful against the tubercle bacilli. All these were found to be extremely toxic and given up (Rao, 1981).

Following Koch's Discovery of the tubercle bacillus an intense interest in chemotherapy of the disease developed. None of the drugs studies in animals and in man showed great promise however, until the discovery of streptomycin by Waskman and coworkers in 1944 (Schartz *et al.,* 1944). Trails by British Medical Research Council (MRC), the United States Public Health Service (USPHS) and the US veterans Administration-armed Forces Co-operative Trails Group confirmed its

efficacy but drug resistance emerged as a series braw back. Therefore, in an effort to prevent resistance in 1948 the MRC undertook a successful trail of combined streptomycin, paraamino Salicylicacid (PAS) therapy (Medical Research Council 1950) By 1952 Isoniazid had become an important part of the initial treatment regimen. It was not until the early 1960s that a MRC trail settled the optimal duration of treatment 2 years (Medical Research Council 1962). A number of trails conducted during the 1950s and 1960s also demonstrated that treatment could be effectively given on an outpatient basis and that hospitalization and bed rest were unnecessary.

TB Research in Global Perspectives

A vast volume of literature exists in tuberculosis as the infective tubercle bacilli continue to survive with new threats for more than a century since its first scientific elucidation. Major research efforts have been directed toward tuberculosis chemotherapy, tuberculosis immunology and vaccines, tuberculosis molecular biology etc in recent year. The portion of the work and reports to tuberculosis epidemiology have been mentioned here.

Kochi (1991) has estimated that about one-third of the worlds population are infected with *M. tuberculosis* and 7.6 million new cases of TB found in developing countries with tuberculosis caused 2.9 million people death in 1990.

Murray *et al.*, (1990) estimated hat the number of new cases of all forms of tuberculosis in developing countries in 1990 was 7.1 million while there well 2.5 million deaths from all forms of tuberculosis. In both studies the largest number of deaths.(1.7-1.8million) was estimated to occur in Asia. At present, the great majority of infected persons reside in developing countries, where TB disproportionately offlicts individuals

with productive and reproductive age group causing great loss of the country (Madni *et al*, 2000).

Khudushina, *et al.,* (1998) stated some specific features of temporary and persistent disability in patients with pulmonary tuberculosis. Disability was analyzed in 270 patients with pulmonary tuberculosis detected in 1995-1997. Today the level of disability and its associated expenses on payment of allowances due to the working incapacity of patients with pulmonary tuberculosis is more and more determined by different poor social factors, such as the specific features of the labour market, unemployment, lower living conditions of most patients with this disease.

Narang *et al.,* (1992) reported smear and culture positive cases of PTB in Wardha district of India. They conducted a door to door survey of 7,73,493 population to detect the symptomatic suggestive of PTB. A total of 12,834 symptomatic were detected. Sputum specimens obtained from 11,897(92.7 percent) symptomatic were subjected to smear microscopy by Ziehl –Neelsen (Z-N) method and culture on L-J medium. Positive by either smear and culture or both were 1,252 cases. Over one half for them (56.23 percent) were detected only by culture

Altet *et al.,* (1996) reported passive smoking and risk of PTB in children immediately following infection in Barcelona. A total of 93 contacts of PTB cases and 95 contacts of the result revealed that tuberculin positive children were selected and smoking habits were investigated by questionnaire. Passive smoking was risk factor for PTB (OR: 5.29, 95 percent Cl: 2.33 –12. 82: $p<0.0005$) The risk was increased when contacts were with passive smokers both at home and outside or the home within the family (OR: 6.35;95 percent cl:3.20 –12.72, $p<0.0001$). Contacts of 0-4 and 5-9 years showed a significantly higher than those

aged ≥ 10. A dose of relationship between the risk of developing active PTB immediately following infection and the number of cigarettes smoked daily by the households adults (P<o.oo1).

Reider (1996) studied the sputum smear conversion during directly observed treatment for TB from 16 April 1991 to 29 March 1994 at a refugee camp in Thailand. He examined the 259 new sputum smear positive patients in whom at least one of three sputum samples obtained was positive of AFB on a smear stained by the Z-N method. Of these 231 were completed 6 months course by the end to the observation and remaining 28 were still on treatment. The conversion rate of sputum smear reported 38. 5 percent were strongly position, 35.9 percent were moderately positive and 25.5 percent were weakly positive at diagnosis. The initial sputum smear positivity was strongly correlated to the extent form of pulmonary disease and the agreement between culturally and microscopically identifiable bacilli was good.

Murhekar *et al.,* (1998) studied on present day status of PTBV in Anadamas and Nicobar Islands by Sputum smear microscopy from the chest symptomatics aged 10 years and above. A total of 190 (11.18 percent) chest symptomatic were reported from the first cluster of 1,700 of whom sputum positive and suspected cases were 5 and 7 rspectively. Similarly 11 sputum positive and 22 suspected were reported after the screening of 7,172 population form the second cluster.

Sarin *et al.,* (2001) studied on diagoniss of TB and exmained two or three sputum specimen in the LRS Institute of TB and Allied Diseases, New Delhi from a single individual. In all 92.2% and 24.9% sputum positive patients were diagnosed out of 3,738 and 4,189 new chest symptomatic from the year 1998 and 1999 respectively. The overall sputum positivity content was around 25% and 90.5% sputum positive

patients were detected by the first spot, specimen. Of the three sputum specimen, the early morning had the best result as compared to other two spot specimens. They reported that, two sputum smears were an effective as three smears for screening chest symptomatic under the field conditions.

Rosha (2001) studied on prolonged fever occurring during treatment of PTB in a TB sanatorium of Jharkhand, India. The study was performed only among the fresh sputum positive admitted cases of a male patients from 1 December 1999 to 30 September 2000, who had mouth temperature>100^0F at least once in 24 hrs. A total of 40 patients AFB positive and HIV positive (mean age 43 years), were examined at least 3 times a week. The incidence rate of fever among the TB patients of extra pulmonary and direct complication of TB was 70% and 22.5% respectively. TB lung abscesses, drug reaction, drug resistant and other diseases were also reported for the cause of fever. In his findings, fever persisting among the patients undergoing treatment for PTB require careful, repeated, clinical examination and detailed investigations should not only be attributed to TB alone or emergence of drug resistance

David *et al.,* (2001) reported the value of examining 3 Acid Fast Bacillus form sputum smears for the removal of patient suspected of having TB from the air borne precaution category in UNC hospital of USA. Respiratory culture from the total of 42 patients grew *M tuberculosis,* of these 36 patients (81%), 1 patients (2%) and 40 patients (95%) had the positive culture on first, second and third submitted specimens respectively. Respiratory culture from 12% patients grew without a positive AFB smear result. In this study, the number of negative smears required before removal of patients from air borne precaution category which pose little increasing risk of spreading TB.

Dominguez-Castellano *et al.,* (2003) studied on factors associates with time to sputum smear conversion among the active pulmonary TB cases diagnosed by Z-N staining method. The study was performed between January 1998 to February 2000 in Virgin Macarena Hospital of Spain. A total of 192 patients were diagnosed for TB, and 109 had active PTB. Of these 109 patients, 82.6% were presented PTB alone while 17 percent had disseminated forms of TB (pulmonary and extra- pulmonary) all were HIV infected drug addiction, sputum quantification, site of TB, HIV infection, drug resistance and initial treatment phase were statistically significant ($P \leq 0.005$) to a longer time to sputum conversion. Sex workers, alcoholic previous TB conditions were potentially affecting the period of sputum conservation but not statistically significant ($P \geq 0.05$).

El-sony *et al.,* (2003) studied the symptoms among the patients attending health services for diagnosis of PTB. in between 15 and 49 years age groups with respiratory symptoms seen consecutively in the chest out patients department of Hospitals and chest clinic at Health center from March 1998 to 1999. A total of 16,735 patients (52.6%) males and (47.4 % females) 5338 patients (54.6%) males and 45.3% females) were identified with respiratory tract symptoms. Of these 963 were diagnosed as TB cases: 763 were pulmonary cases, 504 sputum smear positive and 259 sputum smear negative and 166 were extra PTB cases. The remaining 4,409 suspects were non tuberculosis cases. They reported the cough most frequently among all the chest patients with conditions other than TB. The majority of PTB patients were complained of shortness of breath and chest pain and smaller proportion had haemoptysis. Sputum smear were stained by Z-N techniques.

In 2006, WHO launched the new stop TB strategy

- Pursuing high-quality DOTS expansion and enhancement
- Addressing TB/HIV, MDR-TB (Multi-drug resistant TB)
- Contributing the health system strengthening
- Engaging all care providers.
- Empowering people with TB and communities

TB Research in Perspectives of Nepal

Subedi (1985) studied on tobacco smoking and its effects on lungs among the patients attending in the chest department of Tri-chandra Military Hospital, Kathmandu. A total of 1,336 patients with some respiratory symptoms, 885 (66.24%) were smokers and 451% (33.75 %) were non-smokers. Of 885 smokers, 431 (48.7 %) had the PTB and 168 (37.25%) bad PTB out of 451 non smokers. He concluded that the prevalence of PTB was higher among the smokers in comparison to non-smokers.

Karki (1993) conducted a study for prevalence of alcohol, "Khaini" and smoking habits in Nepalese population. Persons smoking currently were considered as smokers. Those person who had never smoked in their life were non-smokers. Similar criteria were applied or "khani" and alcohol consumption. Among 203 smokers, 163 were male and 40 were female, among 262 alcohol consumers. Two hundred and twenty-five were male and 37 were female and among the 126 "khaini" chewing persons 116 were male and 10 were female.

Smith *et. al.,* (1993) found that higher prevalence of infection of TB in males than females from the tuberculin survey carried out in Gorkha district. Smith (1996) also reported the incidence was higher in males than females.

Shrestha (1989) reported 47 % male and 3.05 % of female TB cases in the histopathological specimens at Tribhuvan University, Teaching Hospital (TUTH).

Smoking and smokers in Sunsari district were surveyed from the B.P Koirala Institute of Health Sciences, Dharan by Jha *et al.*, (1999). They performed the study in 1994 with the structured questionnaire among the 8,643 randomly selected participants in about smoking habits quantity and time duration of smoking. Of the 8,643 participants, 17. 5 % were smokers and smoking was found most common among the 50-64 year age groups. Among them 68.4% belonged to the low socio-economic group, 11% of the smokers were smoking more than 20 sticks per day and 42 % were smoking from more than 20 years.

Sharma (2000) reported the importance of three samples of sputum smear microcopy for diagnosis of PTB at NTC Thimi, Bhaktpur. The Study was performed from July 1999 to June 2000. He observed the 9454 males and 4484 females (n=13938). Of them, 14.78 % were positive in average. The method follows that the first samples the spots specimen, second sample at early morning and third samples as spot specimen, the result revealed 74.3 %, 21 % and 3 % positive cases respectively. He recommended that 3 sputum samples should be examined for the diagnosis of PTB.

PTB suspect is defined as the persistence of productive cough for more than 3 weeks. Thus TB suspects should be immediately subjected to diagnosis of TB. The result may be either TB positive or –ve i.e., probability is 50% both (NTP manual) TB infection is defined as the presence of tubercle bacilli, but it dormant/or subclincial stage, and hence the most people with TB infections can not spread the disease to others. The great majority (possibly as many as 90%) of infected persons do not

develop active TB during their life time. But if their body defence becomes weak due to many reasons such as HIV infection, they can develop TB disease later in life. They can be relatively easily identified because they have a positive response to tuberculin skin test (STC, 2004).

Evidence also suggests that HIV can promote the emergence of multi drug resistance strains of *M. tuberculosis* several factors such as (i) increased susceptibility to TB (ii) increased opportunity to acquire TB due to over crowding exposure to patients with MDR TB due to increased hospital visits and (iii) Malabsorption of anti tuberculosis drugs resulting in sub-optimal therapeutic blood levels in spite of strict adherence to treatment regimen (Sharma *et al.*, 2005)

Nepal, NTP started DOTS plus project for treatment of MDR cases in Sept. 2005.

By July 2006 NTP was providing DOTS based services through 560 treatment centers and 2,795 sub treatment center in the country During this reporting period NTP registered 35,493 all types of TB cases, among them 14,027 were new smear positive which corresponds to case finding rate of 65% while treatment success rate is 88% (HMG/NTP, 2006).

IV

MATERIALS AND METHODS

Study Area

Nepal is administratively divided into five development regions, 14 zones and 75 districts. There are 20 districts in Terai region, 38 districts in Hill region and remaining 17 districts are in the Mountainous regions.

Dhanusha is a district which lies in Terai and is 375 Km far from Kathmandu. This terai district is situated in Central Development Region of Nepal having 1,180 Sq. Km of area and 67,136 populations including males 3,49,422 and females 3,21,942 respectively. In Dhanusha district, Hindu population are 6,04,763, Buddha, Islam, Kirat, Jain, Christian, Sikh, Bahae and others are 9696, 56124, 25, 23, 230, 17, 16 and 470 respectively

Janakpur Municipality (Ward No.8 and 9) of Dhanusha district was the site selected for study. Janakpur Municipality has been divided into 19 wards with 13,437 households and total population of 74,192 with 40108 males and 34,084 females. Ward No. 8 and 9 of Janakpur Municipality have 2,326 households with 11,812 population, among which 6,375 males and 5,437 females. Janakpur Municipality consists of different castes: Brahman, Bhumihar, Rajput, Islam, Kaistha, Bania and Sudi. This study area is surrounded by agricultural fields.

Materials Equipment

Microscope, Glass Slides, Disposable Container, Bamboo Stick, Spirit Lamp, Clean Soft Cloth, Diamond Pencil, Staining Pan or rack, Forcep, Slide stand, Slide box, Laboratory register book, Result Slip

Chemicals

- Ziehl's Neelsen Solution, 20 percent H_2 $So_{4,}$ 0.1 percent Methylene Blue Solution, Immersion Oil, Xylol, Distilled Water

METHODS

In order to determine the prevalence of human tuberculosis in Janakpur ward No 8 & 9 of Dhanusha district, the study was designed in different phases.

I. Questionnaire Survey

II. Sputum Examination

A set of questionnaire contained name, age, sex, occupation, education, marital status, relationship of the respondents with the head of household, surrounding environment and their effects against the disease. Knowledge about the disease, respondent's current health status and clinical symptoms of tuberculosis in relatives were also incldued. The questions were filled by interviewing the respondents, during the collection of sputum.

Study Duration

The survey was conducted with the help of doctor and local people within the study area during May and June 2006.

Sample Size

A total of 250 sputum samples from the people of ward 8 and 9 of Janakpur Municipality were included in the survey. The total population of these two wards are 11,812.

During study period, 250 samples of sputum of suspected persons were collected and examined. Among them160 were males and 90 were

females. The samples were collected from those persons who had following symptoms either each or all.

a. Cough of 4 week or more
b. Chest pain
c. Fever
d. Haemoptysis

Sampling Techniques

The early morning sputum specimen represents to the pulmonary secretions overnight. Suspected persons were requested with the following instruction before collecting the sample. Gargle well to remove food remnants remaining in the mouth just before collection. Specimen collected should not be exposed to direct sunlight as tubercle bacilli are highly sensitive. Disposable containers were used for sputum-collection and they were cleaned, sterilized, unbreakable, unleakable and wide mouthed and collected containers were labelled with the name of the persons or identification number with the marker then sealed thoroughly with cello tape. The collected date, specimen number and other information were recorded in the field diary. The packed samples were carried to the laboratory of Janakpur Hospital for sputum smear microscopy. The examination of sputum samples were carried out following the procedure given below:

Smear Preparation

- Sputum specimen numbers were written on the edge of glass slide.
- A thin and small tooth pick was broken into 2 pieces to make the edge rough.
- A small portion of yellowish particle of sputum was picked

- It was spread to a size of approximately 2x3 cm with the help of bamboo stick over the centre of slide.
- Dried it at room temp completely.
- The slide was passed through the flame of ignited cotton swab or spirit lamp 2-3 times.

Smear Staining

- The fixed slides were placed on the staining bridge.
- The fixed smear of sputum was stained with Ziehl's Neelsen solution and the whole surface of the slide was covered.
- The slide was heated till the steam came off from stain. It was left for 5 minutes.
- The excess staining solution was taken off.
- The stained slide was washed off with water.
- The excess water was taken off.

Decolourization

- The slide was covered with 20 percent H_2SO_4 solution till no more stains come off.
- The decolorizer was washed off with water.
- The excess water was taken off.
- The slide was covered with 0.1 percent methylene blue solution for 10-20 seconds.
- The excess staining solution was taken off.
- The slide was washed well with water. Allowed to dry the stained smear at room temperature (blotting paper was not used).

Microscopic Examination

The stained slides were examined under microscope by magnifying hundred times. Systematic search of the stained smear is necessary, 300 visual fields (v. f.) were examined before reporting as negative.

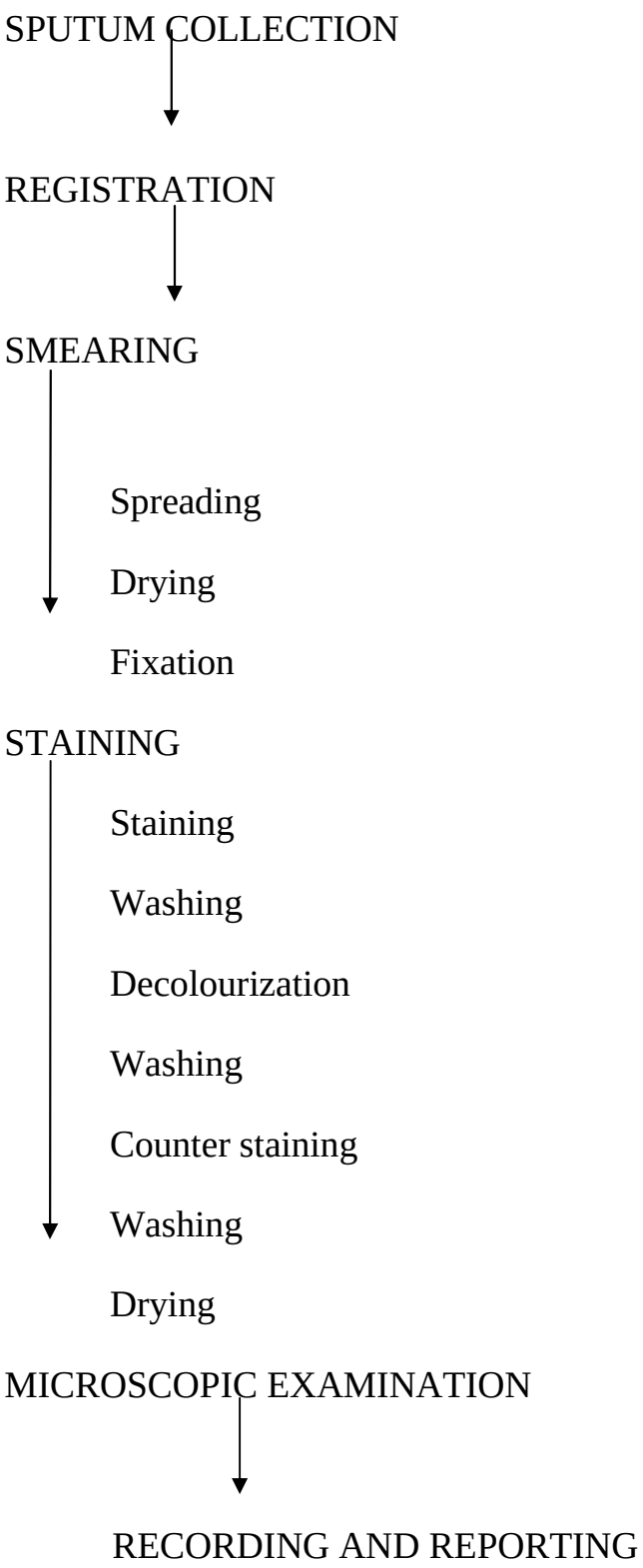
Recording and Reporting

The expressions of the amount of detected acid-fast bacilli were according to 'American Lung Association' in USA. Direct Sputum Smear microscopy reporting/grading scale ALA (Z-N method)

Result

Negative	O AFB/300vf
$\pm$	1-2 AFB/300vf
1^+	1-9 AFB/100vf
2^+	1-9 AFB/10vf
3^+	1-9 AFB/vf
4^+	>10 AFB/vf

FLOW CHART OF DIRECT SPUTUM SMEAR EXAMINATION



V
RESULTS

The survey was conducted in two wards 8 and 9 of Janakpur municipality of Dhanusha district. The total population of these two wards are 11,812 including 6,375 (53.97%) males and 5,437 (46.02%) females.

The study was divided into 2 parts i.e. microscopic examination of sputum and survey by questionnaire. The economical and demographical characteristics of study population were also conducted to know the back ground of respondents.

1. General Prevalence of Pulmonary Tuberculosis

Altogether 250 slides were collected from population of numbers 8 and 9 ward of Janakpur Municipality. No people was taking medicine of TB before samples were obtained. Among total samples, 9 (3.6%) cases were found positive for Pulmonary Tuberculosis. These were new cases of TB detected.

Table 1: General Prevalence of Pulmonary Tuberculosis

Total Slides Examined	Positive Slides	
250	No	%
	9	3.6

1.1 Ward-wise Positivity of PTB

Among 9 positive cases there were 6(66.66%) in ward 8 and 3 (33.33%) in ward 9. The positive cases were verified from Janakpur Zonal Hospital in which 2(22.22%), 5 (55.55%), 2 (22.22%) were first (1+) second (2+) and third (3+) grade scale respectively which is shown in Table 2.

Table 2 : Ward-wise Positivity and Grading of Slides

Ward No.	Total Slides collected	Total Positive		Grading		
		No.	%	1+	2+	3+
8	125	6	2.4	1	3	2
9	125	3	1.2	1	2	0
Total	250	9	3.6			

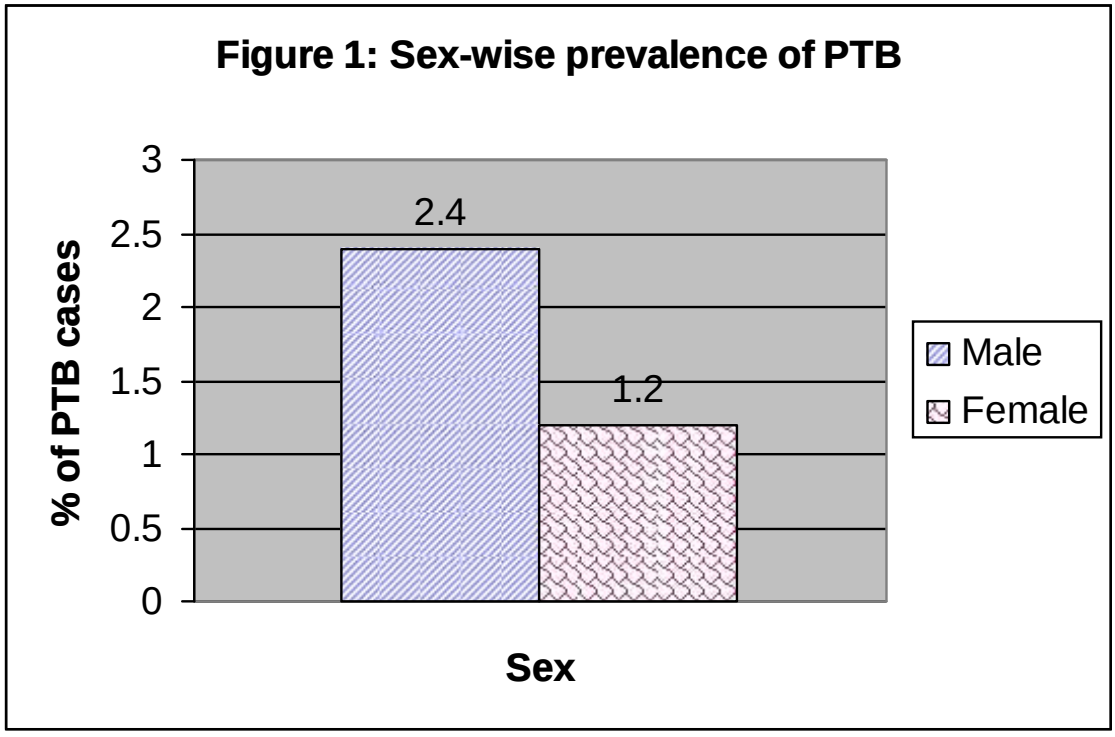
Note 1^+, 2^+, 3^+ grade scale = grading of positivity according to number of bacilli as reference to WHO guide line

1.2 Sex-wise Prevalence of Pulmonary Tuberculosis

Out of 250 total examined samples 160 were males and 90 were females. Among males 6 samples and among females 3 samples were found +ve for PTB Respectively. Statistically, the difference of prevalence of PTB between the males and females was found to be insignificant ($\chi 2 = 0.1851$, $P>0.05$, 3d.f.).

Table 2: Sex wise prevalence of PTB

S. No.	Sex	Total sample examined	PTB +ve	Percent%
1	Male	160	6	2.4
2	Female	90	3	1.2
Total		250	9	3.6

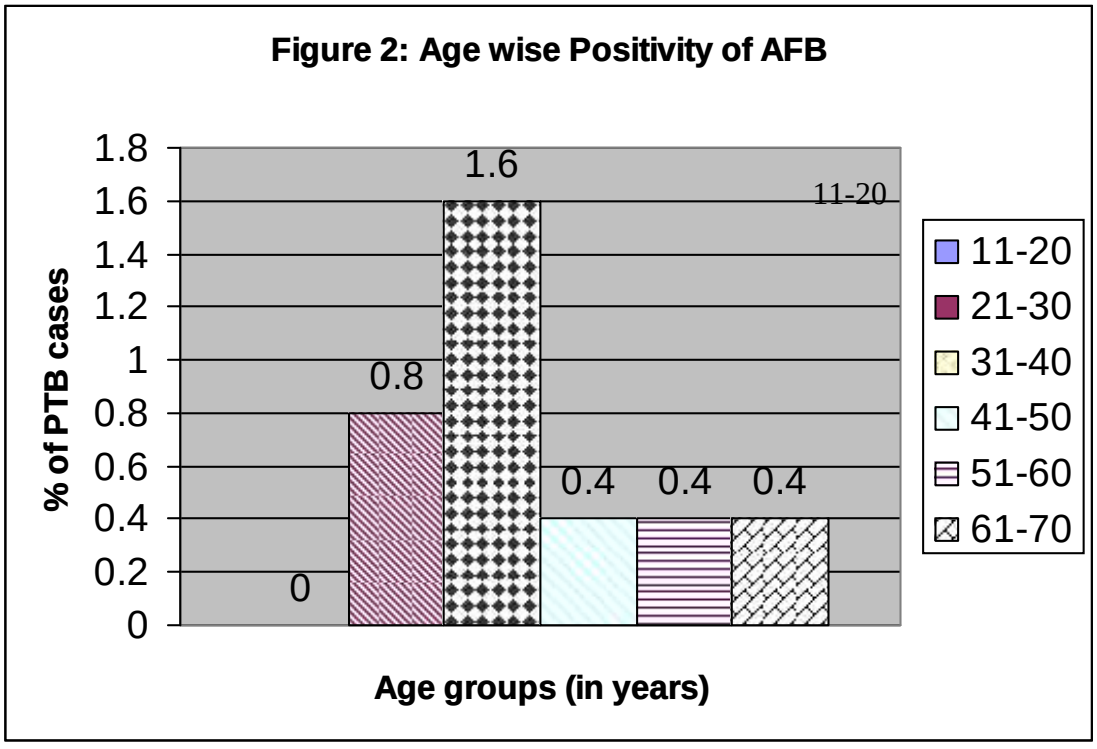


1.3 Age-wise Positivity of AFB

Among 9 sputum positive cases, maximum prevalence was observed in 31-40 (1.6%) yrs age group followed by 21-30 yrs age group and no any cases was found in the age group 11-20 years. Statistically the difference between the age groups was found to be insignificant (χ^2=3.3350, P>0.05, 5df).

Table 4: Age wise positivity of AFB

S.No.	Age group	Total sample examined	PTB +ve	Percent
1	11-20	40	0	0
2	21-30	50	2	0.8
3	31-40	70	4	1.6
4	41-50	35	1	0.4
5	51-60	35	1	0.4
6	61-70	20	1	0.4
	Total	250	9	3.6

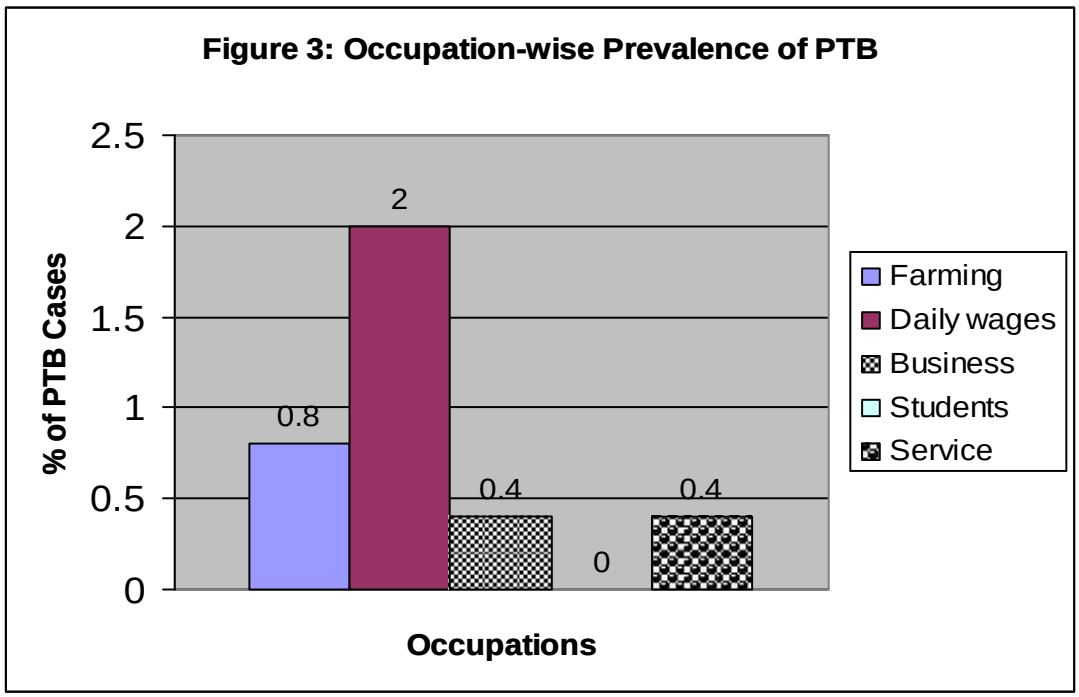


1.4 Occupation-wise

Out of 250 samples, the highest +ve cases 5 (2%) were found in persons earning in daily wages followed by farming peoples in which 2 (0.8%) +ve cases were found while students group was not found to be infected by PTB. Statistically the difference in prevalence of PTB among occupation-wise group was found not to be significant ($\chi 2 = 5.4462$, P> 0.005, d.f.).

Table 5: Occupation-wise Prevalence of PTB

S.N.	Occupation	Total samples examined	Male samples	+ve cases	Female samples	+ve cases	Total +ve cases	+ve %
1	Farming	45	25	1	20	1	2	0.8
2	Daily wages	65	50	3	15	2	5	2
3	Business	60	40	1	20	0	1	0.4
4	Students	25	15	0	10	0	0	0
5	Service	55	30	1	25	0	1	0.4
Total		250	160	6	90	3	9	3.6



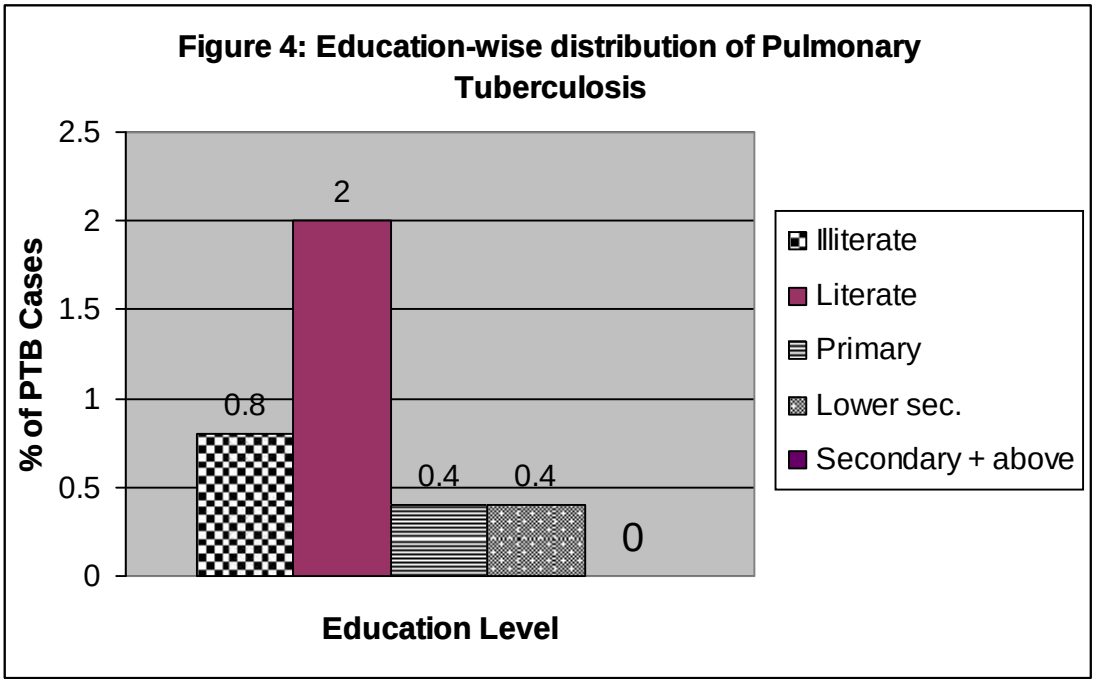
1.5 Education-wise prevalence of Pulmonary Tuberculosis

Out of 250 samples, the highest number of +ve cases were found in literate people 5 (2%) followed by illiterate 2(0.8%). None of the samples from people with higher secondary education level was found to be positive. Statistically the difference of PTB prevalence among people of different education level was found to be significant ($\chi 2 = 33.98$, $P<0.05$, 9d.f.).

Table 6: Education-wise distribution of Pulmonary Tuberculosis

S.N.	Educational level	Total Samples	Male Samples	+ve case	Female Samples	+ve case	Total +ve	%
1	Illiterate	20	5	1	15	1	2	0.8
2	Literate	60	35	4	25	1	5	2
3	Primary	90	55	0	35	1	1	0.4
4	Lower sec.	60	50	1	10	0	1	0.4
5	Higher Secondary	20	15	0	5	0	0	0
Total		250	160	6	90	3	9	3.6

(* Literate = able to read and write, Illiterate = unable to read and write)



2. Result Based on Questionnaire Survey

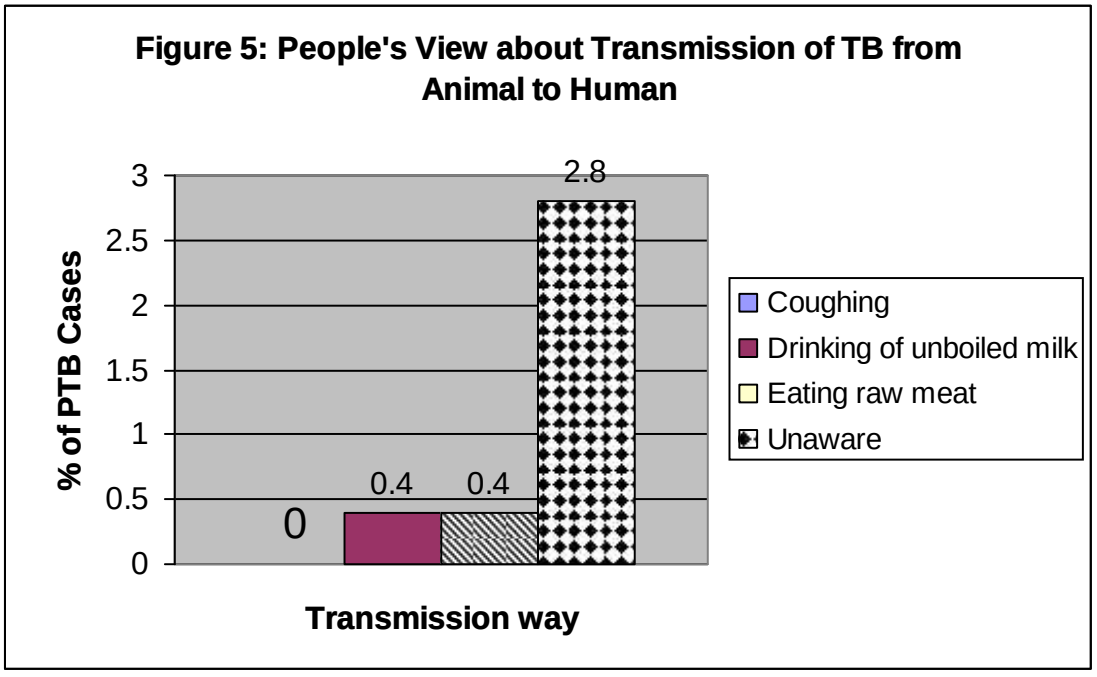
2.1 Knowledge of TB

2.1.1 Knowledge of TB as a Zoonotic Disease

A survey through a set of questionnaire was performed to the same lot of population whose sputum was examined. Among 250 samples, it was found that 170 (68%) people were unaware of zoonotic nature of tuberculosis which appeared very high and only 80 (32%) had average knowledge. Among the average knowledge of zoonotic disease their view regarding mode of transmission of TB is shown in Table 7.

Table 7: People's View about Transmission of TB from Animal to Human

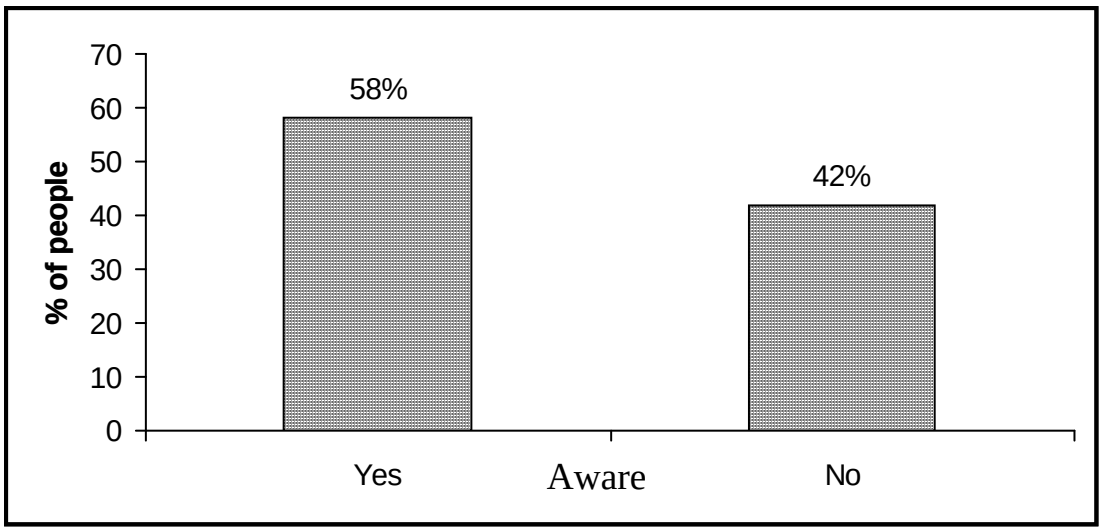
S.N.	Category	No. of +ve Response	No. of PTB Cases	+ve %
1	Coughing	10	0	0
2	Drinking of unboiled milk	50	1	0.4
3	Eating raw meat	20	1	0.4
4	Unaware	170	7	2.8
	Total	250	9	3.6



2.1.2 Awareness of TB and TB Transmission

Among total interviewed respondents 145 (58%) were aware about tuberculosis while remaining 105 (42%) were not found to be so aware as had been expected.

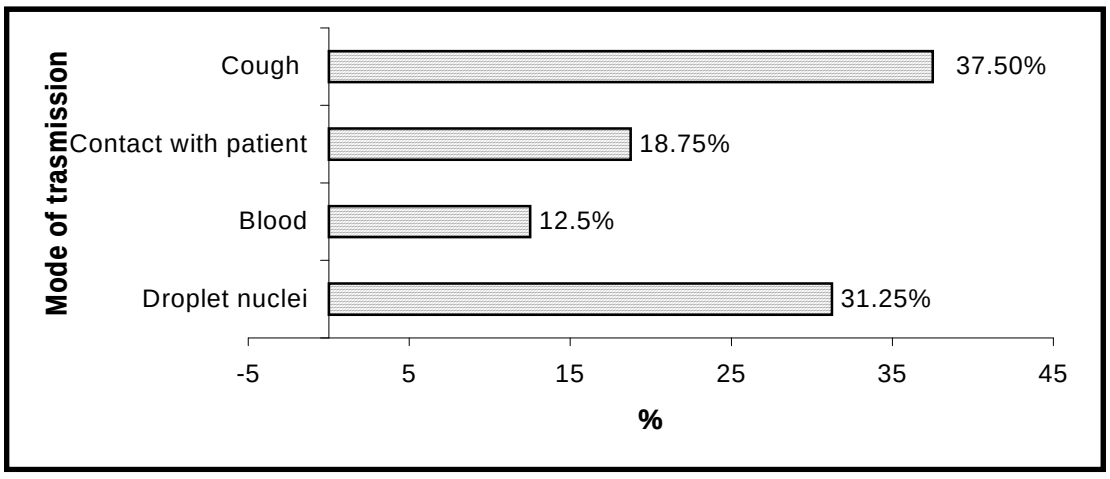
Figure No. 6: People's View about Awareness of TB



2.1.3 Awareness of TB transmission

Regarding transmission of PTB, 190 (76%) knew that TB is an infectious disease. Among them 160 (84.21%) knew that TB transmits from human to human. Among 160, 60 (37.51%) knew that it transmits through cough, 50 (31.25%) knew through droplets 20 (12.5%) through blood and 30 (18.75%) knew through direct contact with patient.

Figure No. 7: People view about Awareness of TB transmission



2.1.4 Knowledge of symptoms of TB

The study showed that maximum people 210 (84%) had knowledge about tuberculosis symptoms, only a few people 40 (16%) had very poor knowledge which is relatively very low.

People's view regarding symptoms of TB was breathlessness, coughing, fever, haemoptysis and coughing and fever.

Table 8: People's view regarding symptoms of TB

S.N.	Symptoms	No. of Respondents	+ve Cases	+ve %
1	Breathlessness	40	1	0.4
2	Coughing	80	2	0.8
3	Fever	35	0	0
4	Haemoptysis	30	3	1.2
5	Coughing and fever	25	2	0.8
6	Unknown	40	1	0.4
	Total	250	9	3.6

2.2 Smoking Behaviour

The survey of local people showed that 140 (56%) were current smokers, 40 (16%) were former smokers and 70 (28%) were non-smokers.

Out of 140 current smokers, 60 (42.85%) smoked less than 10 cigarettes/day, 50 (35.7%) smoked between 10 and 20 cigarettes/day and 30 (21.42%) smoked more than 20 cigarettes, bidi/day.

Table 9: Rate of Smoking Per Day

Smoking behaviour	Total	%	+ve cases	Total % of +ve case
Former smoker	40	16	0	0
Current smokers :				
10 cig/day	40	16	1	2.5
10-20 cig/ day	80	32	2	2.5
> 20 cig/day	10	4	2	20
One packet of bidi/day	10	4	3	30
Non smokers	70	28	1	1.43
Total	250	100	9	3.6

2.3 Treatment Methods

The survey showed that maximum no. of respondents 220 (88%) go for then medical treatment for any disease to zonal hospital, while some go to private clinics and a few believed in herbal treatment.

The 9 PTB positive cases observed during the present study were asked to visit DOTS clinic. Out of 9 +ve cases, 6 of them went to DOTS but the rest 3 visited private clinics as they hesitated to go to DOTS.

VI

DISCUSSION AND CONCLUSION

Tuberculosis is a disease of clinical and veterinary importance and caused by the genus *Mycobacterium* of the group Mycobacteria. There are various species of Mycobacteria of whom the most important genus is. *M. tuberculosis* which causes natural TB in man, primates and dogs.

For the first time Robert Koch identified *M. tuberculosis* as causative agent of TB in 1882. During that period TB caused 1/7 of death in Europe. At present TB is global health problem. More than 90% of global TB cases and deaths occur in the developing world when 78.5% of cases are in the most economically productive age group (15-54 years old) (WHO, 2006). About 20% of world's population is suffering from TB and about 8 million people are victimized each year. Approximate annual death is 3 million (WHO, 1988).

TB remains a major global public health problem particularly in developing and underdeveloped counties. Globally, it is responsible for more than three million deaths each year (WHO, 2004). The risk of TB is greater than in areas of residence characterized by crowding, poverty lower education, etc (Lifson *et al.*, 1999).

In case of Nepal also, it remained one of the major health problems. According to National TB center's Newsletter (2001), there are over 80,000 people having TB. About 50,000 people develop TB and 10,000 people die from this every year (nearly 200 deaths every week and over 25 deaths every day). Nearly 22,000 have infection sputum positive TB in the same period.

In Nepal, for the diagnosis of tuberculosis mainly used method are chest x-ray, direct sputum smear examination by microscopy and

tuberculin test. Only a few hospitals have facilitates for *Mycobacterium* culture and anti-tuberculosis drug sensitivity test.

The district Hospital of study area (Dhanusha) mainly use only sputum smear examination by microscopy for AFB, even having chest x-ray. It may be due to rapid and cheap for the initial diagnosis of TB and monitoring of treatment and also because of low economic status of the people of Dhanusha district. Government of Nepal is also actively working for the free diagnosis of TB.

The present study aims to investigate the prevalence of pulmonary tuberculosis (PTB) among symptomatic people, in Janakpur Municipality in the wards 8 and 9. To observe the prevalence of PTB during study period, a total of 250 samples were collected who had deep cough, chest pain, haemoptysis and mild fever at night.

Age wise observation of the smear shows that the high occurrence of AFB positive was observed among adult age group (31-40 years). Among 9 positive cases, 4 (44.44%) belonged to 31-40 years age group, 2 (22.22%) were of (21-30 years) age group and remaining 3 were of above 40-70 years age group.

This shows that the maximum number of TB patients were in the productive age group. Similarly, Kochi (1994) described in developing counties, about 70% of TB patients were under 50 years age group. Pandit (1997) stated that 70% of TB deaths are in the economically productive age group (15-40 years). In this age groups many persons smoke and drink excessively and migrate to different places for jobs, this increases the susceptibility for TB.

The incidence of TB was found to be higher in male patients. Similarly, in 1994, Smith *et al.,* found higher prevalence of infection in

males than females from tuberculin survey carried out in Gorkha district. Smith (1996) reported that in most countries of the world, the reported incidence of TB is higher in men than women. Shrestha (1989) reported 47% of male and 3.05% of female TB cases in histopathological specimens at T.U. Teaching Hospital.

Three possible factors explain the gender difference observed. The most commonly accepted being that women are less exposed to infection than men. The second might be the biological difference, such as an increased susceptibility in males. Finally infected women may progress more frequently to disease and die more rapidly, leaving a cohort with a low prevalence of infection.

Karki conducted a study in 1995 for prevalence of alcohol, 'Khaini' and smoking habit in Nepalese population. Persons smoking currently were considered as smoker. Those person who have never smoked in their life were non-smoker. Similar criteria were applied for 'Khaini' and alcohol consumption. Among 203 smokers, 163 were males and 40 were females; among 262 alcohol consumption, 225 were males and 37 were females, among 126 'khaini' chewing persons, 116 were males and 10 were female. This data show that alcohol consumption, 'khaini' and smoking habits were higher in males than in females. Various studies show that there is positive correlation between alcohol consumption 'khaini' and smoking habits, and respiratory tract infection. So those males were more susceptible than women.

In our study, showed that 56% peoples were current smokers, 16% former smoker and 28% never smokers. Among the current smokers, 35.29% smoked less than 10 cigarettes/day; 17.64% smoked more than 20 cigarettes, bidi/day and 47% smoked between 10 and 20 cigarettes/day

which is relatively high. This shows that susceptibility of TB is very high to those who redulge in smoking.

Similar type of study was conducted in collaboration with WHO in the district of Kolin to determine the epidemiological situation of tuberculosis during the period of 1965-1972. Among 504 persons, the diagnosis was confirmed bacteriologically in 379 cases (75%). Out of these 379 cases of bacillary tuberculosis, 220 (58%) were in males and 159 (42%) in females. The great majority of new cases also were found in younger age group and elderly person. In our study also positive cases were found in males than females and majority of cases were found in younger age group.

Nepal National Planning Commission (NPC) and UNICEF (1991) conducted a study in 'Sunsari' and 'Morang' in 125 health subjects. Nakanishi and Shrestha (1990) have reported that immunoglobulin M (IgM) and immunoglobulinG (IgM) concentration were found significantly higher in female than male. The higher concentration of these antibodies in females have protective value hence, low occurrence of tuberculosis among female than male is observed.

In another study done by Onozoki National TB programmed, 754 patients from the two districts of 'Dhading' and 'Chitwan' were newly registered, among them 454 (60%) were new smear positive pulmonary tuberculosis and 354 (70%) were males and 134 (30%) were females, the mean age was 32.5 years. This occurrence among male than female and age group in similar to the present findings.

A household survey was carried out to determine people's knowledge, attitude and practices regarding tuberculosis by means of structured questionnaire. A total of 250 respondents were selected from

household survey. Among them higher percentage (95%) of respondents were knowing about TB disease.

Similarly, in the present study most of the respondents have no formal education i.e. primary level which is very high when poverty and lower education play big role for the increased risk of TB.

VIII

RECOMMENDATIONS

The following recommendations are forwarded to minimize the tuberculosis after conducting the survey in Janakpur Municipality ward no. 8 and 9 of Dhanusha District.

- Many people still are unknown about the pulmonary tuberculosis. Thus, it is necessary to aware them. For this awareness programme given through mass media, radio and television must be expanded for protecting Mycobacterial disease and to improve sanitation, health and hygiene.
- People should be made conscious to use mask, avoid to drink unboiled milk, to eat raw meat for protection against microbial transmission.
- Treatment of TB patients with DOTS therapy should be made more popular all over the country. This will make people not to hesitate in visiting DOTS clinic.
- TB infected persons should be well treated and friendly behaved.

REFERENCES

Acha, P.N. & Szyfres, B., (1980). Zoonoses and Communicable Disease Common to man and animals. *PAN American Health Organization, USA.*

Amatya, N.G. (1992). National Tuberculosis Control Programme in Nepal and Its Progress in This Year. *Saninar and Workshop on National Tuberculosis Control Programme,* NTC, Thimi, Bhaktpaur, Nepal.

Annual Report of NTC Programme, 2062-63.

Bam, D.S. (2002) DOTS, TB Control Break Through in Nepal Souvenir. *The Nepal Association of TB and Chest Physicians.* 30-31.

Bloom, B.R. and Fine (1994). Tuberculosis. Pathogenesis Protection and Control. First edition. Asm Press, Washington DC.

Chakraborty, P. (1998). Mycobacterium Tuberculosis. A Textbook of Microbiology. Central Book Agency (P.) Ltd.

Cheesbrough, M. (1993). Mycobacteria. Medical Laboratory Manual for Tropical Countries. Tropical Health Technological London, 3: 289-299.

Day, N.C. and Day, T.K. (1982). Medical Bacteriology, Eleventh Edition. Allied Agency Calcutta.

Department of Health Services (DOHS). Annual Report, DOHS, 2004/05. HMG Nepal.

El. Sony, A.L. Mustafa, S.A., Khamis, A.H., Sobhi, S. Enasson, D.A., Baraka, O.Z. and Bjune. G. (2003). Symptoms in Patients attending Service for Diagnosis of Pulmonary Tuberculosis in Sudan. *Int. J. Tubere. Lung Dis.* Vol. 7, No. 6, Pp. 550-555.

Ghai, O.P., Gupta, P. (1999). Tuberculosis Essential Preventive Medicine. A Clinical and Applied Orientation.

Groothius, D.E. and Yates M.D. (1991). Diagnostic and Public Health Mycobacteriology. Bureau of Hygiene and Tropical Disease England.

His Majesty's of Government of Nepal and WHO (1994) National Tuberculosis Programme Review.

History of Tuberculosis in the SAARC Region, 2005.

HMG/NTP (2003). Tuberculosis Control in Nepal 1998/2006.

Joshi Y.P., (April 2006), Annual Reports of NTC, Thimi Bhaktapur, Nepal

Joshi, D.D. (1986). Epidemiological Situation of Tuberculosis in Nepal J. Inst. Med. 115-128.

Joshi, D.D., Heidman, P., and Sollod A. (1999). National Zoonoses and Food Hygiene Research Center (NZFHRC), Tahachal, Ktm., Nepal. Tufts University, School of Veterinary Medicine, USA, RNAC-Proceeding (Volume 1): Third National Conference on Science and Technology.

Khudushina, T.A., Maslakova, M.G., Yasyuchenya T.V. and Terekhova N.D. (1998). Problem of Tuber Kuleza 0(6): 12-14.

Kochi, A. (1991). The Global Tuberculosis Situation and the New Control Strategy of the World Health Organization. Tubercle. 71: 1-6.

Kumar, P., Bam D.S. (2000) 318-PD; TB Control by Regional Cooperation in South Asia SAARC Tuberculosis Centre, Kathmandu, Nepal.

National Tuberculosis Programme (NTP). Annual Report 2001-2006, National Tuberculosis Centre, Bhaktapur.

Parija, S.C. Kumar, N and Singh, NP (1998). Sputum Microscopy. A Practical Manual Venus Printer and Publisher, New Delhi, pp. 1-3.

Pelezar, M.J., Chan, E.C.S. and Kneg N.R. (1999). Microbiology, Fifth Edition, Tata McGraw Hill Publishing Company Limited.

Pinner, M. (1945). Pulmonary Tuberculosis in Adult. Its Fundamental Aspects, Charles, Thomas, Spring, Field, IL P. 190.

Rao, R.N., Vishwanathan, R., Desmukh M.D., Pamra, P. Sen, P.K., Berdia N.L., Dingley H.B. (1981). A Textbook of Tuberculosis.

Sharma (Pandit), N.R. (2000). Importance of Three Samples of Sputum Smear Microscopy for the Diagnosis of Pulmonary Tuberculosis. Souvenir, the Nepal Association of TB and Chest Physicians. pp. 65.

Sharma *et al*., (2005), Annual Reports of NTC, Thimi Bhaktapur, Nepal

Smith, I. (1995). Tuberculin Survey in Gorkha District: Proceeding of the Seminar and Workshop of National Tuberculosis Control Programme (NTCP), Kathmandu Japan International Cooperation Agency (JICA). pp. 93-96.

STC, (2004), History of Tuberculosis in SAARC Region Published on World TB day.

STC/NTC (2002). General Information of TB and Its Control in SAARC. Published on World TB Day.

TB and HIV/AIDS Update 2006 in the SAARC Region.

Wayne, L.G. and Kabica G.B., (1896). Bergy's Manual of Systematic Bacteriology. Macobacteriaceae Vol. II, Williams and Wilkins, Baltimore, London, Los Angeles, Sydney, Tokyo.

WHO Report 2007, Global TB Control, Surveillance Planning, Financing.