RETROSPECTIVE ASSESSMENT OF THE TREND OF TUBERCULOSIS (TB) AT LUMBINI PROVINCIAL HOSPITAL DURING 2015 TO 2020 ALONG WITH KNOWLEDGE, ATTITUDE AND PRACTICE AMONG TB PATIENTS

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DECLARATION

I hereby declare that the work presented in this thesis has been done by myself, and has not been submitted elsewhere for the award of any degree. All sources of information have been specifically acknowledged by reference to the author(s) or institution(s).

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RECOMMENDATION

This is to recommend that the thesis entitled **"RETROSPECTIVE ASSESSMENT OF THE TREND OF TUBERCULOSIS AT LUMBINI PROVINCIAL HOSPITAL DURING 2015 TO 2020 ALONG WITH KNOWLEDGE, ATTITUDE AND PRACTICE AMONG TB PATIENTS"** has been carried out by Shreesti K.C for the partial fulfillment of Master's Degree of Science in Zoology with special paper Parasitology. This is her original work and has been carried out under my supervision. To the best of my knowledge, this thesis work has not been submitted for any other degree in any institution.

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LIST OF ABBERVIATIONS

Abbreviated form	Details of abbreviations
AFB	Acid-fast Bacilli
CDC	Centre for Disease Control and Prevention
DM	Diabetes Mellitus
DOTS	Directly-Observed Treatment, Short Course
HIV	Human Immunodeficiency Virus
NTC	National Tuberculosis Centre
PTB	Pulmonary Tuberculosis
LZH	Lumbini Zonal Hospital
TB	Tuberculosis
WHO	World Health Organization
ZN	Ziehl–Neelsen
LPH	Lumbini Provincial Hospital
AIDS	Acquired Immunodeficiency Syndrome

ABSTRACT

Pulmonary tuberculosis (TB) is an infectious bacterial disease infecting the lungs caused by *Mycobacterium tuberculosis*. The morbidity and mortality due to TB is decreasing in trend in most of the countries. To assess the disease trend particularly in Lumbini province as well as people's current perception of the disease, a retrospective analysis of the disease along with the Knowledge, attitude and practices (KAP) survey was carried out at Lumbini Provincial Hospital (LPH). Five years of data analysis of the Lumbini Provincial Hospital from 2015 AD indicated that the disease condition was in a steady state with slight increase (9.5%) in 2016/17. Suspected people seeking a diagnosis of TB in the hospital seems continuously increased from 2015 to 2020. TB prevalence for the last 5 years indicated 7.25% using AFB smear microscopy and 36.47% by Xpert MTB/RIF method. Males were found highly infected compared to female and mostly infected age group were 15-30 years. Similarly based on caste group Madeshi and Janjati people were found highly infected compared to others. Questionnaire survey results indicated that awareness of the disease is high but the knowledge of symptoms and route of the disease transmission is unsatisfactory. For preventive practices of the disease that people followed seems poor. Hence, the disease condition is still worsening the life of the people in the province. To reduce the disease burden, community-focused awareness and preventive program are recommended.

1. INTRODUCTION

1.1 Background

Tuberculosis (TB) is an infectious disease caused by the bacillus *Mycobacterium tuberculosis.* The disease primarily affects the lungs and causes pulmonary tuberculosis. It can also cause extra-pulmonary tuberculosis affecting various organs of the body such as intestine, meninges, bones and joints, lymph glands, skin and other tissues of the body (Kumar et al. 2007). TB is the world's most serious public health problem particularly in developing and under-developing countries which causes great antiquity contributing high morbidity and mortality than any other bacterial infections (Grange et al. 1998). TB incidence is falling at a rate of 2% per year and global TB deaths decreased from 1.4 million in 2011 to 1.3 million deaths in 2012 (WHO 2013a). It is the most common cause of death in the most economically productive age group i.e. 15 to 49 years (Harries 1998).

TB is one of the most widespread infectious diseases in Nepal and possesses a serious threat to health (MOHP 2012). According to the latest WHO Global TB report 2017, tuberculosis mortality rate was 23 per 100,000 population, which includes both HIV positive and negative people. In Iraq 10.3% (N=397) prevalence of HIV infection of TB were reported (Al et al. 2021). Prevalence of human immunodeficiency virus infection among tuberculosis patients was found 2.5% (N=1664) from Mahakali Zonal Hospital, Kanchapur, Western Regional Tuberculosis, Kaski National Anti-tuberculosis Association, Morang, United Mission Nepal, National TB center Bhaktapur and TB Nepal,Bake (Adhikari et al 2019).

M. tuberculosis bacteria is non-motile, gram-positive bacteria, measuring about 2-4 µm in length and 0.2-0.6 µm in breadth, has no capsule and spores (Skripkin et al. 1981).The general symptoms of TB include feeling weakness, night sweats, fever, lack of appetite, and loss of weight and chest pain cough or coughing with blood sputum mucus form the lungs are the most common system (Karakousis et al. 2017). TB is transmitted mainly by droplet infection and droplet nuclei generated by sputum-positive patients with pulmonary tuberculosis and also can be transmitted when active pulmonary tuberculosis patients cough, sneeze, speak, talk, sing or spit (Akande 2020, Park 2017). A single sneeze can release up to 40,000 droplets (Cole and Cook, 1998).

Starting in the mid-1990s, efforts to improve TB care and control intensified at national and international levels. WHO developed the DOTS strategy (WHO2012a). In Nepal, the DOTS strategy was adopted as national policy for TB control in 1996, rapid implementation meant DOTS availability and coverage reached 53% in 1996 and 100% by 2006 (Asbroeket et al. 2008). One-third of the world's population is estimated to be infected by *Mycobacterium tuberculosis* which is collectively responsible for about three million deaths each year and over 95% of which occur in developing countries. In sub-Saharan Africa and Southeast Asia, the highest prevalence of tuberculosis infection and estimated annual risk of tuberculosis infection, almost 3.8 million cases of tuberculosis were reported in the world in 1990, of which 49% were in Southeast Asia region (Raviglione et al. 1995). There were an estimated 10.4 million new TB cases worldwide, of which 6.2 million were men, 3.2 million were women, and 1 million were children, (WHO 2017).

Commonly used method for TB diagnosis includes: clinical, immunological, microscopy, radiography and bacterial culture. Ziehl-Neelsen /Fluorescent sputum staining together referred to as Acid-Fast Bacilli (AFB) staining is the commonly used methods for TB diagnosis. Recently developed advances molecular diagnostic method includes MTBDRplus, loop-mediated isothermal amplification (LAMP), and line probe assay (LPA), Xpert MTB/RIF, and whole genome sequencing (Acharay et al. 2020). In December 2010, the WHO endorsed Xpert MTB/RIF for the rapid and accurate detection of TB and people suspected of having MDR-TB (WHO 2011). The use of Xpert MTB/RIF started in Nepal 1011/2012 and there are 74 Xpert MTB/RIF centers throughout the country. The Xpert MTB/RIF automated molecular diagnostic test is a new cartridge-based nucleic acid amplification test (NAAT) it detect both the presence of the *Mycobacterium tuberculosis* complex genome in patient specimens and the presence of genomic sequences of the main mutations responsible for Rifampicin resistance less than 2 hours (Christelle et al. 2014). This diagnostic method is more sensitive than sputum microscopy in detecting TB, and it has similar accuracy as culture (Boehme et al. 2010).

Most of the factors which are responsible for the risks that help to develop from latent stage into the active state are called risks factors. Everyone is highly susceptible and at risk to be infected with TB which possesses a highly contagious characteristic (Mokhtar et al. 2012). There are several known risk factors that make people more susceptible to TB infection. The most important risk factor globally is HIV; 13% of all people with TB are infected by

the virus (WHO, 2011). This is a particular problem in sub-Saharan Africa, where rates of HIV are high (Chaisson and Martinson 2008). Diabetes mellitus is also an important risk factor that is growing in importance in developing countries (Restrepo 2007). Hodgkin lymphoma, end-stage renal disease, chronic lung disease, malnutrition, and alcoholism are also risk factors for TB (Kumar et al. 2007). Those at high risk thus include people who inject illicit drugs, inhabitants and employees of locales where vulnerable people gather (e.g. prisons and homeless shelters), and resource-poor communities, high-risk ethnic minorities, and children in close contact with high-risk category patients, and healthcare providers serving these patients (Griffith and Kerr 1996). TB is closely linked to both overcrowding and malnutrition, making it one of the principal diseases of poverty (Lawn and Zumla 2011). Patients treated with glucocorticoids have also an increased risk of developing TB (Jick et al. 2006). TB is a social disease with medical aspects. The social factors include many non-medical factors such as poor quality of life, poor housing, and overcrowding, population explosion, undernutrition, lack of education large families' marriages, and lack of awareness causes of illness (Park 2007).

Knowledge regarding any diseases is very crucial to cure and ensure the good quality of life of patients and knowledge is also considered as a key factor in determining the attitude and practices of an individual (Solliman et al. 2012, Qureshi et al. 2008). On lack of knowledge about the causes, symptoms and mode of transmission as well as appropriate treatment of TB within communities do not affect the health-seeking behavior of patients that also endorse the use of traditional healers over biomedical approaches, and also could attain to poor adherence to TB treatment than long delay in diagnosis which possesses a challenge to control the diseases (Gele et al. 2009). Correct KAP measure of the community towards TB and its management is a prerequisite to early treatment seeking (Mangesho et al. 2007). Financial status, culture, health care amenities and perception regarding health are some of the factors that influence the attitude and practices towards TB (Hashim et al. 2003).

WHO (2012a) reported 8.7 million new cases of TB globally of which 0.5 million were in children less than 15 years. In Asia (58%), African region (27%), Eastern Mediterranean (8%), Europe (4%) and from America (3%) TB cases were reported in 2012 (WHO 2013b). TB death is associated with property in the developing country, in 2017 Southeast Asia, 4.4 million people fell ill and an estimated 0.638 million died because of the disease which is

more than half of global TB death (Basnet et al. 2009). In Nepal, the incidence of new smear-positive TB declined from 58.9 to 53.4 in 2001 to 2006 and incidence decreased in male and age group <45 years. Also increasing in case detection rate, treatment success rate and decreasing trend in the failure rate (Shrestha et al. 2019). In 2075/2076, a total of 32,043 cases of TB were notified and registered at NTP, Bagmati provinces hold the highest proportion of TB cases (24%) and Karnali provinces holds the lowest proportion (4%) in Lumbini provinces has the highest case notification rate where Gandaki, Karnali and provinces 1 has lowest rate below 100 (Annual report 2075/2076).

The TB situation in the Lumbini province needs to be analyzed in the present context. In order to assess the tuberculosis trend in Lumbini province retrospective study was carried out at Lumbini Provincial Hospital (LPH) which is the only government hospital dedicated to the treatment of TB.

1.2 Objective

1.2.1 General Objective

To assess retrospectively the trend of tuberculosis at Lumbini Provincial Hospital during 2015 to 2020 along with KAP TB patients.

1.2.2 Specific Objective

1. To determine the trend and prevalence of tuberculosis at Lumbini Provincial Hospital from 2015 to 2020.
2. To assess knowledge, attitude and practice (KAP) of TB patients regarding TB.

1.3 Significance of the study

TB is still a major public health problem in Nepal. The present study has assessed the current situation of tuberculosis in this region. The trend of TB based on age, sex, caste and district of this region during the last five years was analyzed and KAP was also assessed among the patients. Hence the findings of this study will help to review the current tuberculosis elimination policy of the government in this region in coming days.

2. LITERATURE REVIEW

TB was well recognized by the time of Hippocrates (377-400 BC), and gives an excellent clinical description of the diseases, called phthisis, a Greek word that means "to consume to spit" and "to waste away" (Grange et al. 1998). TB is a worldwide public health problem and Robert Koch report in 1822 the successful isolation of the causative agent of TB named 1 year later as *Mycobacterium tuberculosis* (Cambau and Drancourt 2014).

Global Scenario of Pulmonary TB

In 2011, there were an estimated 8.7 million incident cases of TB globally (WHO 2012b). Likewise, different research works in the American continent regarding the prevalence of pulmonary tuberculosis have been carried out. In 2018, a total of 9,029 new tuberculosis cases were reported in the United States and 0.7% decrease from 2017 (Talwar et al.2019). Similarly in Brazil number of new cases seems to be decreased with the incident rate (1.4% annually) and the same as the mortality rate during ten years period i.e from 2001 to 2010 (Oliveira et.al 2013). In Morocco mouchrik et al. (2018) conducted a retrospective study from January 2010 and December 2011, the study indicated 89% of pulmonary tuberculosis cases were microscopically positive. In Minnesota from 1997-2001, 50.7% had a positive Mantoux test among 9842 total refugees (Varkey et al. 2007). Regarding the gender-wise prevalence of American continent in different countries Marocco, Minnesota, Brazil and Canada, Male were found more infected than females (Mouchrik et al. 2018, Varkey et al. 2007, Oliveira et.al 2013, Bras et.al 2014). TB mostly affects adults in their most productive years, however all age groups are at risk 3.3% of the case were children under the age of 15 years in Morocco (Mouchrik et al. 2018). Similarly in Brazil 15-34 and 35-64 years old and in Canada 25-54 years old were found highly infected (Oliveira et al. 2013, Bras et al. 2014).

TB case notifications have continued to decline in different countries of Western Europe such as Belgium, Finland, France, Germany, and Spain (Raviglione et al. 1993). In Norwegian Steadily decreased incidence of TB-born population from 1977 to 2001 (Winje et al. 2003). In North West London 60 cases were recorded, among them, 11 patients were sputum Acid Fast Bacilli smear-positive and in 49 patients, culture of sputum isolated *Mycobacterium tuberculosis* from 2012 to 2019 (Naguid et al. 2019). Similarly in Turkey among 411 cases, extra-pulmonary tuberculosis (54.5%) were found higher than pulmonary

tuberculosis (50.6%) and diagnostic method were sputum/smear analysis (72.7%), clinical radiological data (21.7%) and Biopsy (6.1%) form January 2010 to July 2014 (Sunnetcioglu et al. 2015). While in French among 52 patients, 31% had pulmonary and extrapulmonary tuberculosis confirmed by the isolation of *Mycobacterium tuberculosis* from sputum (n=21), gastric aspirate (n=8), bone (n=1), or cerebrospinal fluid (n=2) form September 2000 to December 2004 Ponttual et al. (2006). In Geneva, Switzerland Kherad et al. (2009) conducted a 4-year retrospective study, among 252 patients 63% were pulmonary 54% extrapulmonary and 17% both tuberculosis were positive. Regarding the gender-wise incidence, males were found two times higher than females in Poland (Kosela 2015). The most significant risk factors identified in European countries: France, Germany, Italy and Spain include the previous TB with pulmonary location, prison, known tuberculosis contact, health care worker, ADIS, sex workers, alcoholism (Casal et al. 2005)

In cases of research carried out in the different African continent revealed that in Kpando Municipal, Ghana from January 2013 to December 2015 decreased on trend of prevalence of TB from 27(50%) in 2013 to 11(20.4%) in 2014 and 2015 (Acheampong et al. 2018). In Nigeria (14.7%), eastern Ethiopia (14.2%), positive prevalence of TB were reported (Iman and Oyeyi 2010, Yohanes et al. 2012). Pulmonary tuberculosis were found more than extra-pulmonary tuberculosis in Southeast Ethiopia and Sudan (Alemu et al. 2017, Abdi 2013). Regarding the gender, male had a higher prevalence of TB compared to the female in Kpando Municipal Ghana (Acheampong et al. 2018). But in Southeast Ethiopia reported both males and females were almost equally affected (Alemu et al. 2017). While in Eritrea females (8.2%) were more prone to have a positive TB smear than males (7.4%) (Keset 2020). Most of the infected age group were 30-43 years in Nigeria, 15-44 years in Southeast Ethiopia and 41-60 had two times more likely to be infected tuberculosis than aged below 20 years old in Eritrea (Iman and Oyeyi 2010, Alemu et al. 2017, Keset 2020).

In cases of Australian continent, in New South Wales from 1975-1995 trend of prevalence of TB were declined from 12.2 per 100000 population in 1975 to 5.2/100000 in 1986, and the notification rate increased steadily to 7.6/100000 in 1995 during this period (Heath et al. 1998). During the Second World War prevalence of TB was at peak level in New Zealand while now considered to be a low TB incidence country (Toole 2019). Prevalence of infection for Melbourne students in years 9 and 10 was 2.5% (95% CI,) and the highest

rates were observed in students born in Indochina (15.9%), other countries in South East Asia (10.2%), and Eastern Europe (10.2%) (Johnson et al. 1998).

In Asian continent, Tabrizi et al. (2014) reported that India (2-2.5 million), China (0.9-1.2 million), South Africa (0.4-0.59million), Indonesia (0.37-0.54 million) and Pakistan (0.33-0.48million) are five countries having the largest population of TB. In Saudi Arabia, 20 years retrospective study from 1991 to 2010 was conducted and the disease trend was rising over the first 10 years of the study period then it started to fall slightly (Orainey et al. 2013). In Japan from 2007-2015, a total of 199856 new TB cases were reported (Manabe et al. 2019). While in Bhutan highest case was reported in 2009 (148) and the lowest (93) in 2004 (Wangdi and Gurung 2012). Similarly, Iraq reported 40.02% positive pulmonary tuberculosis cases from January 1, 2011, to June 30 (Dujaili et al. 2013). In District Dir (Lower) Pakistan (N=1378) suspected cases, 44.41% were positive for TB (Ahmad et al. 2015). While in Bangalore Tertiary Care Teaching Hospital for two years in which out of 120 patients pulmonary cases (73.83%) are more than extra-pulmonary tuberculosis (51.67%) (Shetty et al. 2020). But in Eastern India (Manjareeka and Nand 2013) reported extrapulmonary tuberculosis (56%) is more than pulmonary tuberculosis (44%) among a total of 406 patients and 12.3% had an HIV-TB coinfection. A different researcher reported male were highly infected compared to the female in different countries such as Iraq, Japan, India (Dujaili et al. 2013, Manabe et al. 2019, Chahal et al. 2017). But in Pakistan females were reported more infected than males (Ahmad et al. 2015). While males and females were equally infected with TB in Bhutan (Wangdi and Gurung 2012). From 1988-2001 in Northwest Turkey, the percentage of TB increased in 23-25 and 45-64 years old age group and decreased in 0-14, 15-24 years old age group (Kart et al. 2003). But in Pakistan, pulmonary tuberculosis cases were found the highest rate in age group 15-24 years (Ahmad et al. 2015). While in Japan highest rate was found in the age group ≥65 years and in the Haryana state of India, the maximum affected age group was reported in between 41-50 years (Manabe et al. 2019, Chahal et al. 2017). In Saudi Arabia incidence increased with age, but only people older than 45 years showed a declining trend from 1991 to 2010 (Orainey et al. 2013). Regarding risk factors of TB, socioeconomic and behavioral factors and specific groups such as health care workers and indigenous population are at increased risk of TB infection and disease (Narasimhan et al. 2013).

National context

TB was one of the major public health problems in Nepal in the period 2001-2008, the incidence of New Smear Positive TB declined from 58.9 in 2001 to 53.4 in 2006 per 100000 populations then reversed in the period 2006-2008 and the notification rate of all cases of TB declined by 3 % over the entire period from 2001 to 2008 (Shrestha et al. 2010). Each year 44,000 people develop active TB and more than half (25,000) of this active TB have the infectious type of pulmonary TB (NTC 2018). In far western Nepal Joshi et al. (2005) collected samples were subjected to smear microscopy by Ziehl -Neelsen's method and the highest prevalence obtained was in 20-29 age group. Sex-wise distribution of tuberculosis revealed a higher prevalence of TB infection in males than in females (Smith 1994). In different districts of Nepal researcher reported male were highly infected compared to the female such as in Gorkha, Lumbini Zonal Hospital, Birgunj, Chitwan, Ramechap (Sharma 2008, Poudel and Maharjan 2015, Shrestha et al. 2013, Amgain and Maharjan 2015, Tamrakar 2002). Based on age distribution Banstola (2012) reported 60% of the infected population was from the productive age group. In far western Nepal Joshi et al. (2005) reported the highest prevalence in 20-29 age group. The median age group was found 32 years old (Adhakari et al. 2013). Regarding the risk factors of TB Lifson et al. (1999) stated that the risk of TB is greater in areas of residence characterized by crowding, poverty and lower education. Smoking and alcohol use were reported as major risk factors in Lumbini Zonal Hospital (Poudel and Maharjan 2015).

Knowledge attitude and practices

Lack of proper knowledge attitude on the causative agent, mode of transmission, symptoms, preventive, control measure and practices might be the reason for higher TB burden. Knowledge, attitude and practices of the health workers, as well as individuals about TB, play the most significant role on control the burdens of tuberculosis in the world. With the help of several KAP surveys identified many knowledge gaps, misconceptions about TB, cultural believes and behavior patterns and practices. Pulmonary tuberculosis patients have greater knowledge than extra-pulmonary tuberculosis patients and socio-demographic factors i.e. sex, age and educational status were significantly associated with the level of knowledge (Mondal et al. 2014).

With negative attitudes and without a health education programmer, levels of knowledge about the causes and treatability of the diseases were poorly reported in Bangladesh (Croft 1999). In India among the 122 patients interviewed by Konda et al. (2016), 48.4% reported persistence cough was the most common symptom and 87% of respondents said that TB spread from one person to another, a low knowledge score was significantly associated with young age group ($P = 0.037$), less education ($P < 0.001$), and low income ($P = 0.027$) and a low attitude and practice score were significantly associated with less education ($P = 0.002$), low income ($P = 0.008$), and the nuclear family ($P = 0.008$). In Tamil Nadu, 16.6% of respondents were aware that TB is caused by microorganisms and transmitted by Cough (26.1%) while regarding the attitude about TB 89.6% of respondents agreed that BCG immunization is required and 45.1% of participants children were immunized by BCG (Easwaran et al. 2015). According to the Khan et al. (2006) in Pakistan (N=170), contaminated food (47.6%) was the source of infection, 57% considered emotional trauma/ stress are the causative agents of TB, separating dishes as an important means of preventing the spread and due to this diseases 38.8% respondent believed that there were reduce the chance of getting married and 23% respondent thought that TB could lead to infertility. In Bhutan, out of (N= 420) trainers, 58.6% have low knowledge about TB and respondents who had previously been treated for TB have a good knowledge compared to those who never had TB in the past while 93% of respondents had good attitudes and practices among the participant (Dorji et al. 2020). In Malaysia majority (81.4%) of the people knew about bacteria as a causative agent of TB, sputum test can be used in the diagnosis of TB (81.4%) and other diagnosis tools chest X-ray(75.5%,), blood investigation(64.7%) and skin test

(11.8%) are also used while 22% of the respondents had good practices towards the prevention of TB by always wearing a mask in crowded places and 11% respondent had a medical check-up for TB once a year on and no miss concept regarding the spread of TB infection genetic(37.3%), sexual intercourse (44.1%), sharing clothes (37.3%) using the same toilet (38.2%), using the same toothbrush (39.2%) and shaking hands (22.5%) do not spread TB infection. The majority of the employees of Prison of Malaysia (N=500) had good knowledge about TB and there was no significant association between the education level, and the level of knowledge about TB, the majority of the respondents didn't know about DOTS (Haque et al. 2018). In Iraq Health workers (N=500) have a good knowledge more than patients about TB while 54.8% of patients had a negative attitude and practices towards TB and only 38.2% of health workers handle suspected TB cases correctly (Hashim et al. 2003). In Sudan reported 85% of respondents were not having any idea about the causative agent of tuberculosis and the most important risk factors with tuberculosis were environmental factors (Abdi 2013). Similarly in Ethiopia, the survey conduct by Esmael et al. (2013) showed that the majority of the respondents had several misconceptions in all aspects of the most infectious form of TB and 69.9% (N=422) respondents claimed that cost is the main reason for not getting care. In the Gambia, people had good knowledge (66.9%) (N=4309) unfavorable attitudes (77%) towards TB and 95.5% of participants go to the health facilities if they had symptoms resembling the TB (Bashorun et al. 2020). In another study in Nigeria where 55.1% had poor knowledge, Male has better knowledge than females and attitudes toward TB did not influence caring for sick relatives and friends, it impeded social interactions and marriage prospects with infected persons within the community (Tobin et al. 2013). According to Uchenna et.al (2014), the primary source of information was radio (59.1%), (N=1200) community members (29.8%) and television (17.1%) and urban residents had a better knowledge of TB than rural residents of southeast Nigeria. Bhebhe et al. (2014) surveyed HCWs Maluti Adventist Hospital (N=140) who were involved with patients and/or sputum, in this survey most respondents (89.2%) had appropriate knowledge of transmission, diagnosis and prevention of TB; however, only 22.0% of the respondents knew the appropriate method of sputum collection.

In Finland according to Hussein et al. (2019) 53% (N=407) of the participant had a low level of knowledge and 63% had favorable attitude, female participants were twice more likely to have a favorable attitude than males (adjusted OR, 2.37; 95%CI, 1.40-4.01) and

high knowledge are twice more likely to have a favorable attitude towards TB (adjusted OR, 2.21; 95%CI, 1.32-3.69). Spruijt et al. (2020) reported enacted (isolation and gossip) and anticipated (concealment of treatment and self-isolation) stigma by participants on Latent TB infection treatment were the cause of fear of getting infected with TB.

In Papua New Guinea Emori et al. (2019) conducted a cross-sectional study. This study total of 1043 people were participants, 79% of respondents in Hiri, 27% in Asaro and 23% in Karkar said bacteria as the leading cause of TB, and 84% of respondents in Hiri, 33% in Asaro and 71% in Karkar said coughing out air droplet was the main mode of transmission.

In Foreign-born (N=167) and US-born (N=84) patients with Latent TB infection, misconceptions existed regarding transmission and contagiousness of Latent TB infection, in both US and foreign-born (Colson et al. 2010). In another study Marks, et al. (2008) conducted US National Health Interview Survey in this survey reported 32% of respondents said TB is curable, 44% know TB is transmitted by air and in aged 18-24 years person had less knowledge about TB transmission. According to Ailinger et al. (2003), (N=14727) older people responded correctly to questions about TB knowledge more often than younger people and gender, education, income, and ethnicity were associated with knowledge and perceived risk.

National context

According to Bhatt et al. (2010) among the 300 cases, 83% of the respondents knew that tuberculosis is a curable disease and 82% of TB patients were found to be conscious about the duration of treatment. A majority (71.9%) of the respondents believed that TB can be prevented by avoiding personal contact (52.6%) with the TB patients and a few of them (43.9%) believed it prevented from providing public awareness about TB (Amgain and Maharjan 2015). Dalit community of Bharatpokhari VDC of Kaski district 29% respondents had an adequate level of knowledge on pulmonary tuberculosis, and education status was associated with a level of knowledge on pulmonary tuberculosis (p=0.005) (Lamichane et al. 2019). Knowledge on health workers had a poor (45.8%) and much poorer among administrative and lower-level staff, while a majority (73.2%) of health care workers have a positive attitude towards infection control (Shrestha et al. 2017). In the survey conducted by Bansal et al. (2019) 67.10% of the patients received health education on preventive measures and 3.70% used the burning method for the sputum disposal after

diagnosis of TB. Knowledge attitude towards TB was generally poor in rural areas. According to Bhandari and Bande (2016), medical students have more knowledge attitude and practices on TB as compared to the nursing staff. Similarly, study (Mohit et al. 2020) among the undergraduate medical students at Nepalgunj Medical College-Banke out of 369 students 89.7% of students had answered TB was transmitted via air,(47.69%) of the respondents say it to be a chronic granulomatous disease caused by *M. tuberculosis*.

3. METHOD AND MATERIALS

3.1 Study area

The study was carried out at Lumbini Provincial Hospital which is situated at the junction of Mahendra and Siddharth highway in Butwal Municipality of Rupandehi District in the western part of Nepal nearby is the birthplace of Lord Buddha, Lumbini. Globally its position is latitude 270 41' 52" (N) and longitude 830 27'51" (E) and 865 meters above sea level. This hospital covers all the districts of Gandaki zone, Southern parts of Parbat and Baglung district of Dhaulagiri zone, Southern parts of Pyuthan districts of Rapti zone, and half parts of Rukum Rolpa and Dang district of Rapti Zone. The hospital catches about 4 million population and thirteen districts of western parts of Nepal. It is a tertiary level of government hospitals. This hospital provides general medicine, general surgery, pediatric, laboratory, radiology, ECG, TB control program including DOTS, leprosy, and malaria control programs.

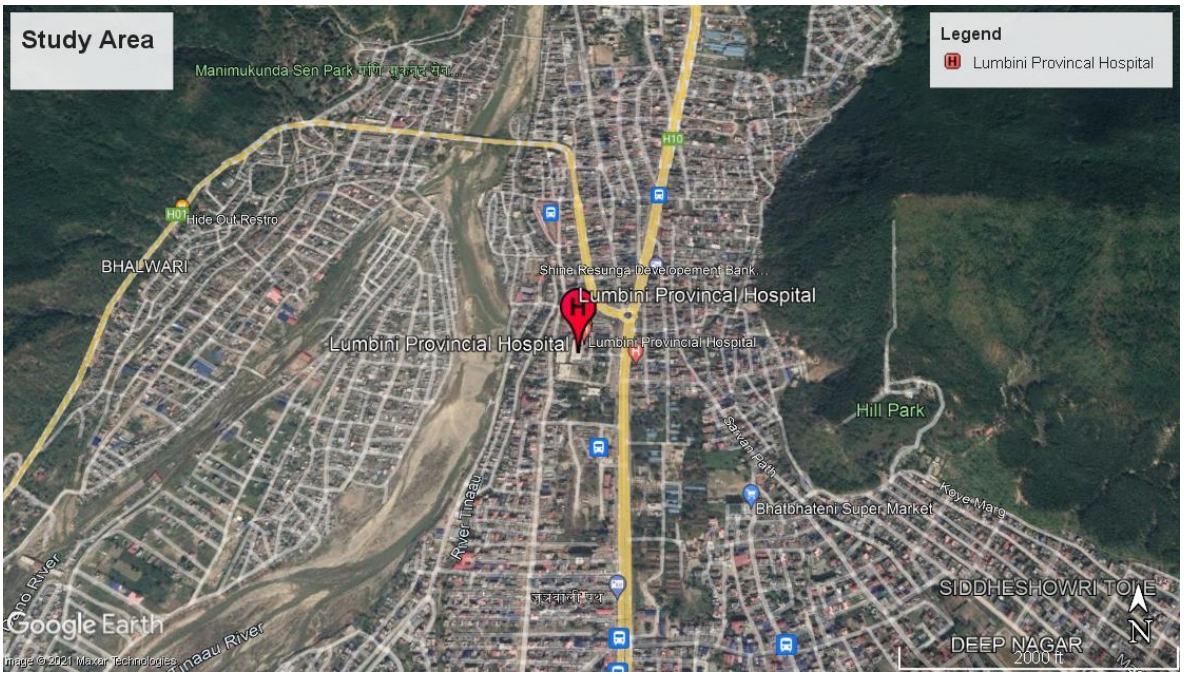

Fig 1: Map of the study area

Materials

3.2.1 Apparatus Required

Microscope, Spirit lamp, Glass slides, Disposable containers, Cotton, Slide stands, Staining pan, Forceps

3.2.2 Chemicals Required

Carbol fuschin, 0.1% Methylene Blue, Immersion oil, 20% sulphuric acid

3.3 Study Design

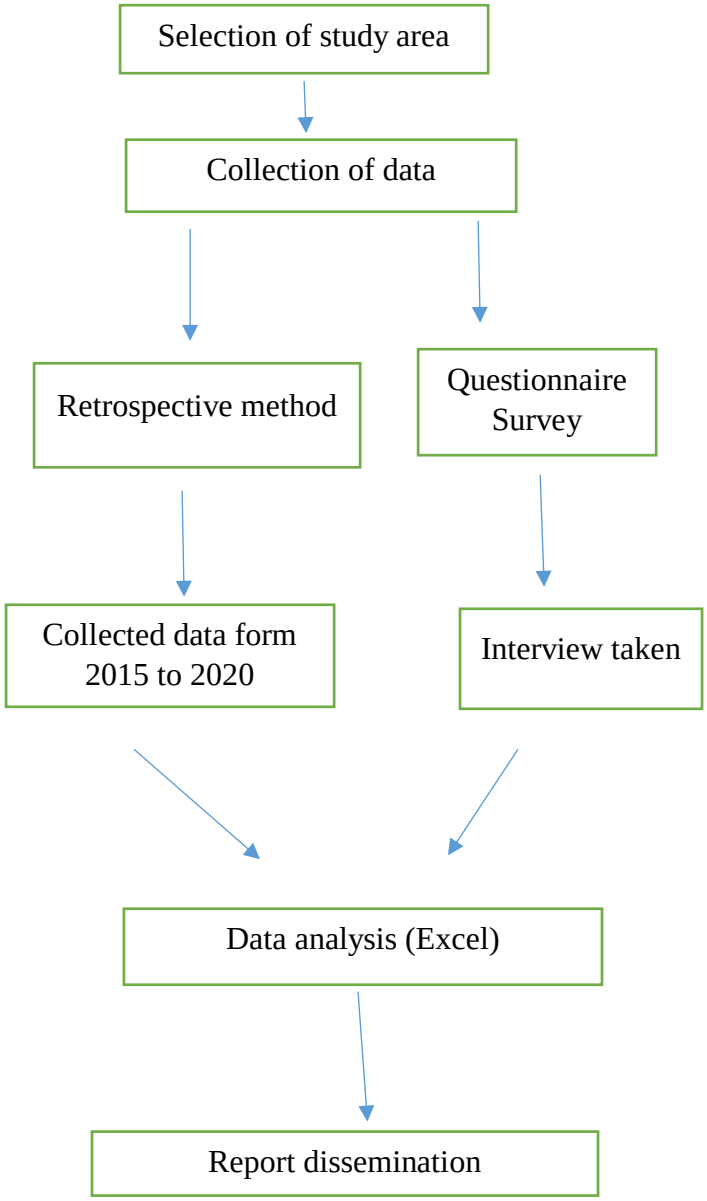

Fig 2: Flow chart of study design

To fulfill the objective the study was divided into 2 phases.

1. Collection of the diagnosis and treatment data of all the patients registered in Lumbini Provincial Hospital for the last 5 years to determine the trends of prevalence of TB.

2. Questionnaire survey to assess the knowledge, Attitude and Preventive Practices (KAP) of the TB suspected patients towards TB.

3.3.1 Collection of the data of TB suspected patients registered at Lumbini Provincial Hospital.

The retrospective data were collected from 2015 to 2020 to determine the trend of PTB. The samples were examined by microscopy method and XpertMTB/RIF method in the laboratory of Lumbini Provincial Hospital. TB diagnosis was done in the hospital either AFA staining or by XpertMTB/RIF, and in some cases, both the methods are applied. To understand the diagnostic techniques, both methods were practiced in the freshly collected samples.

A. AFA staining methods

Sample collection

The patients were asked to submit sputum of samples of two consecutive days i.e. spot and morning sample. For the collection of sputum samples, patients were given a vial or disposable container and instructions. About 5ml of sputum samples were collected in disposable containers or vials.

Slide preparation

The disposable container was open carefully then a small portion of the sputum sample was transferred into the naming slides (where sputum specimen number was written) with the help of bamboo sticks, than sample was left for dried at room temperature and fixed by passing through the flame 2-3 times. The slides were placed in serial order on the staining rack with smeared slides facing upward ensuring slides don't touch each other. The smear was flooded with carbol fuchsin and heated from below with spirit cotton until the vapors just beings rise than the heated carbol fuchsin was allowed to remain in the slides it's left

for 5 minutes. The smear was covered with 20% sulphuric acid solution for about 5 minutes or until decolorized and again smear was covered by or stained with 0.1% methylene blue solution for about 2 minutes, then the smear was washed by tap water and slides were dried at room temperatures.

Observation of prepared slides

The slides were examined under the microscope in X100 with oil immersion.

B. Xpert MTB/ RIF

The Xpert MTB/RIF assay is a nucleic acid amplification (NAA) test that uses a disposable cartridge with the Xpert MTB/RIF Instrument System. A sputum sample was collected from the patient with suspected TB. The sputum was mixed with the reagent that was provided with the assay, and a cartridge containing this mixture was placed in the Xpert MTB/RIF machine after 90 minutes result showed in the computer automatically.

3.3.2 Questionnaire survey to assess KAP towards TB

To assess the KAP analysis the information about positive patients was collected from Lumbini Provincial Hospital and a set of structured questionnaires was prepared. Through the information like user name and phone number interviewed was taken among the 53 patients by phone call. Details about knowledge on tuberculosis like symptoms of the diseases, route of transmission, and parts of the body affected by TB were included in the questionnaire. The questionnaire also contains knowledge and practices of patients on the preventive method of tuberculosis and attitude of the patients. Due to the COVID pandemic and lockdown situation of the country face to face questionnaire survey couldn't be done.

3.4 Data Analysis and Interpretation

The collected data was analyzed with the help of Excel. The association between categorical variables was assessed by chi-square test if p-value <0.05 it showed significant relation and p-vale >0.05 showed insignificant relations. Thus analyzed data were interpreted by representing with table pie-chart and bar-diagram.

4. RESULTS

TB remains a public health threat in Nepal and is responsible for ill-health to thousands of people each year. To assess the trend of tuberculosis prevalence along with, knowledge, attitude, and practices of patients visiting Lumbini Provincial Hospital during 2015 to 2020 were retrospectively analyzed.

4.1 Tuberculosis trend recorded during 2015/2016 to 2019/2020 A.D. at Lumbini Provincial Hospital

By microscopy method during last 5-year's TB suspected people visited in Lumbini Provincial Hospital were ranged from 2800 to 3800. Among them mean TB prevalence was found to be 7.18%. The TB trend indicated that prevalence was significantly high ($p<0.05$) during the years 2016/2017 in other year's prevalence of TB were almost in the same range. By Xpert MTB/RIF method prevalence of TB were ranged from 25 to 60% during the last 5- year's period. The TB trend indicated that prevalence was significantly high ($p<0.05$) during the years 2015/2016 and in other years prevalence rang were in decreasing trend. (Fig 3).

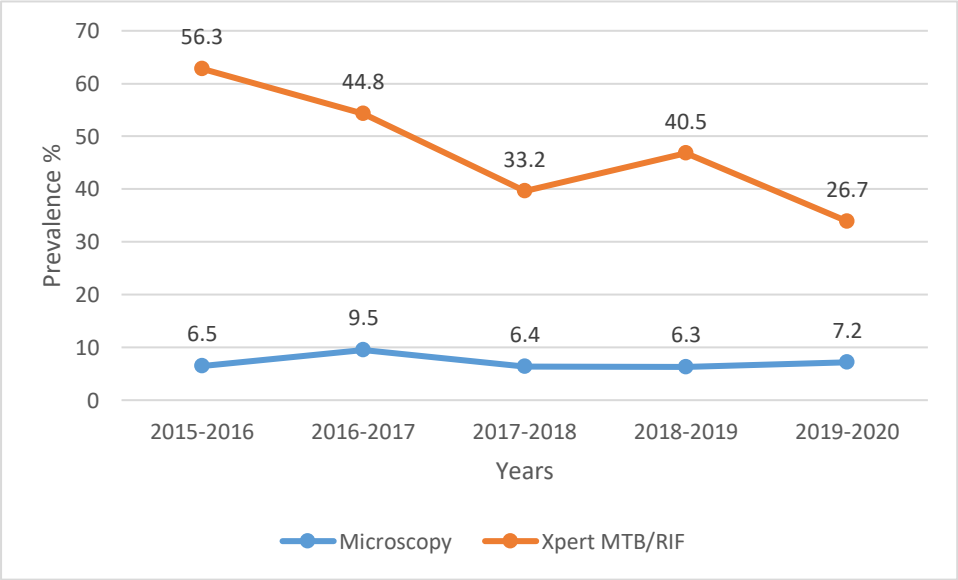

Fig 3: Trend on the prevalence of TB by microscopy and Xpert MTB/RIF method at LPH during 2015/2016 to 2019/2020.

4.1.1 Prevalence of TB at LPH during 2015/2016 to 2019/2020

In Lumbini Provincial Hospital during 2015/2016 to 2019/2020 by microscopy methods prevalence of TB was 7.25% and by Xpert MTB/RIF method 36.47% Fig 3(a), Fig 3(b). In both method (Microscopy and Xpert MTB/RIF) TB infected were found significantly high in male compared to the female. ($p<0.05$) Fig 4(a), Fig 4(b).

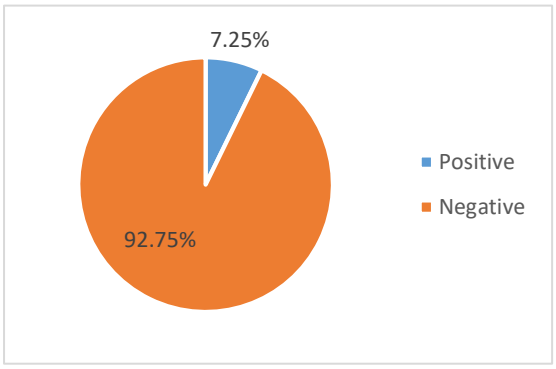

Fig: 4(a)

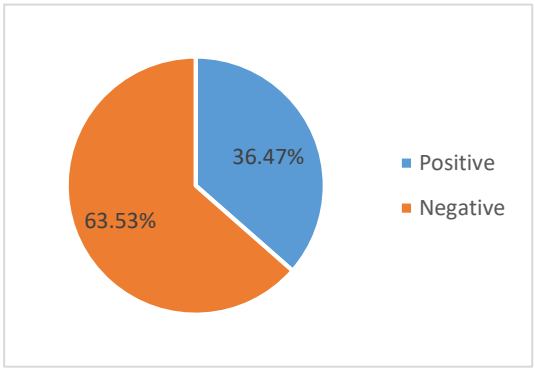

Fig: 4(b)

Fig 4(a): Prevalence of TB by microscopy method, Fig 4(b): By Xpert MTB/RIF method at LPH during the year 2015/2016 to 2019/2020

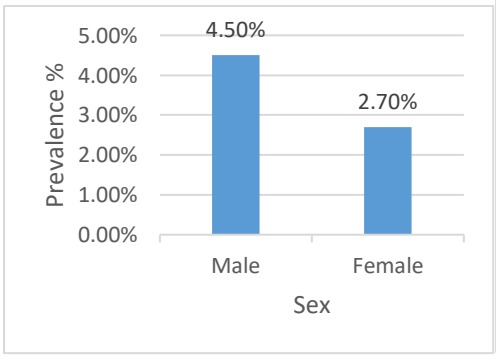

Fig: 5(a)

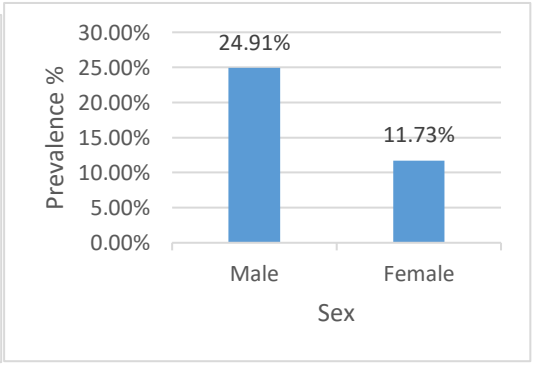

Fig: 5(b)

Fig 5(a): Sex-wise prevalence of TB by microscopy method, Fig 5(b): By Xpert MTB/RIF method during 2015/2016 to 2019/2020.

The sex and years-wise prevalence of TB by microscopy method indicated that the highest prevalence was found in the year 2016/2017. In this method prevalence were ranged from 5 to 11%, from 2015 to 2017 males had a significantly high prevalence of TB compared to females. But after 2017, although males had a high prevalence of TB which was not statistically significant ($p>0.05$). In year-wise TB prevalence using Xpert MTB/RIF method indicated decreasing trend from 2015 to 2020. While sex-wise trend indicated a significantly higher prevalence rate in Male from 2017 to 2020. (Table 1).

Table 1: Sex and year-wise prevalence of TB

S.N	Microscopy					Xpert MTB/RIF				
Sex	Male		Female		p-values	Male		Female		p-values
Years	Total	Pos(%)	Total	Pos(%)		Total	Pos(%)	Total	Pos(%)	
2015-2016	1740	7.7	1261	5	0.0042	250	57.2	110	54.5	0.63
2016-2017	2134	10.9	1513	7.5	0.0007	436	46.7	213	40.8	0.15
2017-2018	2136	7	1715	5.7	0.105	851	37.6	467	29.7	0.004
2018-2019	2180	6.6	1639	5.9	0.35	1061	44.3	669	34.3	0.000005
2019-2020	1592	7.3	1219	7.2	0.89	1088	28.2	694	24.3	0.07

TB situation at Lumbini Provincial Hospital was analyzed further based on caste. The result indicated that Madeshi (8.6%) people have infected significantly high prevalence than other caste groups ($p<0.05$). While Xpert MTB/RIF method janjati people were shown to be infected with significantly high prevalence while the prevalence of TB in Brahmin people was found significantly low in both methods. (Fig 5).

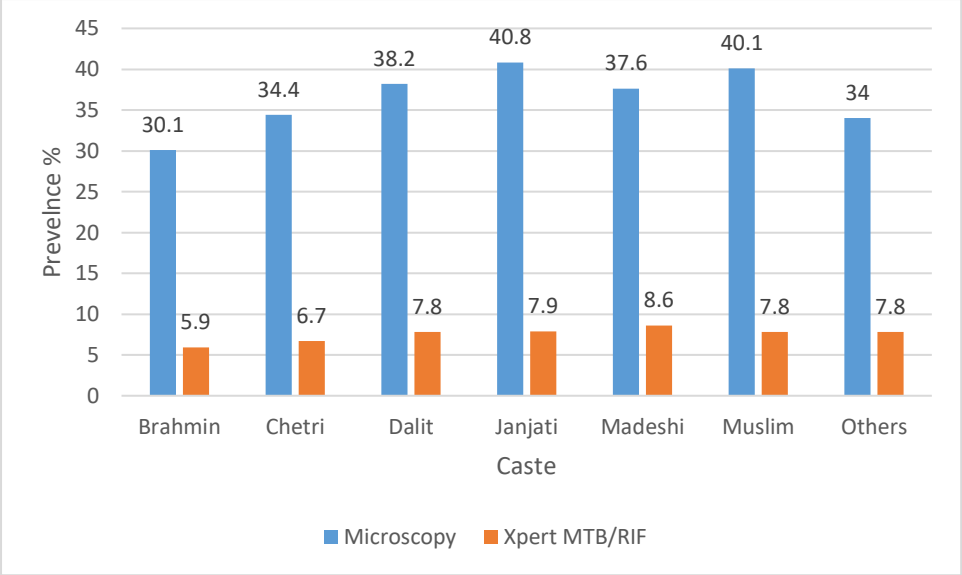

Fig 5: Caste-wise prevalence of TB

Based on age and sex groups, a high prevalence of TB was found in between 16-30 years age group in both methods. The male belongs to age group 16 to 75 years was significantly high compared to female while in 0-15 and 75+ years age group male was highly infected it was not statistically significant. In the case of Xpert MTB/RIF method from 16 to 75+ prevalence of tuberculosis were in decreasing trend and male were significantly highly infected (Table 2).

Table 2: Age and Sex-wise Prevalence of TB

S.N	Microscopy					Xpert MTB/RIF				
Age range	Examined	Prevalence (%)	Male	Female	p-values	Examined	Prevalence (%)	Male	Female	p-values
0-15	579	6	18(6.1)	17(5.9)	0.93	253	16.6	20(14%)	22(19.8%)	0.22
16-30	4528	7.8	208(8.6)	149(7)	0.03	1222	54.9	336(49.1)	206(38.1)	0.000006
31-45	3715	7.6	175(8.3)	110(6.8)	0.07	1205	38	311(41.9)	148(31.7)	0.0003
46-60	3428	7.7	190(9.2)	74(5.3)	0.00007	1287	40.1	374(44.8)	142(31.4)	7E-09
61-75	3516	6.3	140(6.7)	85(5.8)	0.11	1382	31.6	317(33.86)	119(26.9)	0.00095
75+	1359	5.6	49(5.7)	28(5.4)	0.8	490	27.5	87(24.3)	48(36.09)	0.03

In both microscopy and Xpert MTB/RIF method prevalence was found high in Lumbini Province compare to the Gandaki province. Lumbini Provincial Hospital is situated in Lumbini province, so most of the infected cases were found in Kapilvastu, Rupandehi, Nawalparasi, Arghakhanchi, Gulmi, Palpa, and Dang. By microscopy method in Gandaki province, the high prevalence was found in Pokhara and by Xpert MTB/RIF method in Baglung district.

Table 3: Province and district-wise TB prevalence in LPH during 2015/2016 to 2019/2020 by Xpert MTB/RIF.

S.N	District	Total Case	Positive	%
Lumbini province	Arghakhanchi	323	113	34.9
	Bardiya	4	1	25
	Dang	134	40	26.8
	Gulmi	253	82	32.4
	Kapilvastu	557	212	38
	Nawalparasi	440	172	39
	Palpa	136	67	49.2
	Pyuthan	118	37	31.3
	Rolpa	44	17	38.6
	Rupandehi	3727	1333	35.7
	Total	5736	2074	36.15
Gandaki Province	Baglung	43	20	46.5
	Syangja	41	10	24.3
	Parbat	11	5	45.4
	Total	95	35	36.4

Table 4: Province and district-wise TB prevalence in LPH during 2015/2016 to 2019/2020 by microscopy.

Lumbini province	District	Total	Positive	%
	Arghakhanchi	753	68	9
	Bardiya	12	1	8.3
	Dang	241	23	9.5
	Rukum	10	1	10
	Gulmi	792	56	7
	Kapilvastu	1176	102	8.6
	Nawalparasi	1070	77	7.1
	Palpa	812	54	6.6
	Pyuthan	235	26	11

	Rolpa	40	1	2.5
	Rupandehi	11647	810	6.9
	Total	16788	1219	7.2
Gandaki	Syanjga	109	8	7.3
	Baglung	132	8	6
	Pokhara	2	1	50
	Parbat	36	2	5.5
	Total	279	19	6.8
Karnali	Salyan	5	2	40

Table 5: Prevalence of TB from India

Method	Total Examined	Total positive	Prevalence
Xpert MTB/RIF	32	3	9.3
Microscopy	95	35	36.4

4.2 Knowledge, Attitude and Practices (KAP) of TB suspected patients visited at Lumbini Provincial Hospital

The questionnaire survey was carried out among 53 TB suspected patients including males (43.4%) and females (56.6%). Age-wise distribution of the survey patients includes 32.07% belongs to age group 15-30 years, 26.4% in 31-45 years, 33.96% in 46-65 years, and 7.5% in 65+ years to understand their KAP using a structured questionnaire.

4.2.1 Knowledge of patients about TB

Regarding symptoms of the diseases, only 34% of them had moderate knowledge and the almost same percentage of the patients indicated blood in sputum is the main symptom. While the rest of the patients showed a lack of knowledge concerning symptoms. Similarly, knowledge regarding transmission status was also found to be unsatisfactory only a few patients had correct knowledge of diseases transmission through droplets while most of them had a concept of transmission through personal contact. A majority (92.45%) of them had only knowledge of pulmonary TB and they were unaware of extra-pulmonary tuberculosis.

Table 6: Knowledge of patients about TB

Question	Frequency (n=53)	Percentage
Know about TB?		
1. Yes	53	100
2.No	0	
Symptoms		
1. Cough	9	17
2. Blood on sputum	20	37.7
3. Weight loss	6	13.1
4. All of the above	18	34
Transmitted		
1. Contact with TB patients	19	35.8
2. Droplet nuclei	2	3.7
3. All of the above	22	41.5
4. Don't know	10	18.6
Affected organ		
1. Lung	49	92.45
2. Skin	0	0
3. Both	1	1.8
4. Dont know	3	5.6

4.2.2 Attitude of patients about TB

Regarding the attitude of the patients towards TB visiting Lumbini Provincial hospital was good. Most of the patients agreed with tuberculosis is a not disease caused by past bad actions or poor diseases. In the case of the treatment, patients had a good attitude mostly patients agree Dhami/Jharki (Shaman) cannot be treated. Fewer patients believed that people who have contact with positive patients get TB while the majority (81.13%) of patients responded that TB can get anybody.

Table 7: Attitude of patients about TB

Question	Frequency(N=53)	Percentage (%)
TB is past life bad action 1. Yes 2. No 3. Don't know	 1 48 4	 1.88 90.56 7.5
Poor diseases 1. Yes 2.No 3. Don't know	 1 48 4	 1.88 90.56 7.5
Who is likely to get TB? 1. Anybody 2. Person who have contact with positive patients 3. Alcohol or drug user 5. All of the above 6. Don't know	 43 1 2 4 3	 81.13 1.88 3.77 7.54 5.6
Treated by Dhami /Jharki 1. Yes 2.No 3 Don't know	 1 49 3	 1.88 92.45 5.6

4.2.3 Practices of patients about TB

For preventive practices pulmonary tuberculosis transmission as expressed by tuberculosis patients, cover mouth and nose while coughing and sneezing, 22.64% avoid personal contact with patients, avoid alcohol (11.32%), avoid smoking (3.77%), and (50.9%) avoid smoking alcohol, personal contact with patients, and open the windows to allow fresh air entry in an isolation room. Practices of the suspected patients regarding the preventive method were good.

Table 8: Practices of patients about TB

Question	Frequency(N=53)	Percentage (%)
Should TB patients come in contact with others when they are under treatment?		
1. Yes	4	7.5
2.No	46	86.7
3. Don't know	3	5.6
Do you open the windows to allow fresh air entry in the isolation room?		
1. Yes	46	86.79
2.No	2	3.77
3. Don't know	5	9.4
Do you cover your mouth and nose while coughing and sneezing?		
1. Yes	53	100
2.No	0	0
Preventive measure		
1. Avoid smoking	2	3.77
2. Avoid alcohol	6	11.32
3. Avoid personal contact with TB patients	12	22.64
4. All of the above	27	50.9
5. Don't know	6	11.3

5. DISCUSSION

Tuberculosis (TB) has been one of the top ten causes of death including other diseases like heart diseases, stroke, respiratory illness, cancer, diabetes in the world. The global death rate due to TB has been reported to be 1.3 million (GDB 2018) and 1.8 million (Abeshik et al. 2018) during the year 2015.

In Northwest Ethiopia, the trend of tuberculosis was decreasing in past ten years from 2005 to 2014 because this country established a strategy that created awareness about TB through the home-to-home community health workers (Alemayehu et al. 2016). Similarly, in Taiwan, new cases declined from 16,758 to 14,265 and incidence decreased 75 per 1000000 population to 62 per 1000000 population from 2002 to 2008 (Yun lo et al. 2011). In the case of India, the proportions of pulmonary TB cases were in decreased trend (92.23% to 81.0%) since the year 2002 to 2012 (Mohit et al. 2015). In Nepal tuberculosis incidence showed a steady decreasing trend from 2003 to 2008 because of attributed to the successful TB control program in the country with the expansion of DOTS but the number of people seeking TB diagnosis seems was still very high (Kakchapati et al. 2010) and from 2015 to 2017 prevalence of tuberculosis was in reducing trend and examined cases were also reduced (Adhakari et al. 2019).

The level of awareness in Lumbini province is high (98.1%) among all provinces (Iwaki et al. 2021). In Lumbini Province through a JICA assistance project, Japanese health experts provided technical training to medical workers to improve their healthcare skills at DOTS center and sub-healthcare centers (JICA 2005). But the present study showed that in Lumbini Provincial Hospital the prevalence rate of TB seems in a steady state with a slight increase (9.5%) in 2016/17 and examined cases were continually increased from 2015 to 2020.

In 2015 in India had the highest TB incidences cases and in Maldives least cases were reported (Abeshik et al. 2018). In the present study, data of the last five years (2015 to 2020) were collected retrospectively from Lumbini Provincial Hospital, among the total examined cases 7.25% were found TB positive using the microscopy method and 36.47% by Xpert MTB/RIF method. A similar study was conducted by Magar et al. (2019) which reported that 18% (72/400) and 39% (156/400) positivity were reported by AFB smear microscopy and Xpert MTB/RIF assay. Sha et al. (2021) reported (n=4131) a 4.33%

prevalence of tuberculosis from Patan hospital by microscopy method. Another study conducted in Jumla by Xpert MTB/RIF method revealed that the prevalence of tuberculosis was (n=805) 11.9% (Magar et al. 2020). In the present study, the prevalence of tuberculosis was recorded more from Xpert MTB/RIF compare to the microscopy method because this method has more sensitivity compared to the microscopy. The sensitivity of MTB/RIF was 95.50% (91.87, 97.82) which was higher than smear microscopy sensitivity 61.97% (55.41, 68.21) (Kurmi et al. 2013). Another survey conducted in Pakistan by Khan et al, (2016) reported that the detection rate of *Mycobacterium tuberculosis* was significantly high on Xpert MTB/RIF as compared to microscopy. However, several studies in Ethiopia, Nigeria, Pakistan (Ali et al. 2012, Imam and Oyeyi 2008, Ahmad et al. 2016) showed higher positivity by microscopy method than the present study.

Gender-wise pulmonary tuberculosis prevalence showed almost double in Male compared to females of which child pulmonary TB seems continuously increasing in Satara district (Mohit et al. 2015). The result was almost similar in the present study. A similar result has also been shown by Poudel (2015) in Lumbini Provincial Hospital. Smith (1996) reported a higher incidence of TB in men than in women in most of the country including Nepal. Another different study conducted in different districts of Nepal (Ramechhap, Gorkha, Jumla, and Chitwan) reported that males had the highest prevalence than females (Tamrakar 2002, Sharma 2008, Magar et al. 2020, Amgain et al. 2013). But in Pakistan, female (57.63%) were more infected compared to the male (42.37%) (Khan et al. 2006). It was possible because males spend more time out of home or are more exposed to the environment for employment. Male may travel more frequently, have more social contact, spend more time in setting that may be conducive to transmission, such as bars, and engage in professions associated with a higher risk of tuberculosis, such as mining (Narasimhan et al. 2013, Oni et al. 2012).

Regarding the age-specific incidence rate ratio by gender, younger and older females were more vulnerable to TB significantly ($p<0.05$) (Kalifarhood et al.2012). The prevalence of tuberculosis was highest among the age group of 16-30 years in the present study and the lowest infected were in 0-15 and 75+ years. Similarly, in Jumla the most infected tuberculosis was reported in the age group 21-30 years by Xpert MTB/RIF method (Magar et al. 2020). But Sha et al. (2021) reported the highest (32.54%) prevalence of tuberculosis were in >60 years of age and least in ≤15 years of age (5.79%) in Patan Hospital. In

Ethopia, Husian et al. (2012) reported a higher prevalence of tuberculosis was in the 15-24 years age group and followed by 25-34 years. But in Nigeria, the highest prevalence (17%) were on the age group 30-43 years (Imam and Oyeyi 2008), in Malaysia 21-40 years (37%) (Jetan et al. 210), in Pakistan < 20 years (48.08%) (Ahmad et al.2016).

TB situation at Lumbini Provincial Hospital was analyzed based on caste groups. The groups were categorized as Brahmin, Chetri, Dalit, Janjati (Magar, Newar), Madeshi, and Muslim. The result indicated that in the case of the microscopy method, most of the examined cases were reported from Brahmin but the positive prevalence of tuberculosis was least in this caste. The examined cases of Madeshi people were less than brahmin and positive cases were significantly higher in Madhesh people. This may be because brahmin people were more aware and have more knowledge about tuberculosis compare to the madeshi people. Lumbini Provincial Hospital was located in the Rupandehi district of Lumbini province, where most of the Magar ethnic groups were living and followed by Tharu, Chettri, Brahmin and Musalman, etc. From the Xpert MTB/RIF method, most of the examined cases were in Janjati people and the significantly highest prevalence of tuberculosis was reported to form this caste. The almost same range of Brahmin people was examined for tuberculosis but the least positive case was reported from this group of people.

Based on province and district-wise tuberculosis prevalence, most of the infected patients were from Lumbini province followed by Gandaki and Karnali provinces in both methods. Most of the infected patients of Lumbini province were from different districts Kapilvastu, Rupandehi, Nawalparasi Arghakhanchi, Gulmi, Palpa which were the nearest district of Lumbini Provincial Hospital. In Gandaki province, the high prevalence was found in Pokhara. Most of the examined cases were reported from the Rupandehi district but the positives case were less when compared to other districts. This may be because most of the people from this district were more aware and consume less time go to the hospital compared to other districts like Arghakachai, Gulmi. According to Kakchapati et al. (2010), higher rates of prevalence of tuberculosis were observed in the Terai region and urban areas because in the Terai region there is high temperature, low socioeconomic status, malnutrition, high level of poverty, and social deprivation which contribute to TB infection. The lower incidence rates of tuberculosis were observed in mountain areas because tuberculosis incidence decreases strongly with increasing altitude (Mansoer et al. 1999 and Vargas et al. 2004).

The low level of awareness among the people regarding TB has also lead to the increase of TB patients (Hashim et al. 2003, Khan et al. 2011). The knowledge of the patient, their attitude, practices toward disease, and compliance to treatment are key factors in the management of the disease (Deogaonkar et al. 2019). This study is an attempt to explore the understanding knowledge, attitude, and preventive practices of the suspected patient on tuberculosis. A different study showed different symptoms of TB, prolonged cough at times chest pain, loss of weight, fever, difficulty in breathing, and coughing up blood (Buregyeya et al. 2011, Ganapathy et al.2008, Mushtaq et al. 2011). In this study, 34% of respondents had moderate knowledge, and the almost same percentage of the patient's revealed blood in sputum as the main symptoms, while the rest of the patients showed a lack of knowledge about symptoms. In a similar study conducted by (Manandher and Krishna 2012), 15.8% believed blood in sputum was the main symptom. In other different studies, patients believed cough was the main symptom (Das et al. 2012, Mohd Salleh et al. 2018, Legesse et al. 2010).

In the present study, only a few patients knew diseases transmission through a droplet and most of them told that transmission of the disease was through contact with infected patients. In other studies, 36% and 51% believed TB spread through coughing and contact with infected patients (Manandhar and Krishna 2012). Similarly, Tiwary (2008) studied that only 37.51 % of the respondents believed TB was transmitted through a cough. Another study conducted by Poudel (2015) reported that the majority of the respondents believed TB was transmitted through the respiratory route, through the use of patient's things, and physical contact with patients. The present study showed knowledge regarding the transmission route was unsatisfactory. Several studies reported about the mode of transmission of TB was by sharing of common materials with TB patients (50%), being in the crowd (25%) and wrong perceptions also reported by having sex with an infected person (6.2%), TB could lead to infertility(23%) and (38.8%) believed there were reduced chance of getting married (Eram et al. 2016, Khan et.al 2006). Early detection of tuberculosis is essential to prevent transmission and to build an effective approach to tuberculosis control policy (Dhakal et al. 2018). Each year on March 24 celebrate World TB Day to raise public awareness about the social and economic consequences of tuberculosis and the government organized many other programs regarding tuberculosis that help people to know about TB. Most of the effective ways to stop the spreading of TB in the community are by curing diseases.

In the present study, all of the respondents had only knowledge of pulmonary TB and they were unaware of extrapulmonary tuberculosis. Similarly, a study conducted by Mondal et al. (2016) in Bangladesh reported that pulmonary TB patients had greater knowledge than extra-pulmonary patients. Regarding the attitude of the TB suspected patients of Lumbini Provincial Hospital, most of the patients (90.56) disagreed that TB is a disease of poverty and caused due to the past life's bad action. A similar result was presented by Poudel (2015) in Lumbini Provincial Hospital which revealed that attitude regarding the treatment of TB was good and most of the patients (92.45%) believed that it cannot be treated by Dhami/Jharki. The preventive practice for pulmonary tuberculosis transmission, as expressed by patients of Lumbini Provincial hospital were covering mouth and nose while coughing and sneezing, avoid personal contact (22.64%), alcohol (11.32%), smoking (3.77%), and opening the window to allow fresh air entry in an isolation room. It showed that the knowledge about TB prevention was satisfactory among the TB patients visiting Lumbini Provincial Hospital.

In another study conducted by Onyeonoro et al. (2014) and Pramanik and Ghosh (2015), knowledge of TB prevention was low, only 14.9% knew that it was prevented by covering mouth while sneezing or coughing and 15% believed avoiding smoking and alcohol can reduce the chance of getting TB. Similar findings were reported by Manandhar and Krishna (2012) where they found out that TB can be prevented by covering mouth at the time of coughing, avoiding smoking and overcrowding respectively.

6. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Tuberculosis is a respiratory disease caused by *M. tuberculosis*. It remains a major threat to our country and pulmonary tuberculosis is the most common form of TB. In this study, two diagnostic methods were used for the detection of tuberculosis, microscopy and Xpert MTB/RIF. The trend of the prevalence of pulmonary tuberculosis seems in a steady state from 2015-2020 in LPZ. In the case of gender-wise prevalence males were more infected than females and age group 16-30 years people were highly infected while children's less than 15 years were less infected. Additionally, the findings of the study majority of the Janjati and Madeshi people were highly infected than other groups while the examined cases were more in Brahmin but less prevalent of tuberculosis in this group. The majority of patients had good attitudes but lack of knowledge concerning the symptoms and route of transmission. Practices towards the preventive measures of tuberculosis were not adequate.

6.2 Recommendations

1. Government should launch more focused TB programmers in Lumbini province to reduce the incidence rate since the trend is not decreased.

2. The local government should initiate community-focused TB awareness programmes since Janjati and Madhesi caste group people are more infected than other caste groups.

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Appendix - I

Questionnaire

Name...

Age…

Knowledge

1. Do you know about TB?

a) Yes b) No

If yes, what are the symptoms of TB?

a) Coughing b) Blood on sputum

c) Weight loss d) All of the above

2. Can TB be transmitted?

a) Yes b) No

If yes, how does it transmit?

a) Contact with TB patients b) Droplet nuclei

c) Coughing d) All of the above

3. Which organ is affected by TB?

a) Lungs b) Skin

c) a and b both d) none of the above

Attitude

1. TB is due to past life bad action.

a) Yes b) No

2. TB is a diseases of poor people.

a) Yes b) No

3. Who is likely to get TB?

a) Anybody b) Person who have contact with positive patients

c) Alcohol or drug user d) All of the above

4. Can Dhami / Jhakri treat TB?

a) Yes b) No

Practices

1. Should TB patients come in contact with others when they are under treatment? a)

a)Yes b) No

2. Do you open the windows to allow fresh air entry in the isolation room?

a) a)Yes b) No

3. Do you cover your mouth and nose while coughing and sneezing?

a) a)Yes b) No

4. Do you think TB transmission can be prevented?

a) Yes b) No

If yes, what are the preventive measures?

a) Avoid smoking b) Avoid Alcohol

c) Avoiding personal contact with the TB patients d) all of the above

Appendix- II

Tables

Table 1: Caste-wise prevalence of TB by microscopy method

Caste group	Total examined	Total positive	Prevalence
Brahmins	5078	303	5.9
Chetri	2175	146	6.7
Dalti	2199	172	7.8
Janjati	5281	419	7.9
Madeshi	1823	158	8.6
Muslim	343	27	7.8
Others	230	18	7.8

Table 2: Caste-wise prevalence of TB by Xpert MTB /RIF method

Caste group	Total examined	Total positive	Prevalence
Brahmins	1371	414	30.1
Chetri	582	201	34.4
Dalti	659	252	38.2
Janjati	1670	682	40.8
Madeshi	972	366	37.6
Muslim	259	104	40.1
Others	326	111	34

Table 3: Trend on the prevalence of TB by microscopy method during 2015/2016 to 2019/2020 in LPH

Years	Total Examined	Total positive	Prevalence
2015-2016	3001	198	6.5
2016-2017	3647	348	9.5
2017-2018	3851	250	6.4
2018-2019	3819	242	6.3
2019-2020	2811	205	7.2

Table 4: Trend on the prevalence of TB by Xpert MTB /RIF method during 2015/2016 to 2019/2020 in LZH

Years	Total Examined	Total positive	Prevalence
2015-2016	360	203	56.3
2016-2017	649	291	44.8
2017-2018	1318	459	33.2
2018-2019	1730	701	40.5
2019-2020	1782	476	26.7

Appendix –iii

Photo plates

Photo No. 1: Preparing of sputum sample for Xpert MTB/RIF method

Photo NO. 2: Xpert MTB/RIF machine

Photo No. 3: Preparing of sputum sample for microscopy method

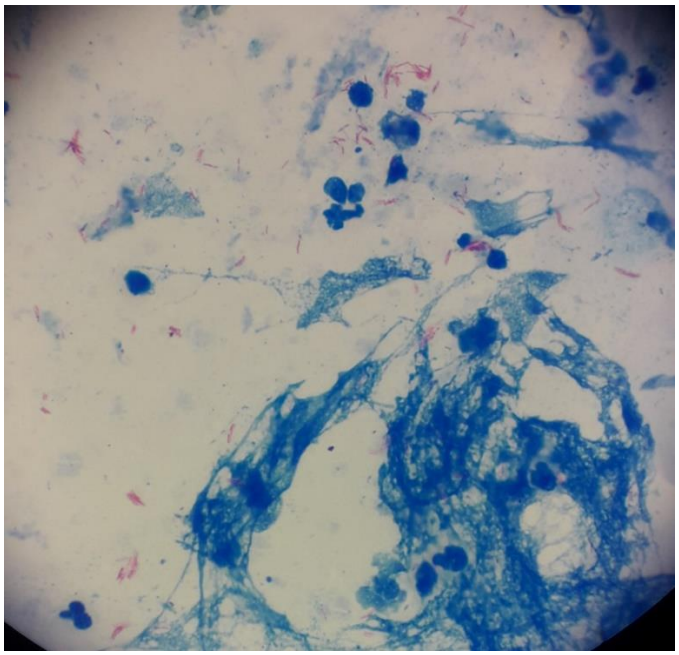

Photo No. 4: Bacteria of TB *Mycobacterium tuberculosis*