TUBERCULOSIS TREND ANALYSIS OF KAVRE DISTRICT, NEPAL FROM 2017-2019 BASED ON QUARTERLY REVIEWED DATA

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RESPONSE PROGRAM

TUBERCULOSIS TREND ANALYSIS OF KAVRE DISTRICT, NEPAL FROM 2017-2019 BASED ON QUARTERLY REVIEWED DATA.

DIRECTED BY PROFESSOR YOUNGAE KANG

A MASTER'S THESIS
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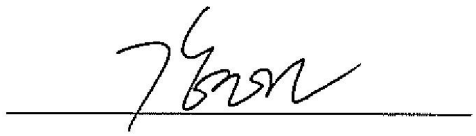
This certifies that the Master's Thesis

of Gautam Bishnu Prasad is approved.



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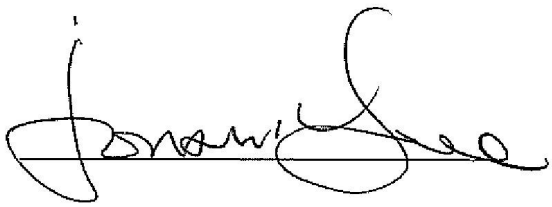

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LIST OF ABBREVIATIONS

ACF	Active Case Finding
ACSM	Advocacy Communication and Social Mobilization
CAT	Category
CNR	Case Notification Rate
DHO	District Health Office
DoHS	Department of Health Services
DOT	Directly Observed Treatment
DOTS	Directly Observed Treatment Short course/ System
DM	Diabetes Mellitus
DPHO	District Public Health Office
DRTB	Drug Resistance Tuberculosis
GDP	Gross Domestic Product
EP	Extra pulmonary
EPTB	Extra Pulmonary Tuberculosis
FCHV	Female Community Health Volunteers
GA	General Assembly
GFATM	The Global Funds Against AIDS, TB and Malaria
HMIS	Health Management Information System
HR	Human Resource
KoICA	Korea International Cooperation Agency
MDG	Millennium Development Goals
MDR	Multi Drug Resistance
M:F	Male : Female
MIS	Management Information System
MoHP	Ministry of Health Population
M&E	Monitoring and Evaluation
NGO	Non Governmental Organization
NRs	Nepali Rupees
NSP	National Strategic Plan

NTC	National Tuberculosis Centre
NTP	National Tuberculosis Program
PBC	Pulmonary Bacteriological Confirmed
PCD	Pulmonary Clinically Diagnosed
PPM	Public Private Mix
PTB	Pulmonary Tuberculosis
RIF	Rifampicin
SDG	Sustainable Development Goals
TB	Tuberculosis
T In	Transferred In
TSR	Treatment Success Rate
UN	United Nations
UNGS	United Nations General Secretary
WHO	World Health Organizations
XDR	Extensive Drug Resistance

GLOSSARY

Pulmonary Tuberculosis (PTB): Any bacteriological confirmed or clinically diagnosed TB case involving the lung parenchyma or the tracheobronchial tree. Miliary TB is classified as PTB because there are lesions in the lungs. A patient with both pulmonary and extrapulmonary TB should be classified as a case of PTB.

Bacteriological confirmed TB: TB is diagnosed in a biological specimen by smear microscopy, culture, or a WHO-approved molecular test such as Xpert MTB/RIF.

Extrapulmonary tuberculosis (EPTB): Any bacteriological confirmed or clinically diagnosed TB case involving organs other than the lungs, e.g., pleura, lymph nodes, abdomen, genitourinary tract, skin, joints, bones, and meninges.

New patients: Patients who have never been treated for TB have taken anti- TB drugs for less than one month. They previously treated patients: Patients who have received one month or more of anti-TB drugs in the past. They are further classified as relapse, treatment after failure, treatment after loss to follow up, other previously treated, and patients with unknown previous TB treatment history.

Relapse patients: Patients who have previously been treated for TB were declared cured, or treatment completed at the end of their most recent course of treatment, and is now diagnosed with a recurrent episode of TB (either a true relapse or a new episode of TB caused by re-infection).

Treatment after failure patients: Are those who have previously been treated for TB and whose treatment failed at the end of their most recent course of treatment.

Treatment after loss to follow-up patients: Patients who have previously been treated for TB and were declared lost to follow-up at the end of their most recent course of treatment. (These were previously known as Treatment after Default patients) Other previously treated: Patients have previously been treated for TB, but whose outcome after their most recent treatment is unknown or undocumented.

Patients with unknown previous TB treatment history: Patients with unknown previous TB treatment history who do not fit into any other categories listed above.

Active case finding (ACF): is synonymous with systematic screening for TB disease, although it typically implies screening implemented outside of health facilities.

Adolescent:Multidrug Resistance (MDR TB): Resistance to at least both isoniazid and rifampicin

Extensive Drug Resistance (XDR-TB): Resistance to any fluoroquinolone and to at least one of three second-line injectable drugs (capreomycin, kanamycin, and amikacin), in addition to multidrug resistance

ABSTRACT

Background: TB is a major global health problem; the intensity of problem is high mostly in low and middle income countries. The problem of TB is varied in different, parts and groups of people in Nepal. The various factors may affect the trend and occurrence of TB. Male are found to be more affected by TB globally. In Nepal, most of the provinces have similar gender ratio of reported TB cases with a lower gender ratio (M: F= 1.5) in Bagmati province, the national gender ratio of all type of TB is 1.73.
This study analyzed the trend of tuberculosis based on quarterly reviewed data in Kavrepalanchock district Bagmati Province, Nepal from 2017-2019.

Methods: A quantitative trend analysis of TB case detection indicators and various variables like gender, age group, registration category, treatment category and mode of referral and diagnosis in Kavrepalanchock district were analyzed and explored based on the quarterly reviewed data received from Ministry of Health and Population NTC, Nepal from 2017 to 2019. Various reports, policies and research publications were reviewed to link the research findings with those publications. The Chi-square test was used as test statistic and Microsoft Excel was used for data organization and analysis. Mendeley desktop software was used for referencing and citation.
Results:
The expected TB cases were in similar trend with the target population. A total 989 registered TB cases were studied excluding 24 transferred in cases. The CNR of Kavrepalanchock district was 89.09, 78.49 and 79.17 per 100,000 populations in 2017, 2018 and 2019 respectively. The reported incidence of PBC cases in study periods was 39.48 – 39.59. The proportion of PBC new cases among all studied cases were nearly comparable percentage; 49.84% in 2019 followed by 49.5 and 44.19% in 2018 and 2017. Similarly, PCD new cases proportion ranges from maximum 11.61 % in 2017 and minimum 5.68% in 2018. The EP new cases proportion was found higher, 35.11 % in 2019 to 36.28 % in 2018.
The adult child case ratio was within the expected range (10% maximum) in all the three years. TB is prevalent in all age groups, with at least 12.5 % of total new and relapse cases each year in elder population (65 and more years). The predominant cases were

reported from 15 to 65 years age group, 79.87 % in 2109, 83.52 % in 2017 and 84.94 % in 2018; economically active people are covered by this group.
The gender ratio (M: F) of new cases was at least 1.6 in each year, which is lower than gender ratio in relapse cases. The test result from Chi-square test in 95 % CE suggested relationship between gender and number of TB cases in the studied years.
The higher male relapsed cases were reported in this study. The majority of cases were found referred by private sectors in all three years and only a few cases were diagnosed by contact tracing.

Conclusions: Tuberculosis burden is related with various factors including the socio-economic, biological and service related factors. The TB burden and incidence was not equivalent within the similar territory of Nepal. Higher EP cases were reported than expected cases. Male were found more affected by TB and gender was found associated with TB cases in study years. More the child and female cases were found missed for detection. It is strongly recommended to consider the policy revision, removing barriers for TB treatment, fostering advocacy, increase case finding and improve reporting system of Tuberculosis program in Nepal.

CHAPTER ONE: INTRODUCTION

Background

Tuberculosis (TB) is a contagious disease caused by bacilli. TB is a major reason of ill health, one of the top 10 causes of death worldwide and the primary cause of death from a single infectious agent (ranking above HIV AIDS). It is caused by the bacillus *Mycobacterium tuberculosis* (MTB), which is spread when people who are sick with TB expel bacteria into the air; for example by coughing (1). In between 1980 to 2010, a significant shift felt in global health, with life expectancy increasing year on year in developed and high-income countries. At the same time the low and middle income countries have been facing a diverse truth that tuberculosis, a preventable and treatable disease, continues to devastate poor communities, claiming 1.7 million lives in 2009 and affecting millions more (2). Most of the TB cases can be cured if diagnosed early and appropriately treated.(3)

TB is a potentially lethal lung disease that affects all parts of the world but thrives in impoverished areas in Europe, Africa and Asia. It can infect any part of the body but most often attacks the lungs, causing a persistent cough, weight loss, fever, night sweats, loss of appetite and the coughing up of blood TB. Tuberculosis usually affects the lungs (Pulmonary TB) but can also affect other sites (extra pulmonary TB). About quarters of the world's population is infected with MTB and thus at risk of developing Tuberculosis.(4)

Leaders of all UN member states have committed to "ending the global TB epidemic" by 2030, back up by solid milestones and targets. Progress supports in global indicators for reductions in TB cases and deaths, enhanced access to TB prevention and care increased financing are moving in the right direction. Single WHO region and seven high TB burden countries are on track to reach 2020 milestones for reductions in TB cases and deaths. In the next three years, annual financing for TB prevention and care and for TB research needs to expand, substantial costs faced by TB patients and their households

must to mitigated and multispectral action on the broader determinants of the TB epidemic needs to intensify. The United Nation's Secretary General's (UNGS) report to the General Assembly (GA) in 2020, to be prepared with WHO support, will provide the next opportunity to access progress towards agreed TB targets and milestones. (1)
Although TB is crucial global health problem, it can be observed that political dedication and priority towards TB management, prevention and control is puffed up from the initial of 21st century. Mostly, the global commitments are presented through various outlines. Some of important commitments in the TB control initiatives are as listed below;(2)

- The Millennium Development Goals (MDGs)
- Sustainable Development Goals (SDGs)
- The Global Funds against AIDS, TB and Malaria (GFATM)
- The End TB Strategy
- The 2017 Moscow Declaration to end TB
- The Political Declaration at the UN high level meeting on TB 2018
- WHO thirteenth General Program of Work 2019-2023
- Regional and national priorities etc.

Statement of the Problem

Among Asia Pacific states, Nepal is one of the most problematic countries with CNR (322) and estimated TB incidence (>550) and mortality rate 21 per 100,000 population. At the same time the CNR of low and middle income countries from the same region was nearly 100, with 133 estimated incidence rates and 32 mortality rate per 100,000 population.(3)The SEARO states comprise 26% of the world's population with an estimated 4.3 million TB infection and 632,000 deaths due to TB. This showed there is 44% burden of TB incidence and more than half of global TB deaths in this region.(5)

The major case detection indicators in the TB control program in Nepal revealed that, TB is a major public health problem. The annual case notification rate (CNR) is 109 per 100,000 populations. The CNR in different provinces demonstrates variation; with Karnali province 78, in contrast Lumbini and Bagmati 127 and 123 respectively in 2019.(6) The CNR among different districts in the Bagmati province with similar characteristics show significant variations with Kavrepalanchock 80, Sindhupalchock 58, Dhading 81, Nuwakot 85, Sindhuli 100 and Makwanpur 142 per 100,000 populations. (7) Among the reported cases, male are nearly 1.7 times as compared to female cases (M:F = 1.7:1).(7) Male were nearly 1.73 times more affected than female among the reported TB cases.(8) Most of the provinces in Nepal have similar gender ratio of reported TB cases with a lower gender ratio (M:F= 1.5) in Bagmati province.(6) Therefore there is a need to investigate the causes of gender difference in reported TB cases in the Bagmati province and Kavrepalanchock district, Nepal.

After the functioning of Constitution of Nepal in 2015, Nepal has been exercising the federal form of governance from the unitary form. With the progress of federalism governance, there occurred some transitional gaps in the public policy and service delivery including healthcare services. As per the constitutional provision in the authority of basic health and sanitation are the sole responsibilities of local level government.(9) As per these provisions, the authority, institutions, Human Resources (HR) and programs has been handover to the respective level.(7)

Due to the responsibility transferred, there is a chance of impeding public health programs in Nepal. The trend of TB might be fluctuating in certain areas. Nepal has been implementing routine health information management system called health management information system (HMIS) since 1995.(10) Due to the transitional period, the public health program management and Monitoring and evaluation (M&E) system has been facing some gaps. Therefore this time is appropriate time to review and further analysis the programmatic data of various public health programs including TB control program.

Research Question

Is there any relationship between gender and the trend of tuberculosis in Kavrepalanchock District, Nepal?

Research Hypothesis

Null Hypothesis (H0): There is no significant gender difference in TB Trend in studied years.

Alternative Hypothesis (H1): There is significant gender difference in TB Trend in studied years.

Objectives of the Study

The study objective is to analyze the trend of tuberculosis based on quarterly reviewed data in Kavrepalanchock district Bagmati Province, Nepal from 2017-2019.

In order to achieve the objectives, some of specific objectives are as follow;

- To assess the trend of TB in Kavrepalanchock district Nepal from 2017 to 2019.
- To analyze the different characteristics of registered TB cases in the study area.
- To provide specific recommendations for planning future TB control program in the similar territory of Nepal.

Significance of the Study

There is a system of quarterly analysis of case finding, case holding and treatment outcome of registered TB cases in national TB program of Nepal in each program level. But the system is getting some distraction due to the process of authority hand over and instable policy on public health after 2015. So, with the help of this study, it's aimed to analyze the trend of TB cases of Kavrepalanchock District last in 2017 to 2019. This study results expected to be useful for the national, provincial and local health stakeholders for planning and management of national TB program in Nepal.

Furthermore the finding might be useful for academia and research institutes and professionals too.

Limitations of the Study

This study was subjected to various limitations. Some of implicit limitations of this study are as below;

- Routine data may miss the real incidence of TB in the community.
- Use of secondary data may not be realistic to analyze the actual trend, so this study focused only on certain characteristics.
- Annual number of gender wise TB cases was considered as TB burden for testing hypothesis.
- This study cannot explore the reasons of gender difference in TB burden.
- Data used are based on the national calendar are considered as 20173/074 to 2017, 2074/75 to 2018 and 2075/76 to 2019.

CHAPTER TWO: LITERATURE REVIEW

General Overview of Tuberculosis

TB infection is one of the most common infections in the world. It is estimated that nearly two billion people (about one fourth of the world's population) are infected with M. tuberculosis. Every year, about 10 million people develop TB disease and 1.6 million people die of it. In fact, TB disease is the leading cause of death due to infectious disease in the world. (11) A relatively small proportion (5–10%) of the estimated 1.7 billion people infected with M. tuberculosis will develop TB disease during their lifetime. However, the probability of developing TB disease is much higher among people infected with HIV; it is also higher among people affected by risk factors such as under nutrition, diabetes, smoking and alcohol consumption. Overall, about 90% of cases occur among adults, with more cases among men than women. The male: female ratio among adults is approximately 2:1.(1)

TB is granulomatous chronic lung disease with human and animal susceptibility. The *Mycobacterium tuberculosis and M. Bovis* is the human and animal bacilli causing TB, other mycobacterium has very low evidence of causing TB inn Human. In human the pulmonary Tuberculosis is considered as primary TB even though extra pulmonary Tuberculosis (EPTB) like gland TB, intestinal TB, bone TB, TB meningitis etc are also common. Both the PTB and EPTB are transmitted mostly through droplet inhalation and droplet nuclei.(12)

The occurrence of TB in children is strongly related to the prevalence of tuberculosis in adult population. The risk of developing infection with *M. tuberculosis* is higher for children staying in high active TB prevalent areas like crowded residence and poor ventilation. Children are considered as the reservoir with high possibility of future TB

occurrence. Child TB detection and treatment are the essential components of TB control and elimination program(13).

The *M. bovis* has variety of hosts, animal to human transmission of this bacilli is transmitted through milk, tissue and their product of infected animals. In some developing states, bovis TB contributes for 1/10th of human TB cases.(12) TB has variety of risk factors including various socioeconomic factors.(14)

National Tuberculosis Policy

Vision: Tuberculosis free Nepal.

Goal: To reduce TB incidence by 20% by the year 2021 compared to 2015 and increase case notifications by cumulative of 20,000 from July 2016 to July 2021 compared to the year 2015.

Objectives:

- Increase case notification through improved health facility based diagnosis; increased diagnosis among children (from 6% at baseline to 10% of total cases by 2021); examination of household contacts and expanded diagnosis among vulnerable groups within the health service such as PLHIV (from179 cases at baseline to over 1,100 cases in 2021) and those with Diabetes Mellitus (DM)
- Maintain the treatment success rate 90 % of patients (all forms of TB) through to 2021.
- Provide DR diagnostic services for 50% of persons with presumptive DR TB by 2018 and 100 % by 2021; successfully treat at least 75% of the diagnosed DR patients.
- Further expand case finding by engaging providers for TB care from the public sectors (beyond MoHP), medical colleges, NGO sector and private sector through results based financing (PPM) schemes, with formal engagements (signed MoUs) to notify TB cases.

- Strengthen community systems for management, advocacy, support and rights for TB patients in order to create an enabling environment to detect and manage TB cases in 60% of all districts by 2018 and 100% by 2021.
- Contribute to health system strengthening through HR management and capacity development, financial management, infrastructures, procurements and supply management in TB.
- Develop a comprehensive TB surveillance, monitoring and evaluation system.
- Develop a plan for continuation of NTP services in the event of disasters and public health emergency.

Former district public health offices / district health offices (DPHO/ DHO), currently known as health offices are responsible for the district level, where as the National Tuberculosis Centre (NTC) is the national level TB program management. NTC is the federal authority, the province health directorates are the provincial authority and the local levels are the local level authority for TB program management.(7)

Disease Burden of Tuberculosis

Global Burden

TB is caused by the bacillus Mycobacterium tuberculosis, which is spread when people who are sick with TB expel bacteria into the air; for example, by coughing. It typically affects the lungs (pulmonary TB) but can also affect other sites (extra pulmonary TB). About a quarter of the world's population is infected with M. tuberculosis and thus at risk of developing TB disease.(15)

Almost 90% of cases each year are in 30 high TB burden countries. Globally, an estimated 1.7 billion people are infected with M. tuberculosis and are thus at risk of developing the disease. With a timely diagnosis and treatment with first-line antibiotics for 6 months, most people who develop TB can be cured and onward transmission of infection curtailed. The number of TB cases occurring each year (and thus the number of

TB-related deaths) can also be driven down by reducing the prevalence of health-related risk factors for TB (e.g. smoking, diabetes and HIV infection), providing preventive treatment to people with a latent TB infection, and taking multisectoral action on broader determinants of TB infection and disease, e.g. poverty, housing quality and under nutrition.(1)

Regional Burden

Geographically, most TB cases in 2018 were in the World Health Organization (WHO) regions of South-East Asia (44%), Africa (24%) and the Western Pacific (18%), with smaller shares in the Eastern Mediterranean (8%), the Americas (3%) and Europe (3%). Eight countries accounted for two thirds of the global total: India (27%), China (9%), Indonesia (8%), the Philippines (6%), Pakistan (6%), Nigeria (4%), Bangladesh (4%) and South Africa (3%). Currently, the world as a whole, most WHO regions and many high TB burden countries are not on track to reach the 2020 milestones of the End TB Strategy. Globally, the average rate of decline in the TB incidence rate was 1.6% per year in the period 2000−2018, and 2.0% between 2017 and 2018. The cumulative reduction between 2015 and 2018 was only 6.3%. The global reduction in the number of TB deaths between 2015 and 2018 was 11%. Faster reductions in TB incidence and deaths require improvements in access to diagnosis and care within the context of progress towards universal health coverage, action on broader determinants of TB incidence (e.g. levels of under nutrition, poverty, smoking and diabetes) and a new treatment or vaccine to substantially lower the risk of developing TB in people who have a latent TB infection.(1)

National Burden

Tuberculosis (TB) remains one of the major public health problems in Nepal. In 2017/18, a total of 32,474 cases of TB were notified and registered at NTP. TB case notification, as well as estimated incidence, has been stagnant for more than decades now in Nepal (CNR

152/100,000 in 2018) despite best efforts of the program is trying to find and cure more TB cases. TB cases were reported from all parts of the country, but the Flat/Terai belt reported the highest numbers of cases followed by hills and mountains. The childhood TB cases reported are nearly 5.5% of all cases which is still a huge challenge in Nepal. Nepal TB program is also missing out to find nearly 28% of estimated cases annually, which has played a big role in control of TB program with 20-25% among them estimated to be held and unreported by private sector.(16)

Tuberculosis (TB) remains a major public problem in Nepal. In 2018, the total of 2,474 cases of TB were notified and registered at NTP. Among these, 98% (31,723) were incident TB cases (New and Relapse), 71% of among all TB cases were pulmonary TB and out of them, 80% were bacteriological confirmed. Among those bacteriological confirmed, 30% (9,897) were confirmed using Xpert MTB/RIF testing. Bagmati province holds the highest proportion of TB cases (24%). Kathmandu district alone holds around 41% (3,183 TB cases) of the TB cases notified from the province 3 while its contribution is around 10% in the national total. Whereas in terms of eco-terrain distribution, Terai belt reported more than half of cases (18,590, 57%).Most cases were reported in the productive age group (highest of 50% in 15-44 year of age).The childhood TB is around 5.5%.

Among all new cases of drugs sensitive TB cases registered last year, 91% of them were treated successfully, with nearly 89% treatment success rates for retreatment cases as well. The burden of DR TB is not as high as the regional or global burden. There are estimated around 1500 (0.84 to 2.4) cases of DR TB annually. However, 350 to 450 MDR TB cases are notified annually. This year alone 420 MDR TB cases were notified. In 2016/17, a total of 257 RR/ MDR TB, 91 Pre-XDR TB and 18 XDR TB were enrolled for treatment. Treatment success rate of MDR patients was 71%. However, the TSR of Pre-XDR TB is 58% and XDR TB is 61%, which were marginally lower than the RR/ MDR TB cases.(17)

Service Outlets and Routine Data Review

From Annual Report Department of Health Services, Nepal 2018, TB services were provided through 4,323 treatment centers. There are further 96 Urban DOT centers providing DOT services in the country. Regarding diagnostic services, there are 624 Microscopic centers and 55 Gene xpert centers (with 58 Gene xpert machines in total) in the country. DRTB services were provided through 21 treatment centers and 86 Treatment Sub-centers. Though the DRTB services are ambulatory, facility-based services were also provided through 2 referral centers located in Nepalgunj and Kalimati Kathmandu, 6 hostels and 1 DR home.(18)

The National Case Notification Rate (All forms) is 112 / 100,000 population. Based on the CNR, there are 22 districts with CNR more than 120, while 29 districts had CNR between 75-120 and remaining 26 districts had below 75 CNR. Among 22 high burden districts, 13 districts are from the Terai belt while remaining 9 are from the Hilly region. Further, more than three-fifths of TB cases (66%) of the cases were reported from Province 2, Province 3, and Province 5 respectively whereas in terms of eco terrain distribution, Terai belt held more than half of TB cases (57%) in the reporting year.(18)

The trend of TB treatment success rates for TB has been consistently above 90% since the last few years. Annual trend of TB treatment success rates at national level for newer cases (New and Relapse) is constantly high at around 90%, for 2018, it is 91%. However, the trend of success rates among the retreatment cases (Failure, Loss to Follow-up and Other previously treated) had been constantly lesser (in comparison to treatment success among newer cases) but it has slightly increased (89%) in this fiscal year.(18)

National TB Prevalence Survey Findings

According to this survey, currently over 117 000 people are living with TB disease in Nepal. Likewise, 69 000 people developed TB in 2018-19. TB burden (incidence) is much higher (1.6 times) than previously estimated. TB prevalence is much higher among

elderly and in men. TB prevalence was also found more in hills and Terai as compared mountain and Kathmandu valley, but prevalence/notification ratio (P/N ratio) highest in hill and mountain. These findings provide better burden estimates for Nepal which will be used for designing appropriate interventions towards ending TB in Nepal.(19)

Major key findings and learning of this survey are Current practice of TB symptom screening can miss cases, Chest x-ray found to be a better screening tool for TB, use of microscopy for diagnosis misses cases, Gene Xpert (molecular technology for the diagnosis of TB) detected more TB cases, DOTS, essential for sustaining high TB treatment success rate, high trust in the service of government health facilities.(19)

Review of Related Studies

A study done in Malawi in 2013 suggests further interventions and additional involvement to reduce peoples' vulnerability to TB and to attain long-term epidemiological target for global TB control. The study explored risk factors that seem to be of importance at the population level include poor living and working conditions associated with high risk of TB transmission, and factors that impair the host's defense against TB infection and disease, such as HIV infection, malnutrition, smoking, diabetes, alcohol abuse, and indoor air pollution. Preventive interventions may target these factors directly or via their underlying social determinants. The identification of risk groups also helps to target strategies for early detection of people in need of TB treatment.(14)

A recent study done in Nepal investigates different barriers for TB treatment. Major barriers highlighted by this study are access to the health centre was the long distance, poor road conditions, and costs associated with travelling. Additionally, lack of awareness of TB and its consequences, and the belief, prompted many respondents to visit traditional healers. Early diagnosis of TB was hindered by lack of trained health personnel to use the equipment, lack of equipment, irregular presence of health workers and long term care, difficult DOTS procedures etc. (20)

Study done in Nepal in 2008 revealed that patient routes towards tuberculosis treatment are dominantly by self referral and include visit in both private and public providers. Once tuberculosis is suspected referral for diagnosis and treatment is prompt giving emphasis of the private practitioners in the patient routes, quality improvement initiatives need to address both private and public health providers.(21)

A Research article published in 2019 in Nepal examined some of issues of national tuberculosis program in Nepal. Registering the missing TB cases in the community is one of the key challenges for program. At this circumstance, it is complicated for NTP to achieve the targets set by NSP 2016-21 as well as milestones and targets of End TB strategy 2016-35. Therefore there is a strong need to expand service delivery sites to ensure the minimum quality standards as well as development of capacity of healthcare providers in the diagnosis and treatment of TB patients.(22)

A study done in Banke district Nepal in 2008 suggested some delays in TB care and treatment. From this study, it is found that the median patient delay 50 days, the median health system delay 18 days, and the median total delay 60 days. Similarly, Sputum smear negative cases had considerably lower risk of getting delay, whereas smokers using >5 cigarettes per day had higher risk of patient delay and health system delay.(23)

A study done among MDR TB cases in Nepal showed significant associations between history of prior tuberculosis, smoking habit social stigma social stigma, knowledge on multi- drug resistant tuberculosis and knowledge on DOTS Plus with multi-drug resistant tuberculosis, although there was no association between alcohol drinking habit and ventilation in room with multi-drug resistant tuberculosis.(24)

A tuberculosis incidence modeling study done in Nepal in 2010 suggested that tuberculosis incidence is in decreasing trend, but the number of cases was still very high, gender differences and higher rates was found in the Terai Region and urban areas suggesting sustained and massive need for the tuberculosis control measures in coming days.(25)

A study done in 2016 in Tunisia reflected that there is a rise in all forms of TB and among high-risk groups, notably children, females and lymph node TB patients in the cases diagnosed in the last two decades.(26)

The UN high-level meeting on tuberculosis suggested for enhancing the role of various stakeholders in the TB treatment and care, although there is private sector and other actor's involvement there still remained an area for improvement, particularly the complexities behind varying drug regulatory and procurement systems per country hindered the active participation of the private sector in TB control activities. For the ideas category, due to an increasing threat of antimicrobial resistance and growing number of global migrations, TB is now widely recognized as a health security issue rather than a purely health issue by the global health actors.(27)

CHAPTER THREE: RESEARCH METHODOLOGY

Conceptual framework

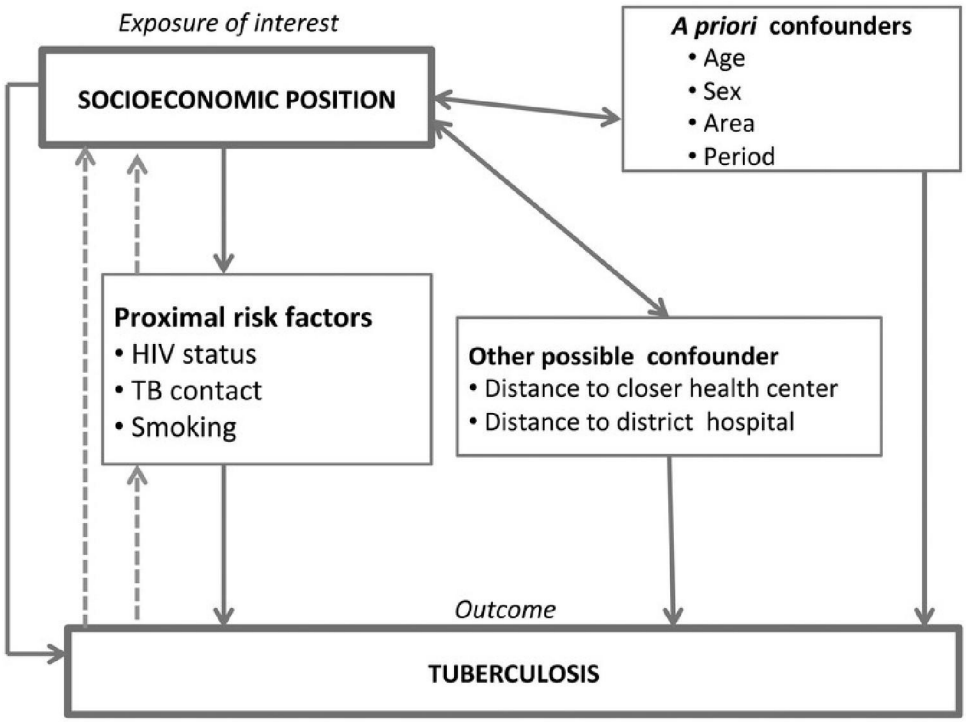

Figure 1 Conceptual framework of Tuberculosis infection

Selection of Study Topic

Some of brainstorming and preliminary works were done for the selection of topic for the thesis works in Nepal before enrollment of this course. I have selected this study topic based on the disease burden, data availability and future implication perspectives.

Further dialogue and presentation with professors and program director in the Graduate School of Public Health, Yonsei University facilitated me for selection of thesis topic. Finally, when university assigned the thesis advisor, after reviewing many literatures and

data, coordination and series of meeting with thesis advisor conclusion made for the thesis topic.

Selection of Study Area

Study area; as Kavrepalanchock district Nepal was selected purposively for this study. The researcher represented the government of Nepal for this program, currently working at Panchkhal municipality, Kavrepalanchock district, Nepal. For my convenience to collect secondary data from different authorities of Nepal, Nepal was as preferred the study area.

Description of Study Area

Nepal is situated in South Asia. It is also known as the land of Mt. Everest, the highest peak of the world and the birth place of Lord Buddha, Lumbini. Nepal is a land locked country, which occupies 0.03 % and 0.3% land area of the World and the Asia respectively. It has diverse topography and climate. It stretches from east to west with an average length of 885 kilometers and widens from north to south with an average breadth of 193 kilometers.(28)

The Constitution of Nepal (2015) has declared the country a Federal Democratic Republic with seven Provinces. It is further divided into 753 local levels including 460 Rural Municipalities, 276 Municipalities, 11 Sub- metropolitan Cities and 6 Metropolitan Cities.(9)

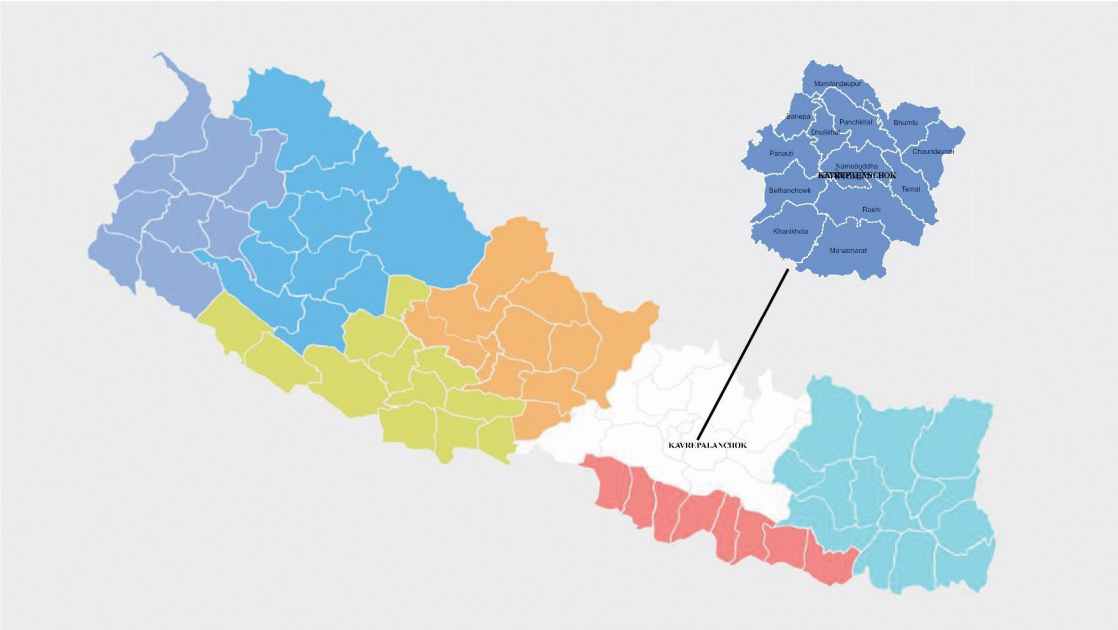

Figure 2 Map of Kavrepalanchock District in Nepal.

There are 77 administrative districts in Nepal. According to the national Population Census 2011, the annual growth rate of population is 1.35 percent and the total population has recorded about 26.5 millions with gender ratio 94.2. The preliminary estimate of GDP per capita at current price stands at NRs. 117455 (US$ 1034) for the fiscal year 2018/19.(28)

Among different seven provinces of Nepal, Kavrepalanchock district lies in the Bagmati province of Nepal. It's very close and attached with the Kathmandu valley and about 25 Kilometer far from the capital city Kathmandu. There are 13 local levels in Kavrepalanchock district, among these 6 are municipalities and 7 are rural municipalities.

Study Design

Study design of this thesis was quantitative, non-experimental, retrospective study based on time series analysis was done for analyzing the disease trend in the study area. The

2017 to 2019 national tuberculosis program reviewed data were obtained and analyzed in 2020 and drawn conclusion and recommendations provided based on the research findings.

Study Population and Unit of Analysis

The national tuberculosis program reviewed data in Kavrepalanchock district were the main source of used for this study. So populations under study were the registered TB cases in the study period in different DOTS centers of Kavrepalanchock district. Altogether 989 registered TB cases of different types excluding the transfer in from other districts were studied.

Study Variables

Although various variables were observed and discussed from the collected data, the Age, gender, local level of habitat etc were considered as predictor variables while tuberculosis incidences were considered as response variable.

Method of Data collection

The secondary data was collected in official manner. Three years (2017-19) national tuberculosis program reviewed data acquired from National Tuberculosis Center (NTC), Nepal. These data were primarily collected for TB program recording and reporting by each TB treatment centers and used for program monitoring by local level, province and federal authorities.

Tools for Data collection

A formal request letter was sent to through email to the NTC and contact person to acquire required data set. Before and after sending the email regular communication with the contact point in NTC was done.

Data analysis methods and tools

When data was acquired through email from the NTC contact point, the completeness and any observable errors were inspected thoroughly. An email was sent to the NTC through the contact point to be clear on these issues. Further organization and analysis of received was succeeded through computerized system. Review of published articles, policies, reports and guidelines were done to discuss and triangulate the findings. The list of reviewed secondary literatures were cited and listed in the references section of this thesis report.

Microsoft Excel was used to analyze the data; similarly, the mendeley desktop software was used to update the references and citation.

The Chi Square test was done to test the hypothesis at 95 % CI,

The relationship of gender wise TB trend with studied years was tested with the computation of Chi- square test (test of goodness).

Chi-square ($\chi 2$) test

A chi-square test for independence, also called Pearson's chi-square test of association is used to see whether distributions of categorical variables differ from each other.

The chi-square test statistic is calculated by using the formula;(28)

$$\chi^2 = \frac{\sum(O_i - E_i)^2}{E_i}$$ With K-1 dif (K is categories)

Where, O_i represents the observed frequency

E_i is the expected frequency under the null hypothesis and computed by

$$E = \frac{\text{row total X column total}}{\text{sample size}}$$

It is recommended to compare the value of the test statistics to the critical value of χ^2_α with the degree of freedom= (r-1) (c-1), and reject the null hypothesis if $\chi^2 > \chi^2_\alpha$
r = number of rows and c= number of column.

Inclusion and Exclusion Criteria

All the registered TB cases in Kavrepalanchock district from 2017 to 2019 (FY 2017, 2018 and 2019) were included in the study. Those cases registered and started treatment in other districts and sent to Kavrepalanchock district for completion of course of treatment are registered as transfer in and those cases were excluded in the study. Hence 24 transferred in cases in the study period were excluded.

Ethical Considerations

The researcher has accomplished the offline course as per the university requirement to conduct the thesis work following bio ethics and publication ethics. Additional ethical considerations including commitment to follow the good research practice was done with the graduate school of public health, Yonsei University.

CHAPTER: FOUR RESULTS

Risk Population, Expected Cases and Detected cases by Registration Categories

As TB is prevalent in all districts in Nepal with varied prevalence rate, the target population is considered as risk population.

Table 1 Target Population and TB Registration Category

Parameters		**2017**	**2018**	**2019**
Risk Population	Total	395125	397518	401643
	0-14 yrs	119728	118722	116528

TB Expected Cases	PBC(50% of All Forms)	293	294	297
	PCD (30% 0f all forms)	175	176	178
	EP (20% of All Forms)	117	118	119
	All Forms TB Cases	**585**	**588**	**594**
	Retreatment (15% of	44	44	45
Registered TB Cases	PBC New Cases	156	157	159
	PCD New Cases	41	18	27
	EP New Cases	126	115	112
	Relapse Cases	29	22	20
	Retreatment other than	1	5	1
Total TB Cases registered Excluded		**353**	**317**	**319**
	Transfer in	10	9	5
Total TB Cases registered Included		**363**	**326**	**324**

Table 1 explained the targets Population, TB expected cases and different registration categories of the study area, which demonstrated that three years total target population was almost the same ranging from 3.95 2 to 4.02 million 2017 to 2019, expected TB cases target was in similar trend with the target population provided by DoHS/ NTC, government of Nepal.

Altogether 989 registered TB cases were studied, from the quarterly reviewed data received from NTC, transfer in cases (n=24) were excluded. Registration Category was found predominance of PBC cases (n=156, 157 and 159) followed by EP (n=126,115, 112) respectively in three years. The higher relapse cases were reported in 2017 (n= 29), followed by 2018 (n=22) and 2019 (n=20). The higher the EP cases might be due to referral sites located in the district. There is high trust to Dhulikhel Hospital to the clients on diagnosis of health problems including Tuberculosis.

Gender, Treatment Categories and Age Distribution

Table 2 Gender, Treatment Category and Age Distribution of TB Cases

Parameters			**2017 (n=353)**	**2018 (n=317)**	**2019 (n=319)**
Type of Cases	New	Female	124	87	95
		Male	199	203	203
	Retreatment	Female	8	7	8
		Male	22	20	13
	All	Female	132	94	103
		Male	221	223	216
Treatment Category		Adult Category I	315	290	283
		Adult Category II	30	19	21
		Child Category I	5	2	8
		Child Category II	0	0	1
		Child Category III	3	6	6
Child Adult Proportion		Child	8	8	15
		Adult	345	309	304
Age Group (Among New and Relapse Cases)		0-15	19	8	21
		15-65	284	265	250
		65 and more	49	39	47
		All Age Group	352	312	318

Table 2 reflects the trend of disaggregated data on gender and treatment type, treatment categories, age distribution of registered TB cases from 2017 to 2019 in study area. Male predominance were reported with highest case in 2018 (n= 223), followed by 2017 (n=221) and 2019 (n=216), new female cases were more in 2017 (n=124) followed by 95 in 2019 and 87 in 2018, relapse cases were also found more in male population, maximum in 2017 (n=22) and minimum in 2019 (n=13).

Adult treatment categories are classified into two categories as CAT I and CAT II whereas child are classified into three categories; CAT III are for only children as per NTP in the study period reporting system. Most of the cases were categorized on CAT I in adult and CAT I and CAT III in child group. The child adult ratio was found highest

0.05 in 2019, followed by 0.03 in 2018 and 0.02 in 2017. Child adult ratio has reflected an increasing trend in child cases. Although the reported total TB cases were decreased from 2017 to 2019.

There is the system of age group reporting in various age groups, 0-5 yrs, then 10 years interval up to 65 years and >-65 years. The prevailing reporting system captured the age distribution of new and relapse cases only. From the table 2, the majority of cases were found from 15-65 years age group, although the child cases and elder age group also hold a significant quantity of cases.

Form of Referral and Diagnosis for TB Diagnosis

In study period, there is specific guided system of recording and reporting of NTP, which contains various forms, reports and recording reporting procedures in monthly basis. The Tuberculosis Treatment Register (HMIS 6.5 A) comprises three columns for recording the form of referral as "Referred by Community or Private or, Contact Tracing" and hence reported accordingly.

Table 3 Form of Referral and Diagnosis for TB Diagnosis (2017-2019)

Parameters		2017	2018	2019
Referred By Community	PBC New	30	30	32
	PBC Relapse	3	1	1
	PBC except new and relapse	6	0	0
	PCD	16	2	4
	EP	37	19	9
	No of Cases	92	52	46
	Percentage	26.06	16.40	14.42
Referred By	PBC New	22	32	55

Private	PBC Relapse	11	4	3
	PBC except new and relapse	5	1	2
	PCD	53	9	15
	EP	91	58	68
	No of Cases	182	104	143
	Percentage	51.56	32.81	44.83
Referred By Contact Tracing	PBC New	2	7	9
	PBC Relapse	1	3	0
	PBC except new and relapse	0	0	0
	PCD	1	0	0
	EP	3	0	0
	No of Cases	7	10	9
	Percentage	1.98	3.15	2.82
Total by all of three	No of Cases	281	166	198
	Percentage	79.60	52.37	62.07

Early detection of TB is very important, which is facilitated by well established referral system from community to diagnostic centers, the active case finding and referred by self has been missed by the TB reporting system in Nepal in the study period.

Table 3 clarifies the referral and diagnosis trend of TB by Community (community level health facilities and FCHVs), private sector and contact tracing in the study period, altogether 65.22 % (n=645) were reported referred and diagnosed by those methods. In overall, 43.38 % were diagnosed by private sectors, which was due to a higher proportion of PCD and EP cases diagnosed by private sectors. In the same time the diagnosis of PBC cases was found mostly by referral from the community. The proportion of referral by contact tracing was only 2.63 in the three years. TB cases except referred/ diagnosed by

community, private sectors and contact tracing fall in self referral and active cases, that's proportion was found 34.78 %.

Major Case Detection Indicators

Trend of Major Case Detection Indicators

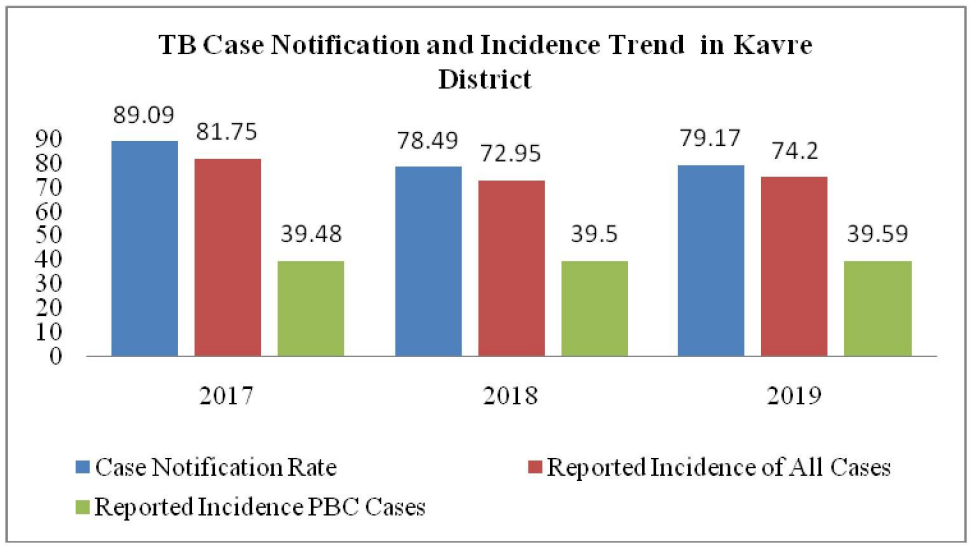

Figure 3 Case Notification and Incidence Trend from 2017 to 2019

Figure 3 explained the CNR, Reported incidence of all types and Reported incidence of PBC TB trend in studied years in Kavrepalanchock district, Nepal. The figure illustrated some of variation was found in CNR and incidence of all types of TB in contrast that mostly similar reported incidence of PBC cases.

Case notification rate (CNR) of Kavrepalanchock district based on the quarterly reviewed data was found 89.09, 78.49 and 79.17 per 100,000 risk population in 2017, 2018 and 2019 respectively. Figure 2 reflects the similar reported incidence of PBC cases in study periods 39.48 – 39.59 per 100,000 risk population in the study period.

Table 4 Major Case Detection Indicators

Indicators	2017	2018	2019
Case Notification Rate	89.09	78.49	79.17
PBC new case percentage	44.19	49.53	49.84
PCD new case percentage	11.61	5.68	8.46
EP new case percentage	35.69	36.28	35.11
Retreatment case percentage	8.50	8.52	6.58
New Case Ratio (PBC: PCD)	3.80	8.72	5.89
New Case Ratio (PBC: EP)	1.24	1.37	1.42
Child Adult Ratio	0.02	0.03	0.05
% of Cases Referred by Community	26.06	16.40	14.42
% of Cases Referred by Private Sector	51.56	32.81	44.83
% of Cases Referred by Contact Tracing	1.98	3.15	2.82
% of Cases Referred by Other than above method	20.40	47.63	37.93

Table 4 explained the CNR, PBC, PCD, EP case proportion and child adult ratio and % of referral and diagnosis by various methods in Kavrepalanchock District in the study period. The table 4 illustrates that proportion of PBC new cases among all (excluding transfer in) cases were nearly comparable percentage; 49.84% in 2019 followed by 49.5 and 44.19% in 2018 and 2017 correspondingly. Similarly, PCD new cases proportion reflected a higher proportion 11.61 % in 2017; and least 5.68% in 2018. The EP new cases proportion ranges from 35.11 % in 2019 to 36.28 % in 2018.

A higher EP case proportion (>35% among new and retreatment all cases) was reported. PBC: PCD case ratio remained diverse in the study period, ranges from 3.8 in 2017 to 8.72 in 2018; adult child case ratio was highest in 2018 and lowest in 2019. In this study, majority of the cases were found referred by private sectors in all three years (32.81% in

2108, 44.83 % in 2019 and 51.56 % in 2017)and only a few were found diagnosed by contact tracing (1.98% to 3.15%).

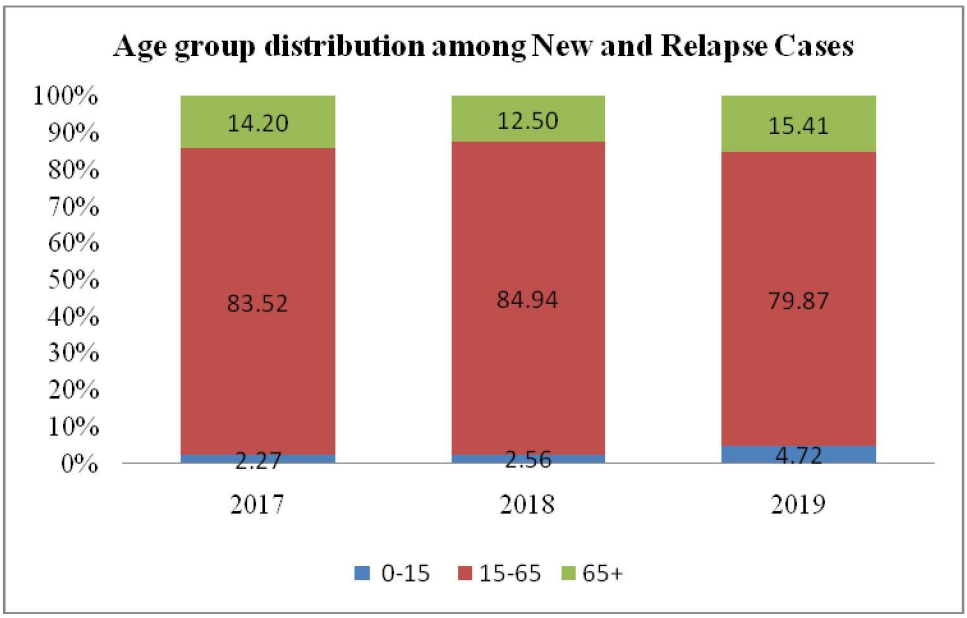

Figure 4 Age group distribution among new and relapse cases in Kavre District

TB was found a serious problem in all age groups, with at least 12.5 % of total new and relapse cases each year in elder population > 65 years, the child case proportion remained within 4.72 % in 2019, 2.56 % in 2018 and 2.27 % in 2017. The study findings further expresses predominant cases were reported from 15 to 65 years age group, 79.87 % in 2109, 83.52 % in 2017 and 84.94 % in 2018.

Table 5 Gender wise Detected and Target TB cases

Year	Female		Male	
	Reported (O)	Target (E)	Reported (O)	Target (E)
2017	132	195	221	390
2018	94	196	223	392

2019	103	198	216	396
Total	329	589	660	1178
Chi Square	346.93			
Table Value	5.991			

Based on the national accepted gender ratio of TB cases (M:F= 2:1), the targeted TB cases (E) were assumed. The Chi-square test was applied to test the hypothesis; relationship between gender and the trend of tuberculosis in studied years. The calculated Chi-square value 346.93 was found higher than the tabulated value in 95 % CI 5.991. Therefore the null hypothesis is rejected and alternative hypothesis is accepted. There was found significance relation between the reporting year wise TB cases and gender wise TB cases.

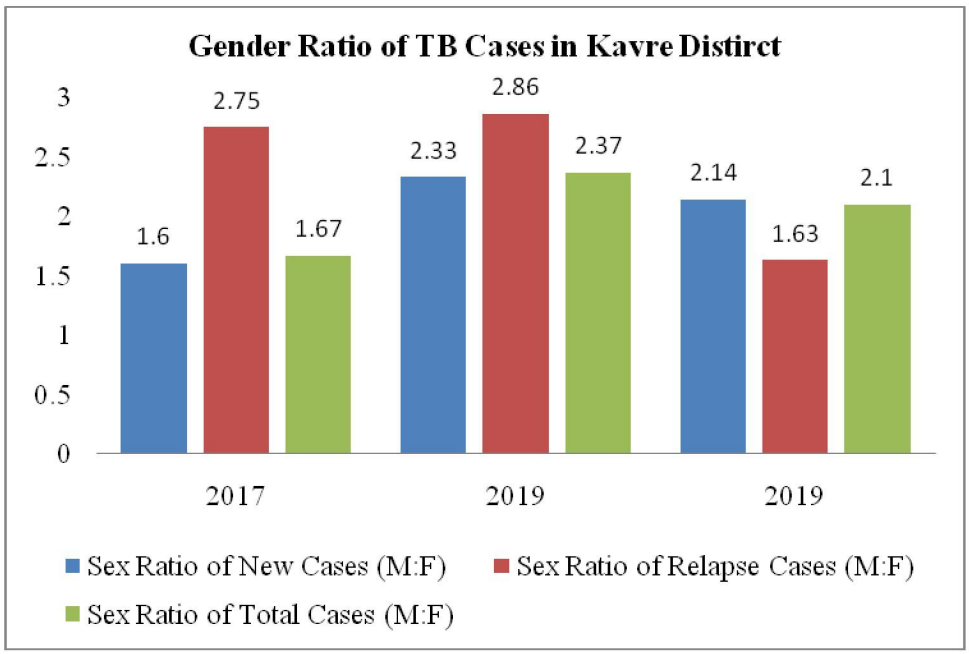

Figure 5 Trend of Gender Ratio of TB Cases

From the above figure the gender ratio of new and relapse TB cases (M: F) was found 1.67 in 2017, 2.1 in 2019 and 2.37 in 2018 with higher the gender ratio among relapse cases showed more males retreated for TB treatment.

CHAPTER FIVE: DISCUSSION

Tuberculosis is a major public health problem in Nepal. According to the WHO estimates that around 45,000 people develop active TB every year in Nepal. Nearly 50 percentages of them are estimated to have infectious pulmonary disease and can spread the disease to others.(29)

The case notification rate of Kavrepalanchock district was 89.09, 78.49 and 79.17 in 2017, 2018 and 2019 (2017, 2018 and 2019) respectively from new and relapse cases, which is lower than the national level. The CNR of all forms of TB in Nepal is 112/100,000 whereas CNR for incident TB cases (new and relapse) is 109/100000 population. (18)(17) The finding The TB incidence has geographical variation with higher occurrence in the city and highly dense populated areas; TB incidence is higher among densely populated metropolitan cities, such as Kathmandu, Banke, Bhakthapur, Chitwan, Dang, Jhapa and others. The highest incidence was in Banke followed by the capital city Kathmandu. (30) The reported CNR of Tuberculosis found to be varied from province to province, highest 127 in Sudurpaschim province, followed by Bagmati province 123 and least is 89 in Province 01.(6)

Despite of estimated higher CNR in study area, the reported CNR was found lower and in decreasing trend. It may be due to various reasons; migration to the Kathmandu valley. In recent years there were observable gaps in the compliance to the Tuberculosis case detection procedures by the community health workers, which may contribute lower case findings.

Regular accessibility of trained service providers and equipment for TB detection is necessary. Awareness raising and collaboration with private and social sectors (traditional healers, teachers, local leaders etc) can support to increase the CNR.(20)

The reported incidence of tuberculosis was found 81.75 in 2017 and 72.95 in 2018 and 74.20 per 100,000 risk population in this study; which revealed that incidence of tuberculosis is slightly decreasing. It demonstrates Kavrepalanchock district as an average

CNR reporting district in Nepal. Among 77 districts, 22 districts had CNR more than 120, while 29 districts had CNR between 75-120 and remaining 26 districts had below 75 CNR.(18) The TB burden with the prevalence rate has found higher in hill and Terai low land than mountain and Kathmandu Valley.(19) Hence the TB control program should be highly prioritized to all over the country.

Current interventions includes facility based and CB-DOTS program throughout the country, public private partnership in TB case detection and treatment with endorsement of PPM guidelines, advocacy communication and social mobilization (ACSM), strengthen the community support system programs etc needs to be continued.(17)(7)

The study found quite lower estimated PBC cases among registered cases in 2017 and 2018. Similarly the PCD new case proportion was found lower than provided target; 11.61 %, 5.68% and 8.46% in 2017, 2018, and 2019 respectively. EP new case was found clearly higher than estimation. The higher the PBC: PCD ratio signifying missed PBC cases in the community needs intensive case finding and contact tracing initiatives.

A survey done in Banke district (n=307) revealed PBC proportion 45.3% PCD proportion (previously reported as sputum –ve TB) 44.3% and EP proportion 10.4%. (23) Where as 71% of among all TB cases were pulmonary TB and out of them, 80% were bacteriological confirmed TB in Nepal.(8) (17)

The high EP cases were found coincided with the similar districts findings in Nepal (6), further investigation is needed in this regards.

The retreatment case among all types of TB was within estimated proportion (within 10 % of PBC new cases).The retreatment case proportion was 8.50 % in 2017, 8.52 % in 2018 and 6.58 % in 2019.

Gene Xpert detected more TB cases in recent years in Nepal. DOTS, essential for sustaining high TB treatment success rate, high trust in the service of government health facilities was found.(19) Some of specific interventions may need to make success and complete treatment registered in DOTS. Some of these are providing food by family members, relatives and community member thus encouraged to complete treatment and

sometimes they are also financially supported, mostly their treatment may be interrupted in continuation phase due to discontinuation of regular income and other socio economic causes.(20)

The higher the gender ratio (M: F) among relapse cases showed more males retreated for TB treatment, which is due discontinuation of treatment, treatment failure or reoccurrence of disease. This may leads to higher communicability, complications, MDR and death among male population. There was a relation between the year wise and gender wise TB cases in the study period.

Higher male TB cases was found is similar study done in Nepal in 2010; which suggested more male were infected but in total the trend is decreasing and a higher rates was in the Terai belt and urban zones suggesting to focus on these areas for the tuberculosis program interventions in coming days.(25) Similarly a gender ratio(M:F) 1.44 was found in Banke district in Nepal(23) A 67 % male TB proportion was reported in Karnali Province, Nepal.(6)

The determinants of high TB notification among male was related with involvement of risk behaviors like high alcohol consumption and smoking in male population, in contrast there may be higher missed female TB cases in the communities due to minimum service coverage to female due to socio- economic causes like low education level and financial barriers in the families in Nepal.(3)

The causes of discontinuity of TB patients in Russian federation found the substance and alcohol abuse, in these groups of of Russian TB patients, substance abuse was a strong predictor of non-adherence and default. (31) A study done in National Tuberculosis Centre , Bhaktpur Nepal revealed that there was a significant association between developing MDR TB with prior history of TB, a smoking habit, social stigma, knowledge of MDR TB and knowledge of DOTS Plus. (24) The chance of developing MDR can be reduces by various approaches; the proper counseling, health education and patient monitoring and emergence of MDR-TB has the potential to be a serious public health

problem in Egypt that needing strengthened TB control and improved continuous monitoring.(32)

There was a system of three treatment categories (regimen) among child TB cases in past. Children are no longer classified as category I or category II regimens. In child TB cases, the current single treatment category is 2 months intensive phase of daily Rifampicin, Isoniazid, Pyrazinamide, Ethambutol and 4 months continuation phase with Rifampicin and Isoniazid.(16)

The age distribution of TB cases was found more predominant cases from 15-65 years age group minimum 79.9 % in 2019. The share of senior citizens (65 years + age) among registered TB cases was remarkable with at least 12.5 %, with a higher proportion 15.4% in 2019. The pediatric cases (<15 yrs of age) proportion was less than five percentage in year suggesting a higher child TB cases.

The recent program analysis in Nepal suggests 28-30 % TB expected cases were missed and undiagnosed within the country.(6) In contrast with this data, this study revealed a higher missed cases in the study area (39.66 % in 2017- 46.30% in 2019).

A study done in Banke district Nepal disclosed 10.4 % of child case, 70.7 % of 15-54 yrs case and 18.9 % of 55 yrs and older age group.(23) The pediatric case proportion is half with compared to the Africa region (13%) and twice than the American region (2%), global age distribution of TB cases suggested that the proportion TB cases rises with age the in all regions exception of the WHO Europe and Americas regions, exceeds 50% in the oldest age groups.(33) The large share, 48% of reported TB cases in Nepal were from 15- 44 years age group, with top TB reporting age group 15-24 years followed by 65 years and older. The reported child TB case proportion was maximum 15 % in Karnali province and minimum 4% in Bagmati and Gandaki Province with national average 5.5%. (6)

In this study, majority of the cases are found referred by private sectors in all three years and only a few were found diagnosed by contact tracing; in the study period the system of self referral and active case findings were missed to report in this column. The high

diagnosis rate by private sector was mostly due to lack of referral government hospitals in Kavrepalanchok district. A different finding that majority of patients were self referred for tuberculosis treatment and include visit in both private and public providers, once tuberculosis is suspected referral for diagnosis and treatment and is prompt giving emphasis of the private practitioners in the patient routes, quality improvement initiatives need to address both private and public health providers.(21)

Tuberculosis is major burden of public health problem in Nepal and is in progress towards achieving the targets of TB control program by implementing various interventions like facility based and CB-DOTS program throughout the country, public private partnership in TB case detection and treatment with endorsement of PPM guidelines, advocacy communication and social mobilization (ACSM), strengthen the community support system programs etc.(17)(7)

All the three layer of governments need to give priority to TB control program in Nepal. The Provincial health directorate, Health office (formerly known as district health office) and local level governments are planning, coordinating and implementing the different activities in provincial, district and local TB control and treatment related activities to meet the target in Nepal.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

Conclusion

A quantitative trend analysis of TB case detection indicators and various variables like gender, age distributions, registration category, treatment category and mode of referral and diagnosis of Kavrepalanchock district were discussed and explored based on the quarterly reviewed data obtained from Ministry of Health and Population NTC, Nepal from 2017 to 2019.

Tuberculosis burden is varied in different parts of Nepal. During this study, the total target population provided by MIS section, DoHS is considered as risk population. The expected TB cases were in similar trend with the target population. A total 989 registered TB cases were studied excluding transfer in cases (n=24).

The CNR of Kavrepalanchock district was 89.09, 78.49 and 79.17 per 100,000 risk population in 2017, 2018 and 2019 respectively. The reported incidence of PBC cases in study periods was 39.48 – 39.59 per 100,000 risk population. The proportion of PBC new cases among all (excluding transfer in) cases was nearly similar and nearly equal to expected 50% proportion. Similarly, PCD new cases proportion ranges from maximum 11.61 % in 2017 and minimum 5.68% in 2018. The EP new cases proportion was clearly higher than the expected proportion. The current trend has not been matched with the expected 30 % PCD and 20 % EP cases in Kavrepalanchock district Nepal.

The adult child case ratio was within the expected range (10% maximum) and has been increasing in each studied years. TB is prevalent in all age groups, with at least 12.5 % of total new and relapse cases each year in elder population > 65 years. The predominant cases were reported from 15 to 65 years age group, 79.87 % in 2019, 83.52 % in 2017 and 84.94 % in 2018; economically active people covered by this age group.

The gender ratio (M: F) of new cases was at least 1.6 in each year, which is lower than gender ratio in relapse cases. The test result from Chi-square test in 95 % CE suggested

some relationship between gender and number of TB cases in the studied years. The higher male relapsed may be associated with various reasons like, poor counseling, case holding, alcoholic habits, smoking behaviors, neglecting habits etc.
The majority of cases were found referred by private sectors in all three years and only a few cases were diagnosed by contact tracing.

Recommendations

Following Recommendations for improving the national TB Control program in Nepal are provided after this study.

Recommendations for Policy Improvement:

- Policy should be endorsed for mandatory TB cases reporting and surveillance.
- The policy regarding asset's right to female should be implemented as per law.
- The DOTS implementation status should be reviewed and revise DOTS policy to reduce its hindrances.

Recommendations for Services Improvement

- Health education and awareness should focus hard to reach and high risk groups including female populations.
- Risk reduction program should be implemented to high risk groups including male populations.
- A special care to all TB cases should be provided in intensive phase to reduce the discontinuation of treatment.
- Special attention should be given in treatment of child, senior citizens, disabled, pregnant and other TB cases with chronic illness.

Recommendations for Case Detection

- The microscopy centers should be established and extended in all local level and hard to reach areas to detect missed TB cases focusing female and child cases.
- A high priority should be given for contact tracing as per national guidelines.
- The capacity of local health workers and volunteers should be developed to identify the high risk and possible TB cases.
- The non health stakeholders should be engaged for improving case detection rate.

Recommendations for Reporting System

- The reporting system should be reformed to computerized system from paper based system.
- The reporting forms and format should be revised to capture essential element for reporting.
- All level of health facilities and workforce should follow the recording and reporting guidelines provided by NTC/ MIS section.

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