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Knowledge and Perception of healthcare professionals on the origins and control of Multidrug-Resistant Tuberculosis outcomes in Sindhupalchowk district of Nepal.

Abstract

Background Multidrug-resistant tuberculosis (MDR-TB) is globally growing as one of the biggest challenges in the public health sector, including in Nepal. MDR-TB is caused by bacteria resistant to anti-TB drugs, transmission from person to person, or ill-treatment. Many studies have been done to figure out the possible ways that could help to control MDR-TB in Nepal, but the knowledge and perception of healthcare professionals there on MDR-TB are not well documented. Healthcare professionals are crucial to the global fight against MDR-TB. Therefore, further exploration of the knowledge of healthcare professionals' understanding of MDR-TB will help Nepal to understand the current MDR-TB presence in the country. ***Objectives*** The study aimed to investigate the knowledge and perceptions of healthcare professionals about the origin and control of MDR-TB cases in the Sindhupalchowk district of Nepal. This study also investigated the knowledge of healthcare professionals concerning barriers to MDR-TB control in Nepal and their prior experience treating MDR-TB patients. ***Methods*** A qualitative research study was conducted using in-depth interviews and FGD. In-depth interviews were conducted primarily with higher-ranked officers such as directors, monitoring, and evaluation officials etc. Out of 10 participants, 8 were government staff and 2 were INGO staff working in the sector of tuberculosis. FGD was conducted with 9 health posts incharge in the Sindhupalchowk district. ***Findings*** Three key findings emerged from this study. Healthcare professionals' knowledge on MDR-TB and its emergence was one of the first discoveries. Healthcare professionals assigned three different definitions to MDR-TB and assumed three reasons for the emergence of MDR-TB. The second discovery revealed reasons for the increment in MDR-TB and was further divided into 3 categories. These 3 categories were patient-associated, healthcare professionals-associated, and health system associated. Patient-associated reasons were further divided into 2 subcategories, healthcare professionals-related reasons into 3 subcategories, and health system-associated reasons into 3 subcategories. The third discovery was MDR-TB control measures. The 9 MDR-TB control measures suggested by healthcare professionals were explained. ***Conclusion*** The study findings suggest valuable knowledge and perspectives held by healthcare professionals based on their professional experience on the emergence, increment, and control of MDR-TB in Nepal that might be applied to MDR-TB control strategies.

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Abbreviations

AHW	Auxiliary Health Worker
BCG	Bacillus Calmette-Guérin
CDC	Centres for disease control and prevention
CIOMS	Council for International Organizations of Medical Sciences
DOHS	Department of Health Services
DOTS	Directly Observed Treatment Short course
FCHV	Female Community Health Volunteer
FGD	Focus Group Discussion
HA	Health Assistant
HIV	Human Immunodeficiency Virus
IDI	In- depth interview
I/NGO	International/non-governmental organization
MDR-TB	Multidrug-resistant tuberculosis
MTBC	Mycobacterium tuberculosis complex
NLC	Nepal Law Commission
NSD	Norwegian Centre for Research Data
NTCC	National TB control center
NTP	National TB programme
PHC	Primary health care
PPE	Personal Protective Equipment
RR	Rifampicin-resistant
SAARC	South Asian Association for Regional Cooperation
SDGs	Sustainable Development Goals
TB	Tuberculosis
WHO	World Health Organizations

CHAPTER 1: INTRODUCTION AND RATIONALE

Introduction

Multidrug-resistant tuberculosis (MDR-TB) is globally growing to become one of the biggest challenges in the public health sector, mainly in low and middle-income countries. MDR-TB is a form of *Mycobacterium tuberculosis* that develops as a result of primary resistance or acquired resistance to TB treatment drugs (Isara & Akpodiete, 2015; WHO, 2019a). Nearly half a million global incident cases of MDR-TB were estimated annually by WHO in 2020 (Iacobino, Fattorini, & Giannoni, 2020); WHO (2019a), where only about one-third received drug-resistant TB treatment (WHO, 2021a). Healthcare professionals contribute greatly to the healthcare system and they ensure effective implementation of the MDR-TB control program (Alene et al., 2019).

MDR-TB, caused by bacteria resistant to anti-TB drugs and by ill-treatment, has a high treatment cost and thus possesses a life-threatening risk. According to WHO, "Multidrug-resistant TB is such TB caused by bacteria that is resistant to two types of powerful anti TB drugs called rifampicin and isoniazid. These two drugs are the most effective first-line drugs. This type of disease thus requires treatment with a second-line regimen" (WHO, 2019a). Some people suffer from drug-resistant TB when bacteria resist two TB treatment drugs or when drug-resistant organisms transmit from person to person (Bhering & Kritski, 2020). Other factors contributing to the development of MDR-TB can be incomplete and inadequate treatment adherence (Jain & Dixit, 2008). The treatment of MDR-TB takes long, requires more expensive drugs (≥US$ 1000 per person) and shows numerous side effects (WHO, 2021a). Inappropriate management while treating and curing MDR-TB patients without experts may result in fatality (CDC, 2016).

Healthcare professionals are integral to the global fight against MDR-TB (Ibrahim et al., 2014). According to WHO "Healthcare professionals are those who study, advise on or provide preventive, curative, rehabilitative and promotional health services to health problems" (WHO, 2010a). Healthcare professionals remain with the patient from the moment MDR-TB is diagnosed until the end of the treatment. Additionally, they work closely with the patients and their families to educate them about MDR-TB and its treatment (Ibrahim et al., 2014).

Moreover, healthcare professionals give emotional support to patients to help in their overall rehabilitation, which includes their physical, emotional, and mental well-being (Chalco et al., 2006). Healthcare professionals' strengths and skills are desirable to control MDR-TB and to achieve Sustainable Development Goals (WHO, 2021b).

In Nepal, healthcare professionals' understanding of MDR-TB and its impact on MDR-TB control has not been well documented. Further exploring knowledge of healthcare professionals' understanding of MDR-TB will help Nepal fully comprehend the current MDR-TB presence in the country. This study intends to explore the knowledge and perception of healthcare professionals on the origins and control of Multidrug-Resistant Tuberculosis outcomes in the Sindhupalchowk district of Nepal.

Rationale

According to WHO, 127 out of 100,000 people in 2020 were diagnosed with TB, which accumulates to approximately 9.9 million TB cases worldwide. Among the total recorded TB cases, 132,222 were of MDR/RR TB. Only one in three people of the total cases of MDR/RR each year received treatment (WHO, 2021a). A high proportion (43%) of the total TB cases occurred in the WHO regions of South-East Asia, and the majority of the TB incident cases (86%) were recorded in 30 high TB burden countries such as Indonesia, South Africa, Bangladesh, India, China and Nepal. Nepal falls in the list of 30 high MDR/RR TB burden countries to be used by WHO in the period 2021-2025. (WHO, 2021a) National Tuberculosis Control Center (NTCC) estimates about 1,500 MDR-TB cases annually in Nepal, but due to limited capacity, only about 350 to 450 MDR-TB cases are diagnosed (Cousins, 2018; DOHS, 2021). There have been various biomedical public health policies such as DOTS (Directly Observed Treatment Short course) (the mid-1990s), DOTS Plus (2005), GeneXpert machines installation (2010), and End TB strategy (2015) to increase Nepal's capacity to combat and prevent MDR-TB (Dixit et al., 2021; Macdonald & Harper, 2019). However, despite intensive efforts to cure TB-infected people in Nepal, only a limited number of people actually have access to proper treatment. In fact, only 384 MDR-TB patients were recorded for treatment in MDR-TB centers in 2019/2020, and 17% of those 384 cases are treated in Bagmati province. Bagmati province, where the Sindhupalchowk district lies, was reported to have the greatest proportion of TB patients (24%) and the highest burden of pre-XDR and XDR TB cases. (DOHS, 2021; NTCC, 2019b)

The MDR-TB crisis remains a massive public health concern for Nepal, despite intensive medical efforts to combat and prevent TB. It can thus be realized that biomedical interventions alone are not sufficient to control TB cases. Other factors should be addressed urgently if TB is to be effectively controlled in Nepal.

Acquiring knowledge on Tuberculosis control is crucial for healthcare workers. Healthcare workers with good knowledge and skills are essential for the diagnosis of TB at an early stage and for appropriate management of those cases. This will facilitate better health outcomes for patients and prevent the transmission of the diseases Alotaibi et al. (2019) whereas knowledge gaps in health service providers hinder tuberculosis control (Banda et al., 2014). There, incomplete or improper information received from healthcare workers can develop negative perceptions that are detrimental to the health-seeking behaviour of patients which can reduce the chances of complete treatment (Isara & Akpodiete, 2015). Even if a nation has a very good strategy to control MDR-TB, it is worthless without qualified health professionals. So, the knowledge of healthcare workers directly affects the management of MDR-TB cases.

Healthcare professionals' motivation towards work can bridge the healthcare gaps in their communities. A motivation to provide high-quality care to patients is associated with a healthcare professional's perception (Willis-Shattuck et al., 2008). "Being acknowledged and respected may promote a client's recovery" (Eriksen, Arman, Davidson, Sundfør, & Karlsson, 2013). This statement clearly states that healthcare workers are affected by their self-emotions. Their perception thus plays a vital role in the management of diseases like MDR-TB.

Although it is known that MDR-TB is a massive public health concern in Nepal, and despite intensive efforts to control the spread of TB in the country, control of TB remains a major public health challenge in Nepal. Other alternatives to control MDR-TB apart from medical effort thus seem important. One of these factors is the knowledge and perception of healthcare professionals in TB because it could bring control policies to work. However, to the best of my knowledge, healthcare professionals' knowledge and perception of TB have not been well-documented, especially in the context of Nepal. Studying their knowledge and perception of MDR-TB will provide real information on existing healthcare conditions regarding MDR-TB control in Nepal. This study will further provide information regarding the needs of specific healthcare programs in the future to build capacity to control MDR-TB.

This study aims to inform healthcare program formulators about existing knowledge and perceptions of healthcare professionals about MDR-TB, and it will serve as one of the decision-support testimonials for healthcare program formulators to develop plans and policies regarding capacity development to control MDR-TB in the future.

CHAPTER 2: BACKGROUND

Definition of TB and drug-resistant TB

Tuberculosis is a communicable disease caused by the bacillus Mycobacterium tuberculosis and may become drug resistant if left untreated. Before the Coronavirus (COVID-19) pandemic, TB was the most prevalent single infectious agent to cause death. Tuberculosis remained the foremost cause of death worldwide for a long period (WHO, 2021a).

TB disease develops when the immune system of a person afflicted with tuberculosis is unable to regulate the bacteria's growth. Otherwise, tuberculosis remains dormant, causing latent tuberculosis infection. However, if a latent tuberculosis infection is not treated, it might lead to TB disease. A person with a latent tuberculosis infection has no symptoms and does not transfer TB to others. TB patients, on the other hand, have symptoms that are dependent on the locations where the bacteria are developing. (CDC, 2016) Such TB patients can spread TB while coughing, talking, or sneezing by discharging bacteria into the air (WHO, 2021a). Though TB bacteria mostly attack the lungs, they can also harm the kidney, spine, and brain. Cough lasting 3 weeks or more-occasionally with blood, chest discomfort, weakness, weight loss, poor appetite, fever, and nocturnal sweating are some of the signs of TB (CDC, 2016). WHO has pointed out five main threats responsible for new TB cases malnutrition, HIV, alcoholism, smoking and diabetes (WHO, 2021a). A chest X-ray or a sputum sample is used to diagnose TB. TB can be cured if people follow the doctor's instructions and take the drug for 4, 6, or 9 months. If they do not, they may acquire drug-resistant tuberculosis (CDC, 2016).

Drug-resistant tuberculosis is divided into five categories by the WHO: isoniazid-resistant TB, rifampicin-resistant TB (RR-TB), multidrug-resistant TB (MDR-TB), pre-extensively drug-resistant TB (pre-XDR-TB), and extensive drug-resistant TB (XDR-TB). Isoniazid-resistant tuberculosis is a kind of drug-resistant tuberculosis in which individuals are solely resistant to the antibiotic isoniazid whereas RR-TB is resistant to only rifampicin

antibiotics. MDR-TB resists both isoniazid and rifampicin. TB that is resistant to rifampicin plus any fluoroquinolone is known as pre-XDR-TB. XDR-TB is a drug-resistant strain of tuberculosis that is resistant to rifampicin, fluoroquinolones, and at least one of the medicines bedaquiline and linezolid.(WHO, 2021a)

History of TB and MDR-TB

To know the epidemiology of MDR-TB in the present context it is necessary to know about the origin of TB and how it has developed into MDR-TB in the past. TB has a very ancient history that is associated with humans and animals.

It is believed that the genus Mycobacterium root was discussed 300 million years ago when the same ancestor of today's mycobacterium species began to live in parasitic forms by depending on the host for survival. Among other parasites, Mycobacterium tuberculosis complex (MTBC) and Mycobacterium lepare were responsible for most human diseases. MTBC which could cause TB includes M. Tuberculosis, M. africanum, M. bovis, and M. canettii. Among them, M. Tuberculosis is hosted by humans and M. bovis is hosted by animals. From a DNA sequencing study of M. Tuberculosis, it was found that M. Tuberculosis was older than M. bovis and M. africanum. From the horizontal transmission, M. tuberculosis was mutated from M. bovis which is present in cattle and goats, resulting in the creation of TB in humans. The situation resulted when people started to domesticate animals in about 9000 BC and started eating milk and meat as a source of protein. Humans developed TB in the gut and nearby lymph nodes as the primary sites of infection. (Bynum, 2012)

TB was a “death sentence” for many in the past (Kanchar & Swaminathan, 2019). In 2,400 BC, TB was seen in Egyptian mummies through molecular analysis of spinal columns (Lakhtakia, 2013). It was known by many names in history before it was named Tuberculosis, such as ‘Consumption,’ ‘Phthisis,’ ‘Scrofula,’ ‘King's evil,’ ‘White plague,’ and ‘Potts disease.’ Hippocrates ‘the father of medicine’ in classical Greece (460-370 BC) identified “phthisis” as a disease from which young people between eighteen and thirty-five suffered a lot. Greece's name “phthisis” was called consumption which means wasting and eating up of the body (Bynum, 2012; Thomas M Daniel, Bates, & Downes, 1994; Lakhtakia, 2013). The increasing disease made Hippocrates give a bold statement and warn his coworkers “to keep away from TB patients to preserve their professional reputation” (Lakhtakia, 2013, p. 486).

Hippocrates believed that TB was hereditary whereas Aristotle named TB as scrofula (384-322 BC) which was discussed for centuries and believed to be contagious (Cambau & Drancourt, 2014; Lakhtakia, 2013). Scrofula meant enlargement of the tubercular cervical lymph nodes and sometimes tubercular infection of bones (Lakhtakia, 2013). Scrofula was referred to as "King's Evil" in England and France throughout medieval times, and it was thought that patients would be cured by the "royal touch". The practice of King's touch on infected people continued for several years and was ended by George in 1714 in England. However, it was practised up to 1825 in France (Barberis, Bragazzi, Galluzzo, & Martini, 2017).

The concept of Aristotle was supported by Ibn Sina (980-1037 BC) "Father of early modern medicine" in his masterpiece "The Cannon of medicine" in the 18th century. He noted TB to be pulmonary TB which was communicable and could get transferred through the body fluids of the infected. He suggested quarantining TB patients to limit its spread .(I. Ali & Guclu, 2022; Lakhtakia, 2013) Later in the 19th century, TB was named "White plague" because the infected patients were extremely pallor. Oliver Wendall Holmes used this term to differentiate pallorness due to TB from other Plague. Dormandy (1999) stated that the term "white" was used because of its association with adults, holiness, and delicate spirit. He even named TB-infected women "terrible beauty." In the period of such a serious situation, tubercular facies were elevated to a poetic and romantic state by many poets and authors. There was a romantic poem named "sought to find beauty in the horror and melancholy of consumption" by Keats and Shelley. That poetry was also called "graveyard poetry." Johann Lukas Schönlein was the first person to use the term "Tuberculosis" in 1834, which was used later by Hermann Brehmer in 1853 as "Tuberculosis of the lungs" in his doctoral thesis. Brehmer also explained that Tuberculosis can be cured at an early stage. (Frith, 2014) He had gotten this and was cured after he went to the Himalayas for fresh air, water, and sunshine. This encouraged him and gave him the idea of the sanatorium treatment which was opened in 1854 in Germany. Rich people who could afford the treatment would travel to the sanatorium, which was in the Himalayas, while poor people had to die in their cold, unventilated room. (Frith, 2014; Lakhtakia, 2013) The concept emerged at that time of isolation, a house with good sun and air, bed rest, nutrition, and hygiene for patients is still prevalent in today's context (Lakhtakia, 2013). Later Villemin used the term tuberculose in 1865. On March 24, 1882, Robert Koch used the term tuberkulose, meaning Tuberculosis in English, after he discovered the causative agent Tubercle bacillus. For this, he achieved a Nobel Prize in 1905. Therefore, we still celebrate March 24 as "World TB Day." After that, x-ray was discovered by Wilhelm Conrad

Röntgen in December 1895. This achievement of Koch helped Clemens von Pirquet to develop the "Tuberculin Skin Test" in 1907. Later, Albert Calmette and Camille Guérin discovered the BCG (Bacillus Calmette-Guérin) vaccine in 1921, and Selman Waksman's discovered streptomycin in 1944. The new era of Tuberculosis treatment and control had come with the discovery of Isoniazid in 1952 and rifamycins in 1957. The prevalence of sanitoriums was diminished, and there was more focus on public health measures to prevent disease.(Al-Humadi, Al-Saigh, & Al-Humadi, 2017; T. M. Daniel, 2006; Frith, 2014; Lakhtakia, 2013; Tubiana, 1996) There was introduction of "triple therapy" (streptomycin, para-aminosalicylic acid and isoniazid) in 1952 which assured 90-95% treatment of patients if there was a continuous treatment for 24 months. Later in 1970, it was found that the use of isoniazid and rifampicin can reduce treatment duration from 18 to 9 months. In 1980, TB was found that adding pyrazinamide can reduce the duration to 6 months. (Iseman, 2002) In 1980, TB was declining in industrialized countries, and they were planning to eliminate it until Drug-resistant TB and its rapid transmission were found in New York. For instance, there was the re-emergence of the TB burden due to HIV, drug-resistance, and migration in both industrialized and non-industrialized countries. MDR-TB was taken as a serious problem in the early 1990s and thought to cause a high burden in Europe and Asia. XDR-TB was a huge problem since 2006 .(Borgdorff & van Soolingen, 2013)

Worldwide efforts to control TB

Year	Organization	Event
1980	International Union against Tuberculosis and Lung Disease	Establishes a model program to control tuberculosis in Tanzania
1991	World Health Assembly	Establishes the "70/85" targets (detect 70% of infectious cases of tuberculosis and cure 85% of the detected cases)
1993	WHO	Declares that tuberculosis is a global emergency
1994	WHO	Launches a new framework for controlling tuberculosis
1995	WHO	Launches DOTS as the official WHO strategy
1998	First ad hoc Committee on the Tuberculosis Epidemic (London Committee)	Establishes the Stop TB Initiative
2000	Stop TB Initiative	Produces the Amsterdam declaration, a call for action from

		20 countries with the highest burden of tuber culosis, and establishes targets to meet the United Nations' Millennium Development Goals
2001	Stop TB Partnership	Organizes six working groups and launches the Global Drug Facility
2001	Global Fund collaboration with Stop TB Partnership	Launches the Global Fund activities, the Millennium Development Goals, and the Washington Commitment
2002		Launches its Expanded DOTS Framework for Effective Tuberculosis Control and establishes DOTS as a brand name
2006		Launches the Stop TB Strategy, consisting of six components, including the revised DOTS strategy as the first component
2006	WHO	Launches the Global Plan to Stop TB, 2006–2015
2011	WHO	Launches the Global Plan to Stop TB, 2011–2015
2012	WHO	Addresses the issue of elimination of tuberculosis after 2015 with the Scientific Technical Advisory Group

Table 1 Tuberculosis control strategy over the several years by WHO – (Marais & Zumla, 2013)

Milestones of Tuberculosis control program in Nepal

Tuberculosis is a severe public health issue, with half of the population affected and thousands of people dying in Nepal. It is also one of the top 10 causes of death in Nepal (NTCC, 2019b). TB has a long history, and the Nepalese government has been attempting to control it for more than six decades. To diagnose and cure tuberculosis patients, the Government of Nepal has established different institutions for a long time. The Tokha Sanatorium (1937) for the isolation of TB patients, which could treat only 50 patients out of thousands of TB suffering people. Central chest clinic (CCC) (1951) was opened in Kathmandu, with the effort of Dr Y.R. Joshi which was later expanded to many other cities including Patan, Bhadgoan, Kalimati, Biratnagar, and Birjung. This clinic was also responsible for defaulter tracking and contact examination along with the treatment of the patients. TB control programme (1965) was established in June in conjunction with the Nepalese government, WHO, and UNICEF to provide preventative services such as BCG vaccination, case detection, training to healthcare workers, regular treatment, and medicine delivery. Patan survey was done by vaccinating people on a house-to-house basis in January 1966 to know the harmlessness of the BCG vaccine. The study found BCG vaccines could be given to those below the age of 14. For the implementation of the Tuberculosis program, NTCC (1989) was established in Bhaktapur. In the same year, Regional TB centre, Pokhara was established. (T. S. Malla, 2003; NTCC, 2021b) DOTS strategy, one of the most effective programs in the world was adopted in 1996

in Nepal. Later, Nepal adopted Stop TB Strategy in 2006 and the End TB Strategy in 2015. (DOHS, 2021).

NTCC is still a focal point for the implementation of the NTP (National Tuberculosis Program) which is also one of the priority programs of MOHP (Ministry of Health and Population). Now, NTCC in coordination with various public, private and partner organizations is trying to improve the NTP to meet the target of sustainable developmental goals and the End TB Strategy in Nepal, which states

SDGs Target 3.3	By 2030, end the epidemics of AIDS, TB, malaria and neglected tropical diseases, and combat hepatitis, water-borne diseases, and other communicable diseases.
WHO End TB Strategy	80% reduction in the TB incidence rate (new and relapse cases per 100000 population per year) by 2030, compared with 2015 2020 milestone: 20% reduction; 2025 milestone: 50% reduction 90% reduction in the annual number of TB deaths by 2030, compared with 2015 2020 milestone: 35% reduction; 2025 milestone: 75% reduction No households affected by TB face catastrophic costs by 2020

Table 2 Objectives of SDGs and WHO End TB - (DOHS, 2021, p. 165)

To meet this target NTP is implementing the following programs.

Social Protection Program by the National TB programme

1. Diagnosis and Treatment support

Most TB services are provided free of cost, but patients need to pay for X-Ray, other laboratory fees and indirect costs. Malnourished and ARI children presumed for TB get NPR 2000 for diagnosis and NPR 2000 for travel and accommodation to referral hospitals. Presumed DRTB cases get NPR 2000 for travel and accommodation for DST in GeneXpert sites in almost

40 districts of Nepal where there are no DR sites and no provision of sputum courier mechanism.

2. Nutritional and transportation support

   The NTP is providing NPR. 3000 per patient per month as nutritional and transportation support to DRTB patients.

3. Inpatient (Hostel-like) facilities

   There are 6 hostels and 1 DR home in various regions of the nation which provide food, lodging, treatment, and care to DRTB patients who need help during intensive and continuation phases of treatment.

4. Institutional services

   Nepal has practiced DOTS since 1996 and had nationwide coverage since 2001. It is one of the most effective programs to control TB and is run by public and private partners of NTP. There are various service sites run by NTP all over Nepal to diagnose and treat TB patients. There are 4,955 DOTS centers, 22 MDR-TB centers, 81 MDR-TB subcenters, 765 microscopy centers, 72 GeneXpert facilities, 2 culture labs DST, and 2 Line Probe Assay at the National Level up to 2019/2020.

   (DOHS, 2021; NTCC, 2019b)

NTP is having various short and long-term plans and programs to control TB under the guidance of global and national policies since its establishment. As the strategic plan (2016/17-2020/21) has ended, NTP has developed a national strategic plan for (2021/22-2025/26) as.

National strategic plan to end Tuberculosis in Nepal (2021/22-2025/26)

Vision

TB free Nepal by

Goal

Nepal has set a goal to decrease the incidence rate from 238 in 2020/21 to 81 patients per 100,000 population by 2025/26, decrease the mortality rate from 58 in 2020/21 to 23 per 100,000 by 2020/21, end TB by 2035, prevent TB by 2050, and reduce the catastrophic cost to zero.

Objective

1. To build and strengthen political commitment, sustainability and patient-friendly health systems to end TB.
2. To ensure the identification of TB, diagnosis, quality treatment, and prevention of TB.

Taken Vision, Goal and Objective from (NTCC, 2021a, p. 9)

Partner Organizations of the National TB programme in Nepal

1. Save the Children
2. SAARC Tuberculosis and HIV/AIDS Centre
3. World Health Organization (WHO
4. Birat Nepal Medical Trust (BNMT Nepal)
5. Japan-Nepal Health and Tuberculosis Research Association (JANTRA)
6. Bagmati Welfare Society Nepal (BWSN)
7. Kapilvastu Integrated Development Services (KIDS)
8. TB Nepal
9. Nepal Anti Tuberculosis Association
10. Health Research and Social Development Forum (HERD) and HERD International
11. Sahayog Samittee Nepal
12. International Organization for Migration
13. Damien Foundation Belgium Nepal.

(NTCC, 2019b)

National TB Prevalence survey (2018-2019)

The National TB Prevalence survey was done using WHO-recommended methods to know the actual burden of the diseases in the country. This is Nepal's first survey to gather such high-quality data which was completed in 2020. From the survey, it was known that 416 out of 100,000 people (Prevalence) counts around 117,000 people living with TB and 245 out of 100,000 people (Incidence) counts around 69,000 developed TB in 2018 in Nepal. Prior estimates of TB prevalence and incidence had both increased by 1.8 and 1.6 times, respectively. The annual incidence was found to decline by 3%, which was not enough to meet the end TB targets. Therefore, this prevalence survey provides information to plan better to achieve End TB targets.(DOHS, 2021)

Healthcare structure in Nepal

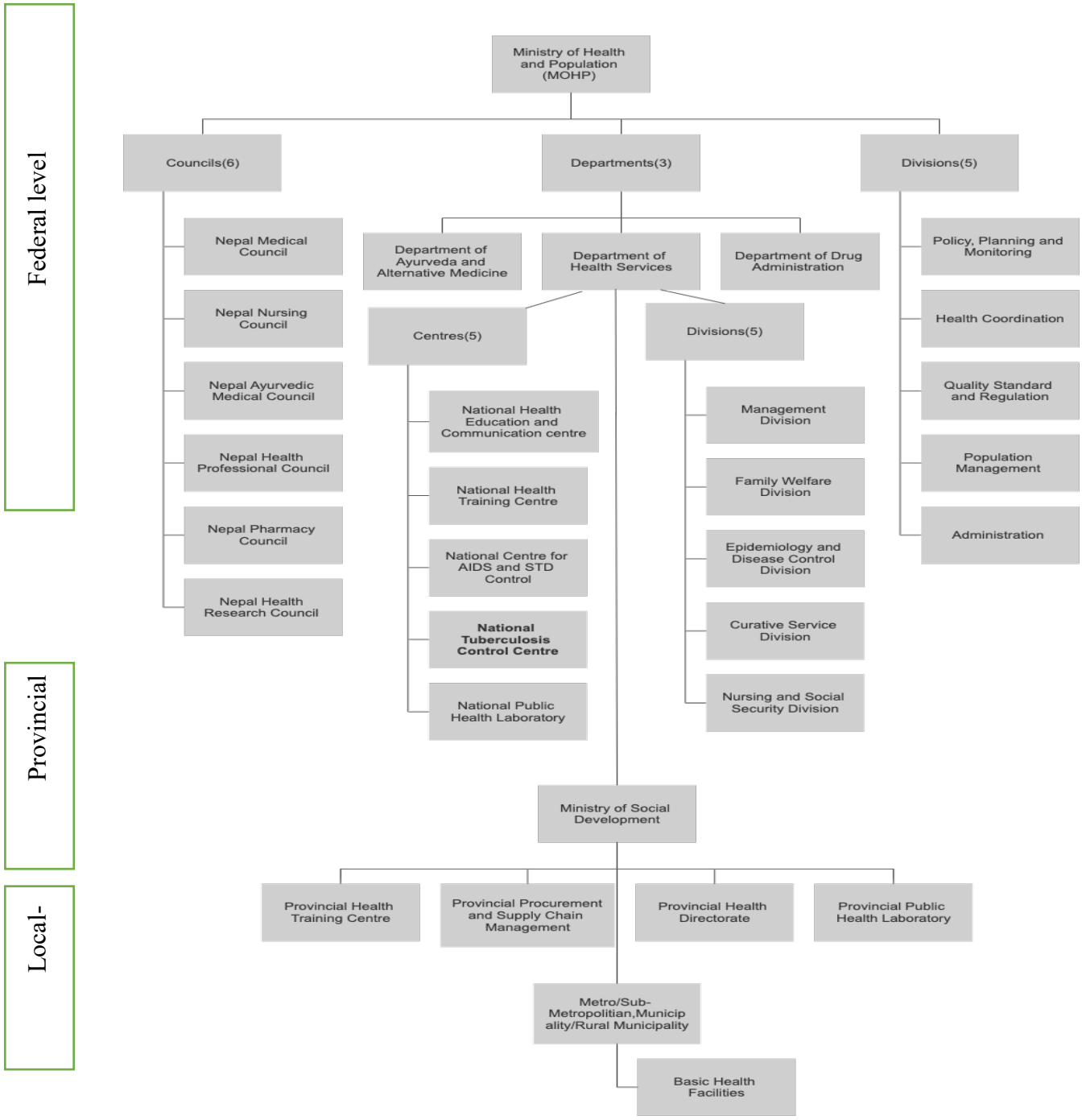

Figure 1 Organogram of the Nepal Health System

Manually crafted for the purpose of this study using data from (DOHS, 2021)

In 2015, the government system of Nepal was reformed from a unitary to a 3-level federal system. The federal democratic republic government has a federal level, 7 provinces, and 753 local governments. Based on these 3 levels, MOHP has also restructured the health system.

MOHP is the head of the health structure and is responsible for guiding all levels of health services. MOHP has 5 divisions, 6 professional councils and 3 departments. The 5 divisions of MOHP are the Policy, Planning & Monitoring Division; the Health Coordination Division; the Quality Standard & Regulation Division, the Population Management Division and the Administration Division. The MOHP 6 professional councils are Nepal Medical Council, Nepal Nursing Council, Nepal Ayurvedic Medical Council, Nepal Health Professional Council, Nepal Pharmacy Council and Nepal Health Research Council. MOHP's 3 departments are the Department of Health Services (DOHS), the Department of Ayurveda and Alternative Medicine (DOAA) and the Department of Drug Administration (DDA).

MOHPs first department, DOHS, has 5 centers and 5 divisions. DOHS's five centers are National Health Education, Information and Communication Centre (NHEICC), National Health Training Centre (NHTC), National Centre for AIDS and STD Control (NCASC), National Tuberculosis Centre (NTCC), and National Public Health Laboratory (NPHL). DOHS's 5 divisions are Management Division (MD), Family Welfare Division (FWD), Epidemiology and Disease Control Division (EDCD), Curative Service Division (CSD) and the Nursing and Social Security Division (NSSD).

At the provincial level, there is the Ministry of social development (MOSD), under which there are the Provincial Health Training Center, Provincial Procurement and Supply Chain Management, Provincial Health Directorate and Provincial Public Health Laboratory. At the local level, there are the Primary Health Care Center, Health Post, Urban Health Center, Community Health Unit, Female Community Health Volunteers and Primary Health care outreach Clinics.

The healthcare system of Nepal is provided by “11 central-level hospitals, 125 provincial hospitals, 77 health offices, 198 primary care centres, 3808 health posts, 374 urban health centres, 299 community health units, 59 other health units. Also, 11 974 primary health care and outreach clinics, 15 853 EPI/outreach clinics and 51420 female community health volunteers provide health services in Nepal ”. (NTCC, 2019b, p. 6)

Nepal public health sector professionals

Healthcare professionals play a crucial role to provide quality health services for the general population. They are also an important part of the health system. In Nepal, healthcare services are provided by the public and private sectors. In the public sector, there are health posts, sub-health posts, primary healthcare units, and hospitals. In the private sector, there are individual-based pharmacies, clinics, hospitals, and health centers. Healthcare professionals are also divided according to the private and public sectors. No exact number of healthcare professionals and their level to be in a certain position is defined in the private sector but there is a fixed level of grade in the public sector. Healthcare professionals in Nepal are governed by Health Service Act, 1997/98 and the Civil Service Act, 1993. Healthcare professionals should have gone through professional training and should have been registered in any of the above-mentioned councils to work as healthcare professionals in Nepal in both the public and private sectors.(MOHP, 2013) In Nepal government post for healthcare professionals starts from the 3rd level and ends at the 12th level. Each level has a specific function of work and is recruited through exams based on their qualification. Healthcare professionals who are registered in councils and are Nepalese citizens can fight for the post of 3rd,4th, 6th and 9th level and can be upgraded to 4th,5th,7th,8th and 10th levels based on their working experience, working duration in remote areas, work performance, and qualification. Highly qualified healthcare workers as medical officers and staff nurses are recruited in PHCCs and hospitals where there are only ANM, MCHW, AHW, and HA in health posts. (MOHP, 2013; NLC, 2018)

CHAPTER 3: LITERATURE REVIEW

This chapter includes relevant research on MDR-TB and topics that are connected to it. Throughout the phases of research planning, data collection, and analysis, literature searches were conducted. Databases including PubMed, Scopus, Web of Science, Google scholar, and Oria were used to collect data.

This section is a review of the literature that is relevant to this study. Understanding the causes of the rise in MDR-TB in Nepal can help us understand its control methods and the importance of healthcare professionals' knowledge in this matter. Therefore, the review starts with a discussion of the causes of the increase in MDR-TB. Further, literature studies on the

control of MDR-TB, the knowledge of healthcare professionals, and the significance of healthcare professionals' knowledge of MDR-TB control will be discussed. At last, a justification for the research will be presented.

Risk factors for the increasement of MDR-TB

There are various risk factors for the development of MDR-TB in Nepal. The National Tuberculosis Control Center (NTCC), Bhaktapur, Nepal, recruited 55 MDR-TB cases and 55 controls for a comparative study that lasted six months. It discovered that prior TB treatment failure, smoking, social stigma, and a lack of knowledge on TB are some risk factors for the development of MDR-TB in Nepal. (Marahatta, Kaewkungwal, Ramasoota, & Singhasivanon, 2010)

In a similar vein, a recent study from August 2018 to July 2019 conducted in four districts (Makwanpur, Chitwan, Dhanusha, and Mahottari) of Nepal discovered that difficulty in gaining access to healthcare was a risk factor for MDR-TB increment in Nepal. This study identified socioeconomic factors such as low TB education, high transportation costs, insufficient food costs, income loss, and stigma as obstacles to accessing health services. To improve access to TB services, they recommended counselling, dietary assistance, psychological support, health insurance, raising travel expenses, and more through the National TB Program. (Dixit et al., 2021)

Similar to the findings of Nepal a case-control study conducted in Serbia to determine risk factors for MDR-TB discovered six independent risk factors for MDR-TB: a family's monthly income of fewer than or equal to 100 euros per month; treatment noncompliance stigma; sadness; use of sedatives; and chronic obstructive pulmonary disease. To reduce MDR-TB, this study recommended multi-sectoral interventions that meet the social and medical requirements of TB patients.(Stosic et al., 2018)

According to a study conducted in TB-high burden countries in the WHO South-East Asia and Western Pacific Regions, poverty, socioeconomic factors, gender equality, and living conditions are all risk factors for TB. This study linked malnutrition, housing conditions, and congestion to poverty and explained how poverty prevents people from accessing healthcare. This study concluded that if we solely concentrate on diagnosis and treatment and ignore

underlying determinants, we would not be able to achieve the End TB targets. (Satyanarayana et al., 2020)

To learn the risk factors of MDR-TB from patients registered in a district hospital in western Nepal, a descriptive case-series study was carried out at Bhim Hospital, Bhairahawa, Rupandehi, Nepal. The study used structured interviews and an inventory of treatment records of patients treated in DOTS plus. There were 36 participants during the study period registered in DOTS-Plus, but the study was unable to recruit all patients, as 3 did not appear at the hospital throughout the study period and 2 declined to participate. So, the study was carried out with 31 participants, 22 males and 9 females. In the majority of the MDR-TB cases, 87% were reported to be poor. They stated that their monthly income was less than NRs 3000, and they were living in a thatched house sharing a room with 3 or more family members. There 77% of participants were illiterate. 58% of the cases had lived in India for at least 6 months without receiving adequate treatment. 97% of patients had revealed their MDR-TB status to their families, however, 3% did not share their status for fear of being socially stigmatized. 70% delayed informing out of fear of social rejection. Similarly, 54% reported being in touch with TB-infected persons whereas 14% reported being in touch with people coughing for long periods but not diagnosed with TB.74% and 54% reported the habit of smoking and drinking alcohol respectively.(Pant et al., 2009)

A study was done in Dharan Municipality Nepal to know features of TB-associated stigmas faced by patients that could increase MDR-TB. There they found that 63.3% of the patients were stigmatized. They have been stigmatized for various things and 63% of the patients wanted people to remain unaware of their illness. 56.7% were less confident in themselves and 41.7% were worried that they would transmit the disease to others. 43.3% of the patients said other people stayed away from them and 37% lost their jobs. 25% thought of getting trouble to get marriage and 48.3% described having problems in their married life. The study concluded the reason for this stigma to be inadequate knowledge and awareness of TB among people. This study suggested increasing awareness among people to increase their compliance with the treatment .(Aryal et al., 2012)

To determine the cause of TB patients failing to finish DOTS treatment, a study was conducted in the Dharan and Sunsari districts of Nepal. According to this descriptive, qualitative study that used semi-structured questionnaires, patients were unable to finish their

treatment because they were unable to stop working due to the financial crisis. Additionally, many cited transportation problems and distant medical facilities as reasons. This study identified additional factors for incomplete treatment such as alcohol consumption, stigma, usage of private clinics, and traditional healers.(Lamsal, Lewis, Smith, & Jha, 2009)

In Nepal, there is a belief in people that "TB is a curse sent as divine retribution for the misdeeds of the person with TB or his family" (S. C. Baral, Karki, & Newell, 2007, p. 8). The writer in this study was not sure about the knowledge of priests on this but stated that this misleading information passing from generation to generation has increased discrimination. According to this study, other than divine punishment social discrimination is done by people because of fear of transmission to themselves. TB is taken as a disreputable disease (disease of poor people and low caste). This belief in a person made them hide their disease from society as they do not want to reveal themselves as a sinful person or as being poor. Due to this, the patient does not go to seek medical help despite having TB symptoms. (S. C. Baral et al., 2007; Coreil, Lauzardo, & Heurtelou, 2004) Social stigma plays a significant role in determining the health-seeking behaviour of patients (Naidu et al., 2020). Late diagnosis of the cases and negative treatment compliance because of social stigma were reported in their studies (Courtwright & Turner, 2010).

A qualitative study was done in the rural lowland district of Nawalparasi, Nepal to know the path to tuberculosis treatment in rural areas of Nepal. This study was done to know how patients find their route to treatment. Semi-structured interviews were taken with twenty-six patients who were under treatment. They found that the patients' routes often started from the medical shop where the patients buy medicines with or without the assistance of the healthcare workers. 21 patients consulted a private health facility and 5 contacted a primary healthcare facility at beginning of their service-seeking path. Patients have visited 2 to 8 service providers before enrolling in tuberculosis treatment. Women were more likely to visit many service providers. The last healthcare facility visited before enrollment in treatment was a government healthcare facility (15 patients) or a private facility (11 patients). Men visited private providers as the last providers more often than women. At the end of their routes, patients visited facilities with a staff of higher qualifications .(ten Asbroek, Bijlsma, Malla, Shrestha, & Delnoij, 2008)

Ways forward to control MDR-TB

A qualitative study was done to know the perception of patients and healthcare workers in the management of tuberculosis in Ethiopia and Norway. The researcher found that several cultural, social, and economic factors influence how people perceive and manage TB symptoms. She highlights that it may take months for the diagnostic process to complete even after the patient's contact with the healthcare workers in Ethiopia. She has also explained structural barriers that cause treatment interruption in patients. The researcher concluded a need for a holistic approach to controlling TB .(Sagbakken, 2010)

To investigate the implications of social infrastructure development, particularly on TB outcomes in metropolitan areas, a study was conducted in Delhi, India. Their social development parameters were the human development index, literacy rates, income, migration rates, slum population growth, and people living in one-room apartments in urban areas. The study used this indicator to show that the development of social infrastructure contributed to successful TB program results. They came to the conclusion that poverty reduction is essential to reducing the global TB burden. (Chandra, Sharma, Joshi, Aggarwal, & Kannan, 2014)

In response to the patient's inability to travel to the far-off health post to participate in the daily DOTS advised by the WHO, where medical professionals observe patients taking medication, two alternative strategies known as Community DOTS and family members DOTS, were initiated in the hill and mountain region of Nepal. The national tuberculosis program in Nepal recommended these two strategies be tested for effectiveness. Therefore, these strategies were tested in 10 districts of Nepal between mid-July 2002 and mid-July 2003. In this strategy, a cluster-randomized controlled experiment was used where 358 patients were assigned to the family-member DOTS and 549 patients were assigned to the community DOTS each across 5 districts. This Community and family members' DOTS fulfilled the worldwide targets for treatment success, and this study determined that it was suited for the hill and mountain regions of Nepal as well as other parts of the world where patients cannot have easy access to healthcare. (Newell, Baral, Pande, Bam, & Malla, 2006) The usefulness of family DOTS to manage Tuberculosis was also suggested by (Harper, 2010).

A study was conducted to evaluate TB treatment supervision practices and outcomes in three types of treatment centers at Nepal's urban and peri-urban government TB treatment facilities. The first group of patients was cared for in treatment facilities, the second group was watched after by family or community members, and the third group received only medication for a month with no supervision. All participants were new, and the study was done for a 5-month period. There, bacteriologically verified cure rates for smear-positive patients were 91% in the first group, 57% in the second group, and 34% in the third group. The best-performing treatment facilities benefited from various factors, such as easy access to lab resources, consistent medicine supplies, maximum opening hours, and assistance from a non-governmental group. (Mathema et al., 2001)

In a hill district of Dhankutta, Nepal where a treatment facility was not near for patients, a prospective study was done to know the best route for DOTS with registered patients. Patients were offered three routes of DOTS for their treatment: 1) ambulatory from public health center; 2) ambulatory from a private health center (INGO); or 3) staying in INGO hostels. Among these three routes, the third one with hostel accommodations fared well with DOTs even in locations where finding medical facilities was challenging. There was also an increment in the number of new cases. Therefore, the third hostel approach was also advised by researchers for the treatment of TB patients in areas with similar topographies. (Wares D, Akhtar, & Singh, 2001)

A study was conducted in Nepal to show how important it is for MDR-TB patients to get specialized psycho-social support. This study brought to light the problem of individuals experiencing mental health problems as a result of the current lengthy 20-month treatment schedule with many adverse side effects. When individuals do not receive assistance from family and neighbours, this anxiety begins to manifest. Therefore, this study suggested that the patient and family members need a psychosocial intervention program during their treatment. (Khanal et al., 2017)

Knowledge of healthcare professionals in MDR-TB

A study was done to know “Healthcare workers’ knowledge, attitudes and practices on tuberculosis infection control, Nepal” in 28 TB health facilities in Kathmandu. A structured questionnaire was asked of 190 healthcare professionals. This study discovered poor infection

control knowledge among healthcare workers and even worse knowledge among management and lower-level staff. Therefore, to reduce the risk of nosocomial TB transmission and improve infection control procedures, this study recommended training and orientation for all healthcare professionals. (A. Shrestha, Bhattarai, Thapa, Basel, & Wagle, 2017)

In March 2018, there was a study to learn about knowledge, attitudes, and practices toward DR TB infection control in Nepal. This was the first study to be carried out on a national scale. Under the National Tuberculosis Program, this cross-sectional survey recruited 102 healthcare professionals from 11 DRTB centers but only 95 took part in the study. The data collection was done through face-to-face interviews. This study found out that although healthcare professionals in DRTB treatment centers have a good understanding of DRTB infection control they lack good attitudes and practices. As a result, this study recommended training, including behavioral change communication, to all healthcare professionals. (S. K. Shrestha et al., 2021)

Importance of healthcare professionals' knowledge in MDR-TB control

A cross-sectional study was conducted in Delta, Nigeria to learn more about healthcare personnel's knowledge and attitudes towards MDR-TB in light of the possibility that these misconceptions could undermine the MDR-TB control program. A total of 96 healthcare professionals and 114 TB patients were involved in this study. This study discovered that MDR-TB awareness was low among TB patients and healthcare workers with low education status, leading to low compliance and poor treatment outcomes. To resolve this issue, the study recommended a training program for both groups. (Isara & Akpodiete, 2015)

A qualitative study was conducted to learn the types and methods of emotional support that MDR-TB patients in Lima, Peru, receive from their nurses. For this study, data were gathered through focus groups with seven nurses who used to give MDR-TB patients individualized care. Observation of the patient and nurse was also done for 8 years. In this study, ten different hard situations of MDR-TB patients who required emotional support were identified. They discussed the kinds of emotional support provided by the nurses as well as how nurses delivered the services. According to this study, patients' issues included treatment enrolment (negative anti-TB treatment in the past), guilt (may spread disease to others), stigma (fear of abandonment), adherence (felt so long to take multiple medications for a minimum of

18 to 24 months), side effects (suffered from nausea, vomiting, etc.), socio-economic challenges (income loss, poverty), special situations (domestic violence, HIV-positive individuals, the elderly, pregnant women), treatment failure and end of life (patients seeing other patients dying due to treatment failure), completion of treatment and cure (fear relapsing with TB and does not wanting to discontinue their medicine), and emotional support for other members of the medical team (support to other health promoters' teams who might get frustrated if any patients die or do not take medicines). Nurses supported patients and their families in a variety of methods, such as counseling, regular monitoring, regular visits, etc., to ensure that patients complete their treatment. In this setting, nurses helped patients not only with their biological needs but also with their mental and social well-being, which resulted in higher patient treatment compliance and higher cure rates. Because of this, even though the study was limited in the number of nurses involved and was concentrated on just one disease, it was highly regarded for its generalizability. Additionally, the behaviour of nurses was strongly advised to boost cure rates. This study demonstrates how highly skilled healthcare professionals can improve the MDR-TB control. (Chalco et al., 2006)

To explore the understanding and perception of primary healthcare workers as well as their challenges and requirements in detecting childhood TB cases in Tanzania, a qualitative study was conducted. Participants were chosen from 29 PHC, 25 dispensaries, and 3 health centers to participate in a total of 13 semi-structured interviews and 3 focus groups were taken. According to this study, the staff's decision to suspect tuberculosis in children and report them to the hospital was assumed after seeing the prolonged duration of the patient's illness, severe symptoms, and known exposure to the disease. No early diagnosis equipment was accessible, and healthcare professionals lacked knowledge, resources, and guidelines. This severely hampered the detection and referral of pediatric TB cases in the early stages of the disease. This study therefore suggested training and feedback from hospitals to increase healthcare professionals' capacity.

Justification of the study

According to the literature study, several risk factors contribute to the rise in MDR-TB. If dealt effectively, most risk factors are avoidable. There is so much research being conducted with patients and healthcare professionals that could help determine how to control MDR-TB. But, to my knowledge, no research has been done in Nepal to determine the perception and

knowledge of healthcare professionals regarding the origin and control of MDR-TB. We can thus gain fresh insights into the control program by understanding the knowledge and perspective of healthcare professionals regarding the origin and control of MDR-TB. Healthcare professionals may have solid ideas that could be utilized for control programs since they are the ones who have seen the patients and programs up close. Therefore, the policymakers who regulate MDR-TB may find some success with the ideas of healthcare professionals. The purpose of this study is to fill the gap left by the absence of healthcare professionals' perspectives on the origin and control of MDR-TB. A qualitative methodology for a comprehensive and in-depth source of data was employed to gain a deeper knowledge of this.

CHAPTER 4: METHODOLOGY

With the aim to explore theoretical and practical knowledge and perception of Nepalese healthcare professionals on MDR-TB origin and control, this research was done using qualitative methodology. Qualitative research answers the question beyond “what works” to “what works for whom when how and why” focusing on improving interventions (Busetto, Wick, & Gumbinger, 2020). Qualitative research has proven its importance in various social science studies (Pope, Van Royen, & Baker, 2002). Qualitative methods can also assist in unveiling more details about medical treatment's "softer" side (Busetto et al., 2020). Therefore, to know patients and healthcare workers’ perceptions and management of tuberculosis in Ethiopia and Norway Sagbakken used a qualitative method. Similarly, the qualitative method was used to give new insights by discovering the emerging phenomenon of dating among the young (Pramod Regmi, Simkhada, & van Teijlingen, 2010; P. Regmi, Simkhada, & Van Teijlingen, 2008). In order to know the perception and experience of patients and healthcare workers to inform a better understanding of gaps in care for pre-discharged tuberculosis patients in Cape Town, South Africa, qualitative methodology was used (Kallon, Colvin, & Trafford, 2022). Various similar studies to my research have used qualitative methods to learn the knowledge, experience, and perception of healthcare workers. Therefore, using qualitative research is appropriate to take the knowledge of healthcare professionals into my research.

The attraction of participants toward online methods due to their convenience, cost-effectiveness, time-efficient, flexibility, and ability to reach hard-to-reach populations is explained by (Horrell, Stephens, & Breheny, 2015). New data collection methods online can

improve the traditional method of data collection FGD and interviews (Deakin & Wakefield, 2014). “Zoom is a collaborative, cloud-based videoconferencing service offering features including online meetings, group messaging services, and secure recording of sessions” (Archibald, Ambagtsheer, Casey, & Lawless, 2019, p. 2; Inc, 2016). In Zoom, we can securely record and store highly sensitive data without relying on other software (Archibald et al., 2019). The suitability of Zoom to collect qualitative data while maintaining its quality was explained by (Archibald et al., 2019). So, to collect data, this online method Zoom was used in my research.

Similarly, according to Webb, the first person is required to sustain the research's epistemology and to pursue reflexivity. If it is relevant to the manner of the research described and an author is offering his or her own opinion based on credible evidence, a study should be written in the first person (Webb, 1992). Therefore, in my research, there will be the use of the first person “I” so that my reflexivity and opinion of this research can be easily distinguished.

Research topic, aim and objectives

Research Question: What are the knowledge and perceptions of Nepalese healthcare professionals with regards to the nature, origins and means to reduce MDR-TB cases in the Sindhupalchowk district of Nepal?

Aim: The aim of the study is to investigate the knowledge and perceptions of healthcare professionals about the origin and control of MDR-TB cases in the Sindhupalchowk district of Nepal.

Sub-Objectives:

- To acquire Nepalese healthcare professionals’ knowledge on when, where, and how MDR-TB originated in Nepal
- To collect healthcare workers’ perceptions on how MDR-TB can be controlled in Nepal
- To collect healthcare workers’ perceptions of their roles to control MDR-TB in Nepal
- To collect healthcare workers' knowledge about their experience curing MDR-TB patients
- To investigate healthcare workers' knowledge of barriers associated with MDR-TB control in Nepal

Methods and Materials

The origin and control of MDR-TB in Sindupalchok district, Nepal was investigated utilizing qualitative methodology among Nepalese healthcare professionals. At first, ethical consent was obtained from Norwegian Centre for Research Data (NSD) Norway, NTCC Nepal, and Nepal Health Research Council (NHRC) Nepal. This was followed by the data collection process. In-depth interviews and focus group discussion (FGD) using various semi-structured questionnaires were employed to collect data. In-depth interviews were conducted using both purposive and snowball sampling approaches. In the purposive sample approach, healthcare professionals recommended by NTCC were interviewed. In the snowball sampling approach, participants were identified by referrals from the purposive sampling participants. In-depth interviews were conducted primarily with higher-ranked officers such as directors, monitoring, and evaluation officials. Similarly, FGD participants were purposively chosen after a discussion with the public health officer of the Sindhupalchowk district. FGD was conducted with health posts incharge in the Sindhupalchowk district. Following on, data was transcribed from Nepali into English. From the transcribed material, relevant recurring and significant categories were coded using the NVivo software. The coded categories were then merged, separated, added, or removed to generate various themes inductively, which led to the conclusion of the study.

Study Site

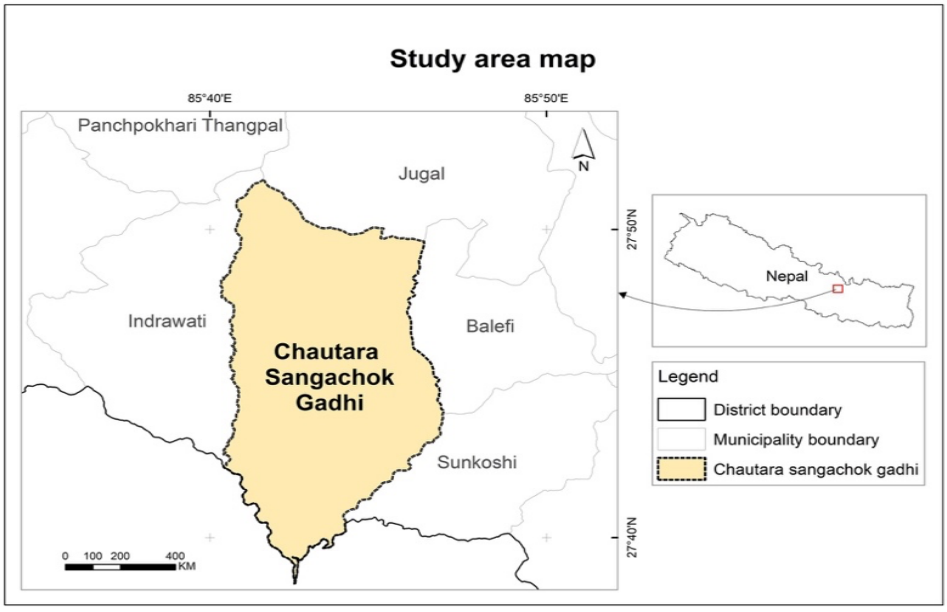

Figure 2 Study area map

The study was undertaken in Chautara Sangachowk Gadi Municipality in Sindhupalchowk district in Nepal. Sindhupalchowk district falls in both hill and mountain regions of Nepal. The healthcare professionals working in health posts of different wards in the municipality were approached for Focus Group Discussion. An in-depth interview was carried out with focal healthcare professionals of National Tuberculosis Centres, Regional health officers, and international non-governmental organizations. All questions asked to respondents while conducting the study were focused to the Sindhupalchowk district in Nepal.

Legal Consent

At first, ethical consent was obtained from NSD Norway. As per the legal procedures of Nepal, I had to take approval from the Nepal Health research council to conduct any health research in Nepal. Similarly, I took approval from the NTCC, Bhaktapur which is the focal point of the National Tuberculosis Programme.

All participants participating in the in-depth interviews and FGD provided oral consent, and mail was sent to them with the information sheet and consent form. Participants who gave the interview and FGD signed the consent form and returned it to me. All participants were interviewed through Zoom, and the interview was recorded with their verbal consent. The interviews were then sent directly to TSD- Service for sensitive data at the University of Oslo to maintain the privacy and confidentiality of participants. All legal consent taken is listed in Appendix A, B, C and D.

Population and sampling process

In-depth interviews and FGD were utilized to collect data in conjunction with a purposive and snowball sampling approach. Similarly, various semi-structured questionnaires were employed to collect data. There was a total of 19 participants in the study out of which 10 participants participated in in-depth interviews and the remaining 9 participants participated in FGD.

In-depth interview

While conducting in-depth interviews both purposive and snowball sampling methods were utilized. In the purposive sample approach, healthcare professionals recommended by

NTCC were interviewed, but in the snowball sampling approach, participants referred to by purposive sampling approach participants were interviewed. In-depth interviews were conducted primarily with higher-ranked officers such as directors, monitoring and evaluation officials. To be precise, participants included 2 directors of NTCC, 2 Nursing officers of NTCC, 1 chief planning, monitoring, and evaluation officer of NTCC, 1 provincial TB Lab officer, 1 TB/ Leprosy inspector, 1 province TB focal person, 1 regional coordinator of INGO, and 1 Liaison Officer of INGO. Out of 10 participants, 8 were government staff and 2 were INGO staff working in the sector of tuberculosis. Questions asked during the in-depth interview are provided in Appendix G.

Focus Group Discussion(FGD)

The purposive sampling method was utilized while conducting FGD. Participants in FGD were purposively chosen after a discussion with the public health officer of the Sindhupalchowk district. FGD was conducted with 9 health posts incharge in the Sindhupalchowk district. All 9 participants were government staff.

Participants' criteria for inclusion and exclusion in the study

Inclusion criteria

- Higher ranked healthcare professionals working in central government health organizations and INGOs who have professional experience of working in the TB sector in Sindhupalchowk district and who are willing to participate in the study
- Healthcare professionals working in the TB sector in Chautara Sangachok Gadi municipality in Sindhupalchowk district who are willing to participate in the study

Exclusion criteria

- Not fulfilling the inclusion criteria mentioned above
- Below 18 years of age
- Not a regular staff in the TB sector
- Not willing to give consent
- Cannot communicate fluently in the local language

Data Collection

The fieldwork took almost 3 months. Data were collected using in-depth interviews and FGD. There was a separate questionnaire for in-depth interviews and FGD. In-depth interviews were taken with central-level TB-related policymakers while health professionals who were implementers of the DOTS centre participated in FGD. For the interview, I sent a Zoom link via email to participants. The time for the meetings was decided based on the participant's availability. Most interviews were taken outside of working hours, but FGD was carried out during working hours. During both in-depth interviews and FGD, I took the data from Zoom with end-to-end encryption conversation. The interview was smooth, and no difficulties were encountered while taking it. Both the interview and FGD were carried out in Nepali with occasional English conversation in between. The duration of each in-depth interview was about 45 to 50 minutes while FGD lasted for 1 hour.

Pretesting

All the prepared questions were at first pretested by asking them with an NGO health worker in an interview. Pretesting helped me to test the validity and understandability of the questions and gave me much-desired interview conducting experience. Questions of FGD were also asked to the same person, but no pretesting of the FGD was done because of time limitations, and difficulties to gather a group of people for FGD. This health worker interview was not presented in the findings of my study.

1. Focus Group Discussion

"Focus group discussion is an interactive discussion between six to eight pre-selected participants, led by a trained moderator and focusing on a specific set of issues. The aim is to gain a broad range of views on the research topic over a period of 60-90 minutes and to create an environment where participants feel comfortable to express their views" (Hennink, Hutter, & Bailey, 2020).

To know the perceptions of the health service provider who knew each other, share a similar background and had little information on the topic, qualitative methodology was used

by (Cremers et al.). It helped them to create a familiar and open environment for the participants which helped to get the baseline information through (Dimitrova et al., 2006).

In this research, I conducted Focus Group discussions with the health posts incharge of different wards of Sindhupalchowk district, Chautara Sangachok Gadi municipality. The place for the FGD was decided after coordinating participants of Chautara, Sangachowk Gadi. Unfortunately, due to the imposed lockdown during the Corona crisis, I was not able to travel to Nepal. Because of the pandemic situation, I had no other alternative than to collect all my data online. I was present at the FGD online via Zoom and the FGD program was facilitated by the public health officer of Chautara, Sangachok municipality. FGD was carried out inside a closed room, so I was able to hear clear voices from all participants.

Further, the public health officer helped me ask all my cross-questions to participants. The moderating public health officer was not counted as a participant in my study. The moderating person also consented to work as a moderator and to maintain the confidentiality of the participants throughout the research. All FGDs were recorded, and notes were taken during the discussion. The notes and recordings were transcribed into English 1 or 2 days after the completion of the discussion. Ethical approval from the concerned authorities and consent from the participants was taken before the discussion started. Confidentiality of the participants was maintained throughout the research process.

2. In-depth Interviews

"In-depth interview is a one-to-one method of data collection that involves an interviewer and an interviewee discussing specific topics in depth. The researcher's purpose is to gain insight into certain issues using a semi-structured interview guide " (Hennink et al., 2020).

In a qualitative research study made in the Peruvian Amazon to know the experiences and perceptions of patients and healthcare professionals to improve MDR-TB, semi-structured face-to-face interviews with MDR-TB patients and healthcare professionals were used by researchers (McNally, de Wildt, Meza, & Wiskin, 2019). Similar to this study, the goal of my research was to obtain a detailed description of the subject through active participant interaction and open debate. Hence, my research uses in-depth interviews.

In my research, I conducted in-depth interviews with healthcare professionals using a semi-structured questionnaire. Such a questionnaire was used so that rich information could be gathered. Interviews lasted for approximately 45-50 minutes. The interview was conducted in our local language Nepali so no translator was required. All interviews were carried out in accordance with participants' time availability. All interviews were recorded after taking their verbal consent, and confidentiality of the participants was maintained throughout the research process.

Data management and analysis

My explorative study featured both the insitu and desk-based data analysis. I translated all interviews and FGD into English. I realized I had reached the saturation point of my interview and FGD data when no new information was further obtained from the participants. I stopped collecting data after reaching the saturation point. I imported the translated 57 pages MS word file into the software program NVivo. In NVivo, documents from MS word can be categorised and coded into clear headings (Welsh, 2002). I used NVivo initially for the coding process where specific information was generalized. For example, when different participants were approached to perform the inquiry on the cause of MDR-TB increment, one participant replied that due to lack of money he could not continue the TB treatment. Similarly, another participant responded by saying that she could not consume nutritious food during TB due to poor economic conditions. Likewise, another participant could not afford transportation to Kathmandu to cure TB. All these reasons related to lack of money were generalized and coded as poverty. Further continuing the coding process, I generated 82 different codes altogether (see appendix H). Further in NVivo, I placed these 82 codes into self-defined categorises and subcategorises wherever relevant. I generated a total of 9 categories and 69 subcategories out of these 82 codes. Having these segmented categories and subcategories helped me to know the essence of the data without deleting the data (Kielmann, Cataldo, & Seeley, 2012). Concerning these categories and subcategories, I started writing my findings. During this process, I familiarize myself with the data after reading and rereading transcripts from which I developed the themes for my thesis (Braun & Clarke, 2006; Braun, Clarke, & Weate, 2016). Finally, utilizing an inductive approach that discovered emerging patterns and themes as suggested by Cleland (2017), I was able to develop three distinct themes.

Ethics

Good research should be scientifically sound, and ethically correct. It should have a logical approach to describe its findings, or else it will be scientifically dishonest (Singh, 2012). Research should be performed considering the right of participants. Ethical consideration is equally important for those who are involved in the research directly or indirectly including the researcher (George, 2016).

There are various components of ethics that a researcher needs to follow to have good research. I followed the following ethical consideration while conducting my research.

1. Approval

According to George (2016) research done in diverse fields varies from one another in several ways. Different studies have different ethical concerns that must be addressed. We do not require the Research Ethics Committee's ethical approval for every type of study. Some research can only be approved by the university, while other studies must go through multiple levels of hierarchical review and approval before they can be considered morally valid.

Similar to the explanation of George, I have taken research approval from different academic and health institutions in Norway and Nepal to perform my study. In Norway, I first took recommendations from the University of Oslo -Institute of Health and Society (see appendix A) and then approval from the NSD (see appendix B). After receiving ethical approval in Norway, I switched to Nepal. In Nepal, NHRC provides research approval to all health-related research, so I approached them first. Getting research approval from the NHRC was an extensive process as I had to produce all my research documents in Nepali. These documents include all my questionnaires, information sheets, consent forms, and payment receipts (see appendices E, F and G). NHRC made no ethical comments in my research, but they did ask for Norway's ethical approval. NHRC further required clearance from NTCC and their recommendation to carry out a study in Chautara Sangachowkgadhi Rural Municipality in Sindhupalchowk district. I received the research approval from NTCC and submitted the documents to NHRC (see appendix C). NHRC approved my research work (see appendix D) after submitting all necessary documents. Obtaining research consent from various institutes in Norway and Nepal took the longest time in my study. All the procedures were performed

during the pandemic amid the Corona crisis. It took me longer than I had initially planned because I had to complete all the procedures online due to the global lockdown uncertainty. I obtained research consent from all the required institutes by Spring 2021.

2. Informed Consent

The goal of informed consent is to protect the participants' autonomy (Beauchamp & Childress, 2001). Based on their preferences, it is the participant's right to decide whether to participate in the study. Participants should not be coerced to participate in any research procedure (Hewitt, 2007). Therefore, in my study, I made sure that all the participants received the consent form and information sheet before the interviews and FGD so that they could decide whether to participate.

As per Council for International Organizations of Medical Sciences (CIOMS) guidelines, a participant must elect to engage in the study after receiving appropriate information and understanding of the research. Informed consent should be as straightforward and readable, and the usage of difficult terms should be reduced (Bedru & Omer, 2012). Therefore, my study information sheets, and consent forms were provided to participants in both English and Nepali to ensure they properly understand the documents.

Since "deferred consent" (getting consent after data collection rather than before) could invite undesired research obstacles according to Beauchamp and Childress (2001), I obtained a signed copy of the consent form from all participants before interviews and FGD to prevent the issue. For interviews, I sent a consent form and information sheets directly to the participants which they later signed and emailed me. In the case of FGD however, local facilitators helped me with this process. Further, prior to the interview and FGD, all participants were asked to verbally consent to their wish to participate in the interview. They were asked if they had any concerns or needed any clarification about my study. Some participants asked for more information during both the interview and the FGD which I provided. Furthermore, participants were given the email ID and telephone numbers of the researcher, supervisor, and NSD in case any questions or concerns regarding the study should arise.

3. Right to withdraw

Even though participants express an initial willingness to engage in a study, they can alter their minds at any point during the research process, and the researcher must be prepared for any of its implications. Because conducting research is such a delicate subject, anyone who does not wish to volunteer should have their feelings acknowledged. (Hewitt, 2007) Therefore, in my study, participants were given full authority to interrupt the interview and FGD, and they were informed about this in the information sheet and verbally before conducting interviews and FGD. However, no one objected but instead participated enthusiastically as well as offered additional knowledge whenever I needed extra information. I also got the impression that the volunteers were pleased to be a part of the study. Participants showed no signs of reluctance to participate throughout the study period.

4. Confidentiality and anonymity

An important aspect of qualitative research is to gather a significant quantity of personal data. There are times when participants desire not to remain anonymous and try to maintain ownership over their material (Richards & Schwartz, 2002). In my investigations, I saw a similar circumstance when participants attempted to show their position and deeds in the TB sector. Participants wished to promote their identity and their work with the help of this thesis. However, I kept their identity anonymous in this study. I obtained consent from participants that their material would be analysed, but their identities would not be revealed. I have maintained participants' anonymity by referring only to their job title, sex, ethnicity, educational status and years of experience in TB. Furthermore, I have safely kept all the data in the University of Oslo's sensitive data services (TDS), which only I can access, and it will be removed at the end of this research.

5. Reflexivity

“A researcher’s background and position will affect what they choose to investigate, the angle of investigation, the methods judged most adequate for this purpose, the findings considered most appropriate, and the framing and communication of conclusions” (Malterud, 2001, pp. 483-484). In qualitative research, there is high involvement of researchers’ knowledge. In every step of research, there is the researcher’s reflexivity. So, here I have

discussed my role in this thesis. I am a public health professional who has more than 3 years of working experience in the public health sector. I share the same language, culture, tradition, and common understanding of the topics as most participants do. Therefore, I consider myself an insider in this thesis.

When I was employed as a "Program Specialist" at RTI (Research Triangle Institute) International in Nuwakot, Nepal in 2018, the word MDR-TB caught my interest. While participating in several government meetings, I observed that TB patients are simply given TB medications without being diagnosed with MDR-TB. This incident captured my attention. I came to understand that if individuals initially knew they had MDR-TB, they would receive the right care and might lessen disease transmission. Later, when I moved to Norway for my higher education, I participated in discussions on antimicrobial resistance and its effects on the world, which piqued my curiosity in learning more about MDR-TB. Based on my understanding and little knowledge of MDR-TB, the objective and sub-objective of my research were developed.

In my opinion, me being an insider made participants feel more comfortable communicating with me. As they already regarded me as one of them, they could share their feelings without hesitation. I spoke to my participants about their backgrounds before beginning any interview. To familiarize myself, I talked about my prior employment, my time studying in Norway, and the global pandemic condition. I assured them during interviews that their anonymity would be protected throughout the research and that none of their responses would be examined. I believe that developing a rapport with interviewees before beginning any FGD helped me learn more in-depth information about healthcare professionals, which would not have been possible if they had viewed me as an outsider. Throughout the interview and FGD, I worked to earn their trust by using phrases like "our community" and "our policies," which made them feel more connected to me.

. While I was gaining their trust, I explained to them why I was conducting this study. Throughout the interviews and FGD, I tried to become a good listener and explore more of their perspectives. While conducting interviews and the FGD, I didn't offer any opinions or recommendations.

I had some trouble comprehending medical names and phrases while I was conducting interviews. As I was interviewing the participants, I asked them to explain these medical terms. Later, when I was transcribing, I Googled the terms to better understand them. Additionally, I talked with my colleagues about my analytical portion to reduce the possibility of misrepresentation and reflexivity.

Communications of Findings

The report will be submitted to the University of Oslo - Master of Philosophy programme in International Community Health at the Institute of Health and Society. The thesis will be submitted to NHRC, NTCC and Chautara, Sangachokgadi municipality to provide support in their decision-making and planning process. Publication of the article and presentations in seminars and workshops is desired. Some participants who requested the final copy of the thesis during an interview will be provided.

CHAPTER 5: FINDINGS

My study aimed to uncover the knowledge and perception of healthcare professionals on the origins and control of Multidrug-Resistant Tuberculosis outcomes in the Sindhupalchowk district of Nepal. This chapter presents the findings obtained through fieldwork. The findings have emerged through in-depth interviews and focus group discussion. Also, some of my observations are presented here.

Demographic Characteristics

All 19 participants were healthcare professionals working in the field of MDR-TB. Among 19 participants, 17 were healthcare professionals from the government, and 2 were from INGOs. An in-depth interview was taken among 10 participants and Focus Group Discussion was done with other 9 other people, listed in the table below.

S.N. Participants	Sex	Ethnicity	Educational Status	Profession	Years of experiences in TB
1.	Male	Madhesi	MSc Medical Microbiology	Provincial TB Lab officer	2 and half years
2.	Female	Brahmin	Bachelor's in nursing	Nursing Officer	1 and half years
3.	Female	Newar	Bachelor's in nursing (Running)	Nursing Officer	1 year
4.	Male	Brahmin	HA/ PCL in general medicine	TB/ Leprosy inspector	6 years
5.	Male	Chhetri	Master's in health education	Province TB focal person	28 years
6.	Male	Brahmin	MPH	Regional Coordinator (INGO)	2 years
7.	Male	Newar	MBBS	Director at NTCC	14 years
8.	Male	Brahmin	MPH	Director at NTCC	3 weeks
9.	Male	Brahmin	MSC	TB/ Vice secretary	12 years
10.	Male	Brahmin	PHD in Public Health	Liaison Officer (INGO)	13 years
11.	Male	Newar	AHW	HP Incharge	27 years
12.	Male	Dalit	Senior AHW	HP Incharge	26 years
13.	Male	Janajati	HA	HP Incharge	1 years
14.	Female	Janajati	HA	HP Incharge	2 years
15.	Female	Brahmin	AHW	HP Incharge	17 years
16.	Female	Chhetri	Senior AHW	HP Incharge	7 years
17.	Female	Janajati	AHW	HP Incharge	5 years
18.	Male	Chhetri	AHW	HP Incharge	3 years
19.	Female	Newar	AHW	HP Incharge	5 years

Table 3 Background information of the participants

Overview of the codes used in the organization of the findings discussed in this chapter

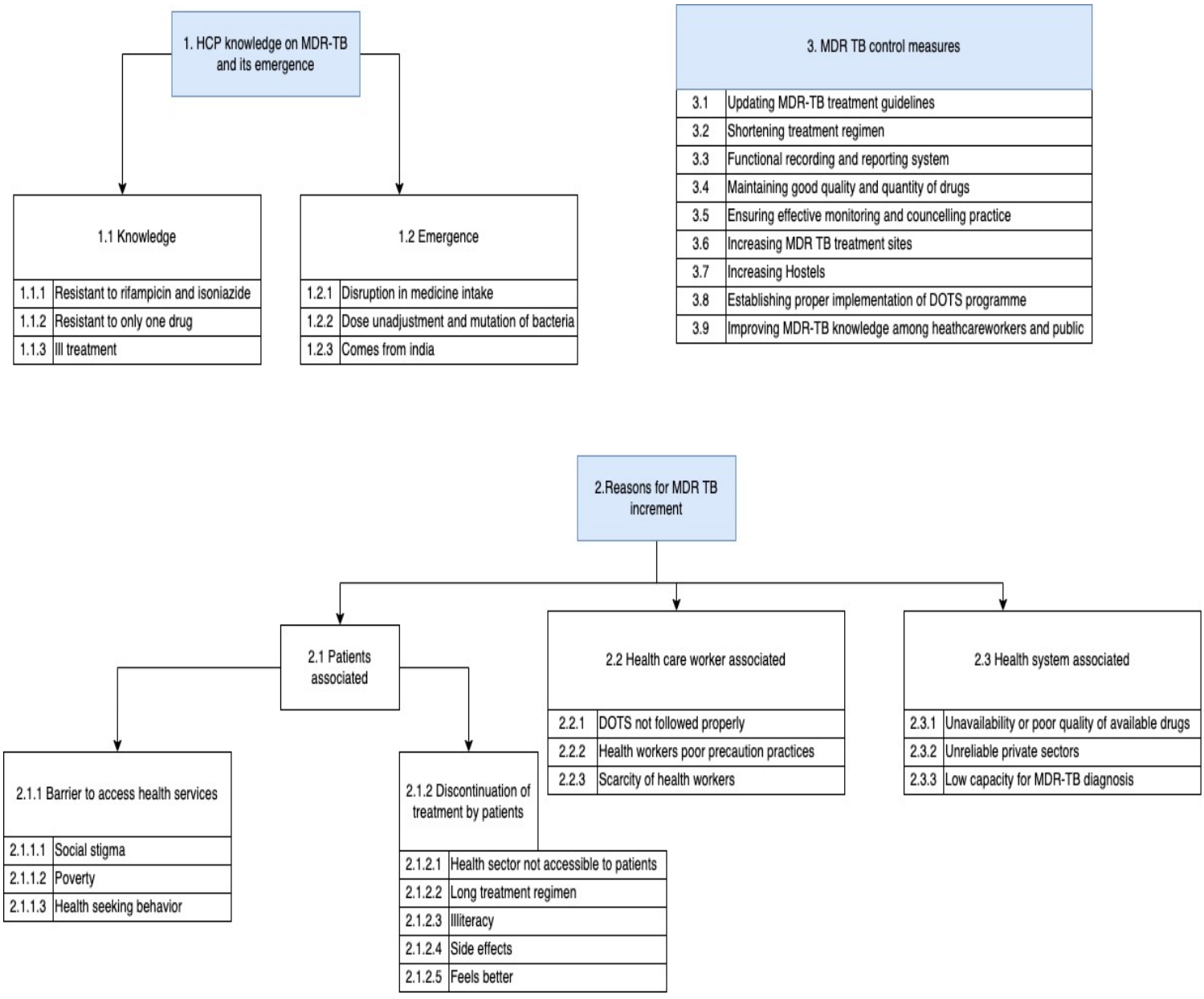

Figure 3 Overview of the findings

The findings consist of three main sections on three distinct themes. The first theme titled "Healthcare professionals' knowledge on MDR-TB and its emergence" is further subdivided into two categories. The second theme "Reasons for MDR-TB increment" is subdivided into three categories. Similarly, the third section "MDR-TB control measures" is subdivided into nine categories. Categories of the first and second sections are further separated into a variety of sub-categories that will be covered in detail in this chapter.

Section one: Healthcare professionals' knowledge on MDR-TB and its emergence

1.1 Healthcare professionals' knowledge on MDR-TB

Participants described MDR-TB in three ways. The first- patient resists two drugs, the second- patient resists one drug and the third- DSTB is not treated properly. Participants' descriptions of MDR-TB were dependent on their professional backgrounds. The interview made it very evident that MDR-TB diagnosis facilities were not available everywhere. As a result, the MDR-TB definition reflected their professional background.

Most participants claimed that patients received MDR-TB treatment after being determined to be resistant to two necessary TB medications (Isoniazid and Rifampicin). The GeneXpert machine was used to find rifampicin resistance, and a Line probe assay was used to find isoniazid resistance. This was described by the participant as

"We made them to consume medicines for two months during an intensive phase from HRZE... Using the GeneXpert device or the Line Probe Assay, we can determine whether the patient is resistant to rifampicin or isoniazid…. These two powerful anti-TB drugs, rifampicin, and isoniazid can develop resistance over time…. If these two medications are ineffective, MDR-TB will result…" (Participant 1, lab officer, IDI)

"MDR-TB reflects drug resistance to multiple medicines, such as rifampicin and isoniazid, rather than just one… They are more frequently observed in relapsing cases or in patients who do not complete the entire course of TB medication... When we evaluate patients' smears in the initial phase after two months... resistance is identified, and patients are treated for MDR-TB." (Participant 13, HA, FGD)

Some participants said that MDR-TB is mainly due to patients not responding to at least one drug of the first-line regimen. Mostly, Rifampicin resistance is seen in Nepal.

"When treating TB, we use drugs like rifampicin and isoniazid; however, if one of these drugs is ineffective or develops resistance in the body, it results in MDR-TB... After GeneXpert analysis, if patients are confirmed to be RR resistant, they are kept under MDR-TB treatment... In Nepal, we usually do not detect isoniazid resistance" (Participant 2, nursing officer, IDI)

Some participants believed that if DSTB is not treated properly, it gives rise to MDR-TB. *"It is clear from the name itself… It is a disease because of the reaction to first-line treatment… If DSTB patients have inappropriate medication combinations…. malnutrition... infection…. high workload… less nutrition…. then they may resist drugs…" (Participant 9, vice secretary, IDI)*

1.2 Healthcare professionals' knowledge on emergence of MDR-TB

Below is an explanation of the health professionals' theories regarding the emergence of MDR-TB in Nepal. Participants in the interviews were unsure about the true reason for MDR-TB in Nepal but provided the three following explanations

1.2.1 Disruption in medicine intake

All interviewees agreed that the development of MDR-TB in Nepal was due to either patients' or healthcare professionals' failure to take their prescribed TB medications regularly and in the proper dosage. MDR-TB is viewed by them as a "man-made calamity."

Participants emphasized that MDR-TB, which is easily transmissible, emerged as a result of the failure to treat drug-sensitive TB. One participant provides the following justification:

"Patients don't have proper counselling…and they don't take the medicine properly...this causes them to stop taking TB medicines which develops resistance later… They don't get recover easily and they transmit those diseases to others." (Participant 2, nursing officer, IDI)

This was supported by other participants.

"It is very difficult to say about the exact origin, but I can say this as a man-made disaster...and are manageable...it is not naturally created…It appeared when DSTB was not treated properly…. It would never have happened (being sad) if DSTB was cured properly and patients would have taken medicine properly and regularly. "jasto le testai sarcha" - Proverb in Nepali which means "MDR-TB patients transfer MDR-TB to others" (Participant 4, TB inspector, IDI)

Additionally, several participants thought that altering treatment plans without educating local service providers and without providing adequate logistics before treating patients led to a gap in the community for medication consumption and an increase in defaulters, which leads to MDR-TB. The participant's narrative demonstrates this

"Hmm, there is a long story behind the origin of MDR-TB…. At first, in ancient times we started treatment with streptomycin and thioacetazone…. this was for 18 months. And then in the mid-80s, we started short-course chemotherapy, which was unsupervised and supplied by some religious institution and dispensary..... may be by Christian and Newar. Rifampicin dose was given only 2 times a week…. there was no such thing as supervision and monitoring…. there was no supply of timely medicine… not all healthcare workers were trained…. We created an environment where the treatment period of 18 months was reduced to 8 months without full planning…. there was no effective monitoring to see whether patients were taking medicine regularly or not... Definitely, in such a situation patients would eat medicine for 15 days or 1 month and leave it in between…. It means the patient becomes a defaulter …. And the same medicine could not work effectively…. Because of this, all MDR-TB gets started." (Participant 7, NTCC director, IDI)

1.2.2 Dose unadjustment and mutation of bacteria

Participants believed MDR-TB could rise when the bacterial count in a TB patient varies according to the stage of disease and the drugs are not adjusted accordingly. With improper examination, there might be an imbalance in drug choice. It is explained by the participant as

"In 1995-1996, we launched an institutional-based DOTS program…. Family members of patients were given medicine because institutional-based care was not feasible in some places…. Monitoring was quite poor… A TB patient initially weighs 30 kg, but after starting treatment, they can weigh up to 40, 50, or even 60 kg…. This should be checked out before administering any medication. But this is not the case…. In my opinion, this may be one of the causes of MDR-TB." (Participant 7, NTCC director, IDI).

Participants during Focus Group Discussion supported this idea by saying:

"In my opinion...bacteria burden can be bigger at times, and antibiotic load increases at times…." They are not evenly balanced with each other... Resistance could result from this." (Participant 18, AHW, FGD)

It had also emerged as one of the primary subjects of conversation in focus groups. Participants' perspectives on this varied. According to their discussion, the life span of the

drugs, varying bacterial load in bodies, and nutritional status develop resistance to drugs which had emerged MDR-TB. Here is a short discussion among participants regarding this issue.

Participants mentioned that utilizing the same medicine for a long time made the drug resistant.

"When it comes to drug resistance, the provider and the consumer aren't the only ones at fault... Rifampicin is an ancient antibiotic we use to treat TB... Some medications we take often over a long period of time develop resistance to themselves…. That, in my opinion, might be a contributing factor to rifampicin resistance." (Participant 13, HA, FGD)

Another participant added the following:

(Agreeing to the statement of Participant 13,) "I also think some drugs of first-line treatment are resistant by themselves.... maybe mutation caused resistant of drugs…" (Participant 16, AHW, FGD)

1.2.3 Comes from India

All participants had a common view regarding the import of MDR-TB from the neighbouring country India. They didn't confirm it, but they believed this might be one of the causes for the emergence of MDR-TB in Nepal. They claimed that TB infections were widespread in India long before they appeared in Nepal. MDR-TB was first observed there as well. Therefore, it may have moved to Nepal.

The opinion of one participant on this is:

"Eight countries have the highest number of TB cases worldwide, according to the Global Report 2020, of which 27% is accounted by India, 8% is in China, Indonesia, Bangladesh, and Pakistan; Nepal is situated in the middle of these countries… consequently, if a disease enters India, it will inevitably spread to Nepal due to open borders, culture, religion, and other factors…. such as the instances we observe during this COVID…. it makes perfect sense to me that MDR-TB may have spread from India to Nepal… According to history and literature, MDR-TB after being discovered in India, was discovered in Nepal…. Therefore, I believe it may have come from there... (A look of confusion)" (Participant 9, vice secretary, IDI)

Section two: Reasons for the Increasement in MDR-TB

2.1 Patients Associated

Healthcare workers believe that MDR-TB gets increased in the community either because of the negligence of patients or because of the fault of health institutions. The fault of the health institution will be discussed later. Here, I will discuss healthcare workers' perceptions of patients on how they increase MDR-TB in the community. Patients' associated reasons for an MDR-TB increment are divided into two categories: barriers to access to health services and discontinuation of treatment by patients.

2.1.1 Barriers to access to health services

The patient needs to struggle with many things in the community before they can reach the health institution for proper care. This part thus deals with the factors associated with patients before reaching the health sector, which can increase MDR-TB.

2.1.1.1 Social Stigma

The participants believed that the root cause for the increase of MDR-TB in the Nepalese context is social stigma. According to them instead of being hated for transmitting diseases to others by everyone in society, patients will choose not to expose themselves to society. This will also make them buy medicines from far and unreliable sources. Patients even choose death over treatment if they need to get exposed to society.

Participants say that because of social stigma, patients remain undetected in the community and try to hide. One participant explained this as a favourable situation to develop MDR-TB.

"Some people also remain undetected in the community and do not go for seeking health care... they develop drug resistance in them.... though many programs are running they are transferring diseases to others..." (Participant 1, lab officer, IDI)

Participants claim that patients are reluctant to seek medical attention because of a lack of social and familial support. This is what one participant said:

"There are many people who try to hide TB from the community .... they have a stigma of being abandoned from the community.... some goes to private sectors....and eat medicine of their own choice…. some even does not do any checkup…. there is societal antipathy towards the patient as they may transfer the diseases to others…. moreover, lack of family support and communication barrier with patients makes the patient not eating drugs in an appropriate amount…." (Participant 2, nursing officer, IDI)

Participants attempt to draw comparisons between TB patients and HIV patients in terms of how both groups suffered social stigma due to mistrust from the public and even certain healthcare professionals.

"There is a stigma towards HIV patients in our Nepali society which is decreasing slowly.... such stigma is also for TB patients…even health professionals may discriminate if they are not trained properly..... If the patient is MDR-TB, then they are furthermore discriminated.... and even health worker wants to stay far from them..... It has brought disputes among families…It has created a distance between patients and family members…Patients are despised and forced to live in isolation.... they do not have any support....." (Participant 6, regional coordinator, IDI)

The FGD also agreed with this. During the conversation, one member used the example of patients who chose death over therapy:
".... I was treating and counselling him…His family hated him…He was uneducated…He had poor financial condition.... his family could not bear his expenses…. So, he does not want to tolerate all of these, and he stayed at home. ... The patient said." Sir I won't take medicine even after my death". He was in the situation to give up his life rather than bearing all the family and social pressure…" (Participant 13, HA, FGD)

2.1.1.2 Poverty

Though participants underlined that MDR-TB can affect anybody in society and is not just a disease of the poor, all participants agreed that MDR-TB is mostly seen among underprivileged and poor groups of society. Participants think that poverty and related problems including mobility, malnutrition, and crowded environments contribute to an

increase in MDR-TB in society. These factors link to one another and raise the prevalence of MDR-TB in the community.

Participants think that people with TB are typically from low socioeconomic backgrounds and are individuals who cannot afford additional fees over the course of therapy. Participant stated:

"*Some do not go for treatment because they do not have money… They think the doctor will make them buy a lot of medicine..... most of them do not know that the medicine is free of cost… Many Nepalese are in debt so they do not want to add burden... if a patient has to rest by taking medicine for a long time, they lose their job… it may cause a financial burden in the family....” (Participant 1, lab officer, IDI)*

Other participants in the FGD agreed with the notion and emphasized that there aren't enough MDR-TB centres, making it difficult for such patients to afford the transportation costs.

Participants in the discussion noted that the government's allowances for patients were insufficient.

“Mainly TB is seen to poor and disadvantaged group..... They are the ones who cannot even come to chautara (Municipality in Sindhupalchowk district) as they cannot bear the cost of transportation and the hospital charge for treatment.....In such a situation, they need to go to National Tuberculosis Center (situated in Kathmandu) to do the GeneXpert test which is problematic for them.” (Participant 14, HA, FGD).

Participants hold the opinion that people must travel for their jobs, increasing their risk of contracting TB people and developing MDR-TB. One participant said:

“Many people who work in India return home with TB …. The patient should rest and avoid working but they again go back to India for work… During that period, they might transfer the diseases to others if they are not eating medicine…. Most patients do not start the treatment in Nepal…. some do but leave the treatment and go back to India… It is very difficult to track them….” (Participant 5, province focal person, IDI).

According to healthcare workers, the nutritional status of people plays a vital role in the increment of MDR-TB. When patients have to take a lot of medicine to treat TB, they should have a good nutritional diet to be able to fight the reaction of the medicine. However, this is not happening in Nepal. As many people are poor, they cannot afford a balanced diet, and the

nutritional allowance given by the state is not sufficient for them. Therefore, some participants claim that many Nepalese people carry latent TB, which manifests when their immune systems are compromised. One participant said:

"It is not due to lack of medicines but due to lack of nutritional food.....As you can see there are many cases of undernutrition in Nepal…. there is a lack of precautionary measures and nutrition intake which hampers the treatment progress…… this can result in a transition from DSTB to DRTB. We should provide sufficient nutrition to patients..... The local government also should take initiation.... but this is not happening…. This increases MDR-TB in people" (Participant 6, regional coordinator, IDI).

It was also discussed in FGD as the following:

"I think some different about this all…. Like I said previously without DSTB there is no DRTB… Those who have DSTB already have low immunity power... Additionally, consumption of medicines declines the immunity power further.... For example, with Corona Vaccine…. within 9- 15 days from the date of vaccination the Vero cell vaccine declines the immunity power of an individual… Likewise in TB patients, they have already low immunity, after consuming antibiotics they require high nutrition to balance the medicine reaction else immunity power declines further…and the body cannot win against the bacterial effect… Those who don't have enough nutrition to balance the reaction of medicine do not get cured and develop resistance...." (Participant 19, AHW, FGD)

Participants explained that because people in rural areas lack access to open spaces, they must live close to one another. Most individuals reside in joint families, and many of them lived in mass during an earthquake, which may be the cause of the rise in MDR-TB.

"If one of the family members is suffering from MDR-TB then his close contact may suffer from this as most of the family have joint families in Nepal." (Participant 1, lab officer, IDI)

"In rural areas, people live in close areas… People live in joint families… This also helps in the transmission of TB.... we can see transmission in highly crowded areas such as a hostel, Jail, barrec etc." (Participant 6, regional coordinator, IDI)

Another participant added

"After the earthquake of 2072 BS, there is a rapid increase in MDR-TB case ratio in Nepal…More people became homeless in Sindhupalchowk district…. They all gather in a tent at the same place which leads to increased MDR-TB." (Participant 3, nursing officer, IDI)

2.1.1.3 Health-seeking behaviour

Healthcare workers stated that patients' health-seeking behaviours had a direct impact on the rise in MDR-TB. The two main explanations given by participants for patients' health-seeking behaviours are a few passive cases enrollment for treatment and patients putting the health sector as the last option which could increase MDR-TB.

Few people, according to some participants, visit the health facility on their own where numerous cases are discovered actively. MDR-TB gets transmitted to many people when patients are not discovered. On this, some participants have said:

"People can seek health only if they are aware of MDR-TB, or if they are educated… Most of the people are not aware…. most people who are in the urban area ask for help when they see symptoms.... so, there are very few people who come directly on their own…." (Participant 6, regional coordinator, IDI)

"There is almost 50 per cent patients referred from private sector…. Some patients are found from contact tracing of MDR-TB patients…patients might be MDR-TB patients' family members or close contact person…contact tracing is also done by many NGOs with global fund support as they have numerous manpower in the community…. Referrals from private sectors and NGOs are more than the cases we find from active case detection surveillance…." (Participant 4, TB inspector, IDI)

Participants reported that patients try to heal themselves first, and if that doesn't work, they visit a nearby private clinic or local pharmacy for a checkup. Even traditional healers are sought in rural areas. They arrive at the TB center when it is already too late, and they have spread the infections to several individuals after receiving no treatment from anywhere and taking numerous antibiotics. One participant gave the following justification for this:

"Firstly, they go to many nearby places for checkup .... they consume antibiotic of many places... once they suspect MDR-TB from other health personnel... they come to us...they might

already have taken second-line drugs…. they might have transferred diseases to many..” (Participant 2, nursing officer, IDI)

Another participant mentioned how people feel fortunate to readily obtain medication from local pharmacies and begin to have medications on their own.

“As local pharmacies are easily available here.... most of the patients waste their initial time by taking medicine from the nearby shop… They say, “We don't need to see any doctor to buy any medicine, how lucky we are.” ....it creates a difficult situation for us… We should provide information to a pharmacist about the symptoms of TB....so that they can advise the patient to follow the TB hospital...” (Participant 7, NTCC director, IDI)

Similar ideas from FGD were also discovered. This is how one FGD participant described it:

“At first patient tries homemade remedies to heal their uneasiness if they could not, the people of the village go to traditional healers for their treatment.....If they have TB, they lose their weight more and more…. so, they consult traditional healers in rural areas…. urban people do not think like that…. In my opinion, taking psychological support from traditional healers is good but to start medicine like this is not good.... We feel very difficult to give counselling for those people…” (Participant 14, HA, FGD, IDI)

2.1.2 Discontinuation of treatment by patients

Under the patient's associated reason for MDR-TB increment, this part deals with the second reason discontinuation of treatment by patients. As we have already discussed the patients’ difficulties to reach the health center here, we will discuss various reasons for patients leaving their treatment incomplete. Thus, this part deals with MDR-TB increment because of increasing defaulters.

2.1.2.1 Health sector not accessible to patients

The participants discussed the fact that there aren't many facilities for diagnosing and treating MDR-TB individuals throughout Nepal. They are mostly confined to urban and terai settings. As a result, accessing healthcare is very difficult for those who live in mountainous or hilly areas. Patients' decreased immunity makes it difficult for them to visit the far hospital.

To finish their treatment, some people even need to rent a room in the city. Even the rainy season and lockdown disrupt transport. Because of this, the patients are unable to receive their medications every day at the medical facilities which increases MDR-TB.

Participants discussed how delays in early diagnosis of cases lead to a rise in MDR-TB. *"We do not have these services of MDR-TB diagnosis even in our district hospital Chautara... we should go to NTCC or any centre level hospital for this... So, early diagnosis is not possible...We cannot even detect whether they are MDR-TB or not before starting treatment…. Patient, themselves needs to be aware and go for a check-up..." (Participant 5, province focal person, IDI)*

Another participant mentioned that many districts lack access to highways necessary for transportation to treatment facilities.

"In our provinces, there are limited MDR-TB treatment centers… It is very difficult to provide services with those limited sites.... Sometimes there are many people at once and patients need to stay in a big line… There are many districts where bus services are stopped during monsoon season…. That is the only way of transportation for them…. There is not even a touch of the road in certain districts…. In those areas, it is difficult for patients to come for treatment…." (Participant 4, TB inspector, IDI)

Participants brought up the issue of the lack of MDR-TB centers and hostels. Patients, primarily from most mountain and hill regions could not travel daily to health facilities. Therefore, patients would be forced to hire a room to complete their treatment. When patients couldn't afford all these costs, they stop taking their treatment, which causes MDR-TB to rise. *"We have very limited DRTB centers. It's difficult to come and go daily. Hostels are also limited...So, patients need to be admitted to the hospital or take a room in rent nearby to complete their treatment. We have a limited number of beds so the patient should stay out of their home paying rent during their treatment duration… It is also difficult for them to rent a room in the city as they come from a far village…. In Nepal, the case is similar to the entire parts except for a few parts… Mostly people of Himalaya and hilly region are getting problem of easy access...." (Participant 5, province focal person, IDI)*

Another participant supported this by saying:

This topic was also covered in the FGD. They emphasized the issues of insufficient MDR-TB centres, difficult monitoring due to distance, and difficult transportation during a lockdown.

"DR centres are far for patients in rural areas people... there are only 21 sites which is problematic…incentives given to them is not enough to cover their transportation charges…they refuse to go far from their home for treatment." (Participant 12, AHW, FGD)

"Monthly monitoring is not possible due to travel distance…." (Participant 15, AHW, FGD)

"During lockdown patients were not able to come to the health services…." (Participant 18, AHW, FGD)

2.1.2.2 Long treatment regimen

Participants claimed that the need for patients to take medicines for long periods was problematic because people's priorities vary over time, and they don't always pay attention to their medication over such a long period. They might leave their treatment incomplete, which can increase MDR-TB. Regarding these, participants have said:

"Treatment process is long compared to general TB.... general TB has six months treatment process... MDR-TB has 9 to 11 months for the short regime and 18 months for the longer regime.... because of the long treatment process patient may skip taking their medicine..." (Participant 2, nursing officer, IDI)

"In cases with MDR-TB, using a lot of medicines for a long time is making things difficult for the patient... One patient stopped taking medication completely in Nepal after getting married and becoming Indian. We got in touch with her with the help of the TB center in India, she is now getting treatment there…Bringing MDR-TB on a controlled track is exceedingly challenging...." (Participant 3, nursing officer, IDI)

2.1.2.3 Illiteracy

Participants claimed that people are discontinuing treatment in the middle due to a lack of education. They are unaware of the implications and place more faith in traditional healers than in medical care.

Participants discuss patients' little knowledge of MDR-TB making them ignore their treatment. One participant explained this.

"Patients who lack information disregard their initial symptoms and avoid getting screened for TB…. if they are discovered and placed in treatment, they just ignore the treatment procedure. ...It is really challenging to get them to finish their treatment..." (Participant 2, nursing officer, IDI)

One participant explained a case of how they made a patient come back on the treatment.

"there was a recent case of one patient from Tamang Community who was not literate…He needed extensive counselling. He spent 15 days with us. He then went back home and began seeing a traditional healer…. We made numerous attempts to reach him... However, he used to ignore us. Finally, we threatened him with calling the police by claiming he was committing a social crime…. Only after that he reconnect with us and resume his practice of medicine…. It was quite challenging for us to get him on treatment…" (Participant 3, nursing officer, IDI)

2.1.2.4 Side effects

Participants said that side effects experienced during MDR-TB treatment cause patients to discontinue taking their medications. One participant said:

"The primary reason for dose incompletion of treatment is the side effects shown by intake of MDR-TB medicine....it has a strong dose compound.... with every consumption it shows different side effects… In some cases, it is difficult for patients to tolerate MDR-TB medicine... Later they refrain from taking the medicine because of intolerability...." (Participant 2, nursing officer, IDI)

Another participant added

"General TB medicines side effects are low compared to the side effects of MDR-TB.... patients must take 35/36 pills which makes them very uneasy, and they feel pain… They prefer to die instead of taking medicine…. This raises a new challenge for convincing patients to consume medicine." (Participant 4, TB inspector, IDI)

2.1.2.5 Feels Better

Participants discussed that patients feel good after having medicine for a certain duration. They overcome their pain and start to gain weight, which makes them think they do not need to take more medicine. This worsens their situation and increases MDR-TB. One participant said,

"After patients eat medicine for 1 month then they start to gain weight... they feel better…they forget about uneasiness and pain caused by TB…. then, they might leave the medicine. if they do so, they will develop MDR-TB in them… but we should make them realize the consequences of leaving medicine in between…." (Participant 2, nursing officer, IDI)

One participant added about the negative result of TB after 2 months and the need for the patients to be clear on this. The participant said:

"In intensive phase after eating medicine for 2 months when we do a check-up, the result comes negative .... then patients will think that they should not eat more.... they might feel they are completely treated ... and can they leave medicine…So, healthcare workers should be extra careful and let the patients know about their condition and the importance of completing their dose…" (Participant 5, province focal person, IDI)

2.2 Healthcare professionals associated

Here is an explanation of the factors related to healthcare professionals that lead to an increase in MDR-TB cases.

2.2.1 DOTS not followed properly

Participants assert that DOTS is not adequately implemented by healthcare professionals, either because it is difficult for patients to visit the health center regularly or because healthcare workers themselves are undertrained. This leads to patients being careless about taking their drugs at the right time and dosage. The effect of this is MDR-TB.

One FGD member provides the following justification, stating their need to administer medications to patients for a longer period**.**

"The medicine use for 2 months in intensive phase and 4 months in continuous phase should be complete… As in DOTS, we should see the patients swallowing the medicine.....without observing directly, when patients come to eat medicine, we give them medicine for 1 week, a 1-month and more... When there was Corona and lockdown last year, we gave medicine for even 1 or 2 months… If we are given medicines like that even, we will not eat...(laughing) so it's obvious that patient will not eat medicine properly…." (Participant 3, nursing office, IDI)

Another participant from the in-depth interview supported the idea and explained the healthcare professionals' negligent behaviour.

"There is no monitoring system whether patients are taking medicine regularly or not… We used to check the empty packet to know the regularity of patients having medicine. but nowadays most are not doing so..." (Participant 7, NTCC director, IDI)

Participants highlighted how ethical behaviour and counselling from healthcare professionals assist patients in understanding their diseases and the significance of receiving treatment. However, a lack of adequate counselling causes patients to neglect their prescribed treatments, which raises the prevalence of MDR-TB in the community.

One participant explains its importance as:

"Lack of counselling will lead the patient does not know about treatment process.... its length, its side effects, and its consequences…. they can even transfer to others if not properly cured.....If they develop MDR-TB then it will be more difficult to cure.... So, counselling is a vital part…. but we are not able to do so…we have to look after many patients at the same time with limited staff." (Participant 2, nursing officer, IDI)

Another participant added,

"Health worker workers are very close to patients…. our behaviour will affect their decision of being in touch and coming regularly for checkup…. So, effective counselling is very important for developing their willpower to complete their treatment…. we healthcare workers can only make the patients complete their treatment….so we must be properly trained about treatment as well as counselling techniques…." (Participant 7, NTCC director, IDI)

When questioned about counselling practices in further detail, many claimed that they lacked sufficient training.

"We healthcare workers are not properly trained…. There is frequent training in urban areas…but in rural areas, most of us might not even know basic things…. taking knowledge from book is not enough…. we are not confident enough to give counselling to patients…. some have taken training, but they are transferred to new places… so my concern is about frequent refresher …." (Participant 6, regional coordinator, IDI)

2.2.2 Poor precaution practices by healthcare workers

Participants described a few ways to prevent the spread of TB as well as the challenges associated with using them. The participants thought they could avoid spreading TB by keeping a safe distance, putting on N95 masks, using ventilated rooms, teaching patients' safe techniques, safely disposing of sputum, and more.

A participant gave some ideas about precautions such as:

"We should not be close with the patients…. Without masks we should not attend them…. N95 masks should be used instead of general masks……we should sit in a cross position rather than facing each other…this will reduce the chance of direct contact….But while doing this all, we should not make patient feel discriminated but should do proper counselling….." (Participant 3, nursing officer, IDI)

Some participants recommended ventilated rooms in addition to the above-mentioned precaution, although they noted that most healthcare facilities do not have such**.**

"T.B is airborne.... so, a health professional should be aware of wearing the mask.... patient may cough, sneeze.... so, we should wear mask.... patient should also wear mask.... patients and health professional both should be aware on this…. Curing of the patients should be done in the ventilated room....in a room where air passes easily…. But as we know all health services cannot do this because of lack of spacious room…" (Participant 6, regional coordinator, IDI).

Participants also talked about patient education and safe sputum disposal as ways to reduce transmission.

"We must be very cautious during the treatment of a tuberculosis patient… We have to take different precaution measures because it transfers through the respiratory tract while sneezing... patients should be instructed and educated properly on sneezing safely.... that they must cover their mouth while sneezing.... they should use masks as far as possible.... they should keep themselves clean..... they should maintain proper distance with children and old people.....During the first 48 hours of the treatment, the patient should be more cautious while living with their family…medicines take time to kill bacteria… The cough syrup of the patient should be disposed of and cleaned properly...." (Participant 8, NTCC director, IDI).

But some of them explained the difficulty in following it routinely. A participant explained,

"HCP should maintain proper distance with patients and use N95 mask… They should give masks to patients and use them by themselves … They should only use N95 masks. But this is not possible all the time…. It is difficult to maintain distance with the patients and segregate TB patients from others as all services are run through our small buildings…." (Participant 1, lab officer, IDI)

One participant clarified that the danger of TB transmission is lower than the risk of COVID but advised taking precautions anyway.

"Healthcare workers who work directly with TB patients should be more careful.....TB is an airborne disease unlike COVID which may get transmitted within 10 minutes, transmission of TB from one person to another requires a minimum of 6 hours of close contact with a 10%-30% transmission rate.....However, while working with TB patients necessary precautionary

measures are needed to be taken such as wearing gloves.....N95 masks…PPE...proper distance… Additionally, other public health measures should be taken to provide the service.....” (Participant 9, vice secretary, IDI)

2.2.3 Scarcity of healthcare workers

Participants indicated two possible causes for the shortage of healthcare professionals in rural areas: a lack of staff or frequent staff turnover. This caused patients to get medications from unauthorized sources, which raises the MDR-TB rate.

Participants described the absence of health professionals at the health facility and patients getting their medications from the caretaker.

“there are many vacant health posts in many rural areas of Nepal…there is not any medical professional… People cannot travel far so they ask for medicines from the caretaker of the health post...” (Participant 5, province focal person, IDI)

“After formation of local government, it is quite positive… In past, people had only the option of local health posts to take health services… their peon (a person who is a caretaker of health services, not a health person) used to give health services... Now, this system has been improved.....” (Participant 3, nursing officer, IDI)

They additionally commented on the random opening and closing hours of the health post.

“The health services are not opened and closed on time.... healthcare workers should be in health services in their duty time..... If the patient comes to the hospital and they do not find a health worker, then the patient will miss their medicine… They might also leave to come to health services if this thing happens repeatedly.... People need to walk for 1 or 2 hours just to come to this health services to have medicine…. so, in my opinion, being ready to serve patients during office time is a must…” (Participant 5, province focal person, IDI)

The healthcare workers claim that qualified personnel are frequently moved to other sectors. Therefore, this interferes with the care of patients. A participant explained.

“Government should not make the transfer of specific experts to other sectors... There should be a rule to make fix the experienced healthcare workers in the same place for a long time so that there is no need to organize frequent training programs for new upcoming staff...

Completely changing the workers from one place to another in the name of adjustment creates trouble to manage the DR treatment system… Some Healthcare workers might not know what DR is…they need so long time to know about TB… So, government should careful during making rules for such systems..." (Participant 3, nursing officer, IDI)

Another participant agreed with this viewpoint and clarified the necessity of having a skilled individual in the position of director.

"There should be a director in the center who had studied depth in TB… These days non-clinical people are in the seat of a director.... which is not so good... There should be a TB specialist or MD on a TB person... So that he can monitor everything ... duration of work should be given at least 3 years without frequent transfer..." (Participant 7, NTCC director, IDI)

2.3 Health System associated

This section describes the reasons for the health system failure that resulted in a rise in MDR-TB.

2.3.1 Unavailability of drugs or poor quality of available drugs

Participants said that there are enough medicines in the health centre under normal circumstances, but if there are any little difficulties, there will be a shortage of medical supplies. Participants also talked about how drug quality is good at the time of purchase but deteriorates during storage and transportation.

Regarding the medicine scarcity, one participant commented

"Another barrier is lack of timely supplement of medicines in necessary health station… Though there is a regular supply of drugs…. mainly at the time of emergency during the earthquake, COVID and monsoon season…. there is not enough medicine in the storage of health post…… so patients are deprived of having medicine.....there is also the same situation when there is transportation blockage in rural areas…." (Participant 10, liaison officer, IDI)

Participants outlined the gap in medicine supply that was formed when the country adopted a federal structure without separating the responsibilities of the several divisions. This is how one participant explains it:

"This federal system has affected medicine supply…There are no specific departments/sectors which regularly supply medicine…Responsibility is frequently changing from one organization to another to supply medicine…Sometimes province and sometimes to other sectors.... not clear guidelines of work before changing the rules make so difficult for healthcare workers who work in ground level…" (Participant 4, TB inspector, IDI)

There is no drug scarcity, according to one participant, who expressed concern regarding quality storage.

"In case of our country Nepal, supply chain management of medicines and quality of the drug is not maintained properly.....this is free medicines, so they are available everywhere and as this is highly focused program by government medicines are enough … quality is compromised sometimes…. their storage could be bad…. if the medicine is put in the under high heat, then its potential is loss……." (Participant 2, nursing officer, IDI)

Another participant agrees that sufficient effort was not taken in the transportation and storage of the medications to retain their quality.

"The reason for increasing MDR-TB is of low-quality drugs…the drug temperature is not maintained…. different parts of our country have different temperature ……standard temperature during transportation and storage is not maintained in different parts of Nepal."(Participant 10, liaison officer, IDI)

One participant added this regarding the quality of the drugs:

"I do not want to complain about the quality of the drug because NTCC before purchasing while bidding they make clear about WHO pre-qualified… We can fully trust government medicine to eat.... but the problem can be in transportation and storage....." (Participant 1, lab officer, IDI)

In the FGD, one participant shared personal experiences.

"I have found many medicines leaflet to be moist and squeezy.... these were not in the condition to give to patients when they arrived in our health post…." (Participant 14, HA, FGD)

2.3.2. Unreliable private sector

According to participants patients goes to different private sectors as they want to hide their diseases in society. They end up receiving unstandardized treatment which increases MDR-TB in people.

"So, it is not sure that the medicine of private sector is WHO pre-qualified and quality is maintained. Drug quality might affect. This cannot cure MDR-TB …" (Participant 1, lab officer, IDI)

Another participant supported this idea and added information about patients going to the local pharmacy.

"Patients do not want them to be exposed as they are suffering from TB in the society.... so, they end up taking unprescribed medicine from local pharmacy .... this is one of the reasons... additionally doctors are prescribing unnecessary antibiotics rather than actual TB medicine …in private treatment sectors where they do not follow WHO standards.... this may cause an increase in MDR-TB …" (Participant 2, nursing officer, IDI)

Another participant brought up the issue of private sector misuse of TB medications for other illnesses.

"About 20/30% of the critically ill people are taking medicine from private organization… The patient has been taking medicine from a private hospital… The medicine given by them is not per our national guidelines… When they do not get the right doses along with dietary supplements, it may increase MDR-TB on them.... More this, there is irrational use of antibiotics by private sectors… our most used TB drug Rifampicin is used to treat UTI (Urinary Tract Infection) and (Pelvic inflammatory disease) in some women… Second-line antibiotics are used to cure common pneumonia…Many TB medicines are used in other treatments rather than for TB by private sectors...." (Participant 7, NTCC director, IDI).

2.3.3. Low capacity for MDR-TB diagnosis

Participants discussed the enormous difference between the estimated number of cases of tuberculosis and the actual number that had been diagnosed. Fewer people from those who have been diagnosed are enrolled in treatment. This delayed diagnosis allows the patients time to spread their disease throughout the community. Compared to urban areas, there are

significantly fewer diagnoses in rural areas. The participant also talked about the challenges of installing the GeneXpert device in Nepal and its significance for early case discoveries.

Participants believe that there are numerous hidden causes, particularly in rural regions, and that the health system is unable to identify them to begin appropriate treatment and stop further transmission. According to participants,

"There is no sufficient diagnosis of the cases…... T.B. diagnosis is done everywhere but drug resistive or sensitive diagnosis devices are not accessible in every rural area… The diagnosis facility should be in the peripheral area also…HIV patients, malnourished people, and diabetes patients are more sensitive to T.B..... They should be diagnosed in time and start treatment…. But due to lack of services in rural areas, it is not happening….and the treatment starts late…. the situation after earthquake 2072 BS..... and COVID-19 is even worse to diagnose patients from the community" (Participant 5, province focal person, IDI)

Another speaker talked about how people were affected by late diagnoses**.**

"We can't know if they have transmitted to others… They may be in the community, and we don't know and that's why the cases are increasing… If they are diagnosed, then they can be managed… We cannot know the transmission due to late diagnosis… Early Diagnosis is preferable...." (Participant 6, regional coordinator, IDI)

Participants reviewed chronic illnesses including HIV and Kalazar, stressing that there is a high likelihood that individuals may develop MDR-TB if they are not identified promptly and if the appropriate treatment is not provided. A participant explained it as.

"We are not able to test TB for all HIV patients… This is our programmatic error…. The treatment regimen for HIV changes if the patient is suffering from TB and vice versa…. If the HIV patient is undetected with TB and is given a normal HIV medicine, it will not make that person well… the patient will eventually develop MDR-TB on them…. which is so scary…" (Participant 8, NTCC director, IDI)

Participants drew attention to the differences between estimated TB cases, who were diagnosed among them, and patients who were receiving TB treatment. A participant described this as follows

"Before prevalent survey of TB, there was an assumption that there were 40 to 45 thousand cases each year...., but the survey showed TB cases should be more of around 69 thousand per

year.... but we can see that the diagnosed patients are very low…. only 28 thousand patients were diagnosed last year… So, we can see that almost 40 thousand cases are hidden.... they can be in subclinical cases, or we missed the diagnosis of the cases... we might not be able to give services to them…, Also the estimation of MDR-TB is around 2 thousand but only 500 cases were diagnosed last year.... even on that only 400 cases were enrolled at MDR-TB treatment.... 100 cases are already missing there also...Here all these missing cases could have transferred the diseases to others in the community even without knowing" (Participant 8, NTCC director, IDI)

Participants talked about the issues of installing the GeneXpert machine across Nepal and how this issue contributes to MDR-TB.

"GeneXpert can be quite expensive… We are not able to have a GeneXpert machine everywhere.... Electricity is needed to run the machine but there is no electricity everywhere in Nepal…certain locations lack adequate cases to install and operate the GeneXpert machine…. transportation of samples is also difficult in many places…." (Participant 1, lab officer, IDI)

Participants mentioned that the late diagnosis of the cases is caused by fewer MDR-TB diagnosis sites and GeneXpert devices. This was described by one participant as:

"All these things are dependent on each other… If a patient comes for treatment in rural areas HP and if there is no GeneXpert machine, then the doctor writes microscopic ZN/AFB stain… If the ZN stain is less sensitive and if the patient is MDR-TB, we do not know from the ZN stain.... we start the first-line drug… The patient might be MDR-TB… The patient's treatment goes on and the treatment does not respond to the disease.... The doctor might suspect it is MDR-TB after the first line of drugs does not work… then only the patient is sent to the GeneXpert site. From GeneXpert if they are known as MDR-TB then the whole drug regimen would get changed... If GeneXpert would be near and easily available, MDR-TB would easily be identified, and treatment would run smoothly… But this is not happening which increases MDR…." (Participant 1, lab officer, IDI)

Another participant supported this.

"It's been a certain year that GeneXpert machine was introduced in our country… Before that, we were not able to distinguish between normal and drug-resistant TB… We used to test by X-ray and microscopic test which does not use to distinguish drug-resistant TB… Still, we do not have a GeneXpert machine in all places…. So, we still have problems in the diagnosis of drug-

resistant cases at the initial stages.... the problem of couriering of samples to GeneXpert sites is also not fixed yet ....” (Participant 8, NTCC director, IDI)

Section three: Measures to be taken for MDR-TB control

Following a discussion of the numerous factors that might be enhancing the prevalence of MDR-TB. Participants have mentioned a few factors that could help control MDR-TB.

3.1 Updating MDR-TB current guidelines

Participants indicated that updating recent guidelines in certain areas would help control MDR-TB.

Participants talked about the need for an adequate budget increment allowance for a family caretaker and patient transportation. A participant explained:

“I think budget on MDR-TB should be expensed on the area so that the patients would be able to go to the treatment centre… The visitor should also be equally focused on their stay…Recent modality should be changed on this... TB-free initiatives program is also going to get launched in certain districts and municipalities, hope this will make some change.....To solve this interconnected issue, we should start with the policy….” (Participant 9, vice secretary, IDI)

Some participants argued that guidelines should be developed with the patient's comfort in mind. They place a strong emphasis on patient awareness and health insurance.

“Policies should be patient-friendly…. …. middle-income people should be the first target…. monitoring of medicines effectiveness should be included…. awareness program should be included…. guidelines that could help MDR-TB patients to link for health insurance so that the patients would get free health services to cure their health complications... skill training program should be included to enhance the livelihood of patients and reduce psychological stress ....” (Participant 10, liaison officer, IDI)

Participants discussed the need to revise earlier regulations in the context of the nation's more current federal system and the NTCC's role in guiding the province until the programs are stable. One person gave this explanation:

“Now, the country has gone to the federal system... so province should be responsible for this all...Guidelines should be updated accordingly and followed…. But immediately, the province

cannot manage this all on their own as for so many years the responsibility was taken by NTCC.... Now, NTCC should strengthen the province level so that in the future province level would be able to provide all services by themselves..." (Participant 1, lab officer, IDI)

Participants suggested that before launching any new program, the guidelines should be clarified to service providers and adjusted according to their needs. This would help to eliminate any gaps.

"In a situation like this global crisis, we may not find all medicine easily…changing scientific protocol by a centre as per the condition is necessary... We should change it following the protocol of WHO and other international protocols... There should be an uninterrupted supply of recommended medicine at any cost... I remember one incident from the past…. hmm…. In the past second-line medicine cycloserine was out of stock, and we were in trouble at that time.... We managed it by purchasing from the black market… We later changed the protocol and use amikacin. So, we should ensure uninterrupted supply before changing protocol. There should be sufficient storage for medicine..." (Participant 7, NTCC director, IDI)

3.2 Shortening treatment regimen

Participants had the belief that MDR-TB could be controlled if the length of the treatment could be shortened in any way. As one person explained this,

"In MDR-TB treatment if long treatment procedure could be shortened then it would be better… This could be done from the upper level… This would help people to complete their dose within the time...." (Participant 12, AHW, FGD).

Another participant added

"As treatment duration is too long at least 9 months, even it may be extended up to 18 months…if treatment protocol could be short, compliance would be better…. there should be the development of alternatives for a long treatment period....it causes side effects, irregular medicine habits.... loss of follow-up..... So, there should be a study on a shorter regimen to provide effective treatment and to control DRTB...." (Participant 4, TB inspector, IDI)

3.3 Functional recording and reporting system

Participants think that it would be simpler for them to track down cases if there was an appropriate case recording and reporting system. They stated that MDR-TB could be better managed if the system was digital. A participant explained further:

"Healthcare workers should give and take contact number of patients and their family members…they should motivate patients for continuous follow-up....there should be the digitalization of patient record...we should have a system where we can notify patients for their follow up by sending them reminders…..it can be done by giving them some device or simply by SMS…patients should also be made aware about the new information… by this, it would be very easy for us to overcome MDR-TB…..I think this is a very important part but we are not applying …."(Participant 7, NTCC director, IDI)

In the focus group discussion, this idea was accepted and explored while also generating some fresh ideas. The discussion was on having one system which could cover all patients and healthcare workers so that information would be delivered in a timely manner.

"To solve the problem of the defaulter, there should be proper recording and reporting of the cases…We should be able to see the history of the patients at once…. From there we can track those who have come for treatment and who have not...". (Participant 12, AHW, FGD)

"We healthcare workers should also be timely notified if there would be any changes in the regime…. This could happen if there would be a system with good communication which would include all healthcare workers working in TB. So, any information updated would be assessable to everyone at once…. (Participant 16, AHW, FGD)

"Yes, that is the thing… there should be a system which will cover all healthcare workers and patients within one umbrella…". (Participant 17, AHW, FGD)

3.4 Maintaining good quality and quantity of drugs

Participants believed that health services needed to have a sufficient supply of high-quality medications. Participants recommended proper planning to ensure an uninterrupted supply of medications and proposed providing medications with a maximum expiration date to rural areas to preserve their quality.

Participants' belief that the medication is sufficient in a normal situation but unavailable in an emergency has already been discussed in MDR-TB increasement. Here, in this section participants talked about preparing in advance for the transportation of drugs in an emergency. During FGD, this concept was explored.

"Uninterrupted supply of medicine is a must in health services…During the time of the earthquake and Corona, there was no medicine in rural health services…. Patients had to send back without any medicines… so I think pre-planning for such a situation should be done by higher-level authorities before a crisis happens…. they should investigate alternative ways to transport medicine according to the geographical structure of health posts… I mean there can be different methods for the Terai region and different for the hilly and mountain region… Quality of drug should be maintained at the time of transportation" (Participant 18, AHW, FGD

Another participant added an idea to send medicine with maximum expiry dates to most rural areas.

"I think the expiry dates of the drugs should be checked by the logistic suppliers at center level…they should not send us such medicine which expires on the way before reaching to us…instead, they should send medicines to us which have long duration…" (Participant 15, AHW, FGD)

All participants voiced their opinions regarding the preservation of drug quality during storage and transportation.

"We healthcare workers ourselves should focus on good quality rather using unnecessary antibiotics…. storage of the medicines should be done by seeing date …Medicines should be transported and stored by maintaining temperature…TB medicines are too expensive and with short life span…so we should be careful and never let go of storage out of stock…". (Participant 4, TB inspector, IDI).

3.5 Ensuring effective monitoring and counselling practice.

Every participant has emphasized the value of counselling in MDR-TB control multiple times. Participants recommended good counselling and case monitoring to control MDR-TB for nearly all causes of MDR-TB increase.

Participants recommended that patients be informed of every step of the treatment process and encouraged to continue their treatment. One participant said

"Counselling should be done by coordinating with private organization…they have high human resources so we can use them…. counselling should be given to reduce the stress of patients…patients should be made known about the importance of having MDR-TB medicines regularly…. the consequences they should bear for not eating…. they should be mentally prepared for a long duration of treatment so that they will cooperate in long run…. MDR-TB patients should be given more time compared to others by healthcare workers…. if counselled properly then we can control defaulter and ultimately, we can control MDR" (Participant 8, NTCC director, IDI)

Participants also spoke about the value of providing counselling to the patient's guardian and community members to support case monitoring. One participant explained:
"Not only patients but family members of patient should make aware about diseases and their treatment…. So, they will motivate patients to have medicines as suggested by the healthcare workers.... what we can add is coordinating with teachers, club, focal person of the areas, FCHV (Female Community Health Volunteer) mothers' group etc. to track patients..... family members of patients are equally important .... if they are monitored properly transmission to others could be controlled…." (Participant 6, regional coordinator, IDI).

Participants in the FGD expressed support for this concept by saying,
"Counseling for patients and their guardians are crucial… The guardian should be trustworthy... Geographically, it is not feasible to call patients every day to the health post in Sindhupalchowk to take medication because it will take them one or two hours to travel there... The patients would be physically sick so travelling makes things harder. Therefore, talking to a reliable guardian about the right doses is an option…. The guardian should be appropriately counselled so that the patient doesn't miss any doses…." (Participant 14, HA, FGD)

3.6 Increasing MDR-TB treatment sites

According to participants, there are fewer service sites available for MDR-TB diagnosis and treatment. Most exist in centers only. There are many patients, yet there are few treatment sites. Therefore, to control MDR-TB GeneXpert machines and MDR-TB treatment centers should be increased in each municipality. Participants shared their thoughts on the best ways to make use of the tools available.

To control MDR-TB, the participant discussed the importance of decentralization of MDR-TB treatment sites in every municipality, which can aid in early diagnosis of cases, enrolment of treatment cases, and decreased transmission of diseases.

Participants talk about how the additional MDR-TB treatment centres make it easier for patients to receive treatment.

"Now, we are in federal system… so it is necessary to have at least one DR site in one municipality…it will help to disseminate medicine properly…. patients will be fully motivated to eat complete doses of medicines if they can have medicine from nearest sites…. Making the services available in local areas helps the patients not to go Kathmandu (Capital city of Nepal) for small test……" (Participant 10, liaison officer, IDI)

Participants also remarked on the value of MDR-TB treatment centers providing an early diagnosis to prevent the transmission of the disease.

"The main thing is the missing cases who are transmitting diseases in the community.... they have not been diagnosed… We need to find out hidden cases so the MDR-TB could get controlled… If we can catch all MDR-TB for once and enrol them in treatment... then the transmission will be broken down… The remaining cases in the community can find out through screening then all the cases will come under treatment...So, early diagnosis of the cases can help a lot...." (Participant 8, NTCC director, IDI)

The significance of the GeneXpert device and how essential it is to control MDR-TB in Nepal was typically addressed by all participants. Participants argued that the number of GeneXpert facilities should expand and that those that presently exist should be functional.

A participant explained the need to increase the current number of GeneXpert machines.

"MDR- TB diagnosing machine called GeneXpert machine should be made available to every health sector... The main reason for increasement in MDR-TB is because cases are undetected…. All modules of GeneXpert are not functioning either…. if we can diagnose drug resistive T.B in rural areas, we can prevent it from transmission..... So, the availability of the machine should be expanded for testing…… Diagnosis sites along with the GeneXpert machine should be expanded to prevent increasing MDR-TB cases." (Participant 6, regional coordinator, IDI)

Participants discussed a steady supply of electricity and how crucial it is for healthcare workers to receive proper training to operate the GeneXpert machine and to have the GeneXpert machine functional.

"There are 4 models in GeneXpert machine... Each model should be in good condition… There should be regular electric supply.....kit may damage if there is irregular line supply… Sometimes there is container but no cartridge.... again, sometimes cartridge is there but the model is not working. So technician should be taught to check the error ...., immediate action should be taken by an engineer to fix it… The engineer should be made able to fix small errors of the machine by giving proper training…" (Participant 7, NTCC director, IDI)

Another participant supported this saying:

"There are around 65 GeneXpert machines in our country... All are not functional…. If the machine stops working, it takes a long time to fix it…. No engineer can fix it…. It should be packed and sent to France for maintenance... It takes a lot of time… GeneXpert is already in low number…. and the duration of its maintenance creates problems...so there should be manpower in Nepal who can fix the error" (Participant 1, lab officer, IDI)

Another participant mentioned that training for healthcare professionals helps them understand the value of the GeneXpert device and encourages them to use it. This was described by the participant as

"NTCC is trying to purchase and increase GeneXpert machine as they are not enough… The global fund is supporting it…This area needs to be focused on… Another thing is letting the healthcare professionals know that they should do GeneXpert according to the national tuberculosis control centre diagnosis algorithm… Every year this guideline is changing, and these are sent every year to each centre. Though it is sent to the health post, they should be given orientation and training regarding this so that many healthcare professionals would know about this… They should be encouraged to do GeneXpert test and make the maximum utilization of it to control MDR-TB." (Participant 4, TB inspector, IDI)

To keep GeneXpert operational, one participant described how to collect samples from remote places.

"NTCC is working in more guidelines… Where there is less workload, and the cases are minimum they are transmitted to the nearest GeneXpert site, so the machine remains utilized..... One NGO in our district have a project where a sample from the microscopic centre was transmitted to the GeneXpert site by using a drone.... this makes the utilization of

GeneXpert… I think we can use this idea in low cases area to increase utilization of GeneXpert machine." (Participant 1, lab officer, IDI)

3.7 Increasing Hostels

Most participants agreed that each province needed to provide a functioning hostel with access to food and medication. Patients should be taught income-generating skills if required in hostels since they may be the family head of the household and need to be able to provide financial support. Additionally, MDR-TB patients won't spread their illnesses to others if they are segregated and kept in a hostel. Hostels will isolate MDR-TB patients from the general population and control MDR-TB.

One participant explained it as:

"There should be at least 1 hostel in each province for DR cases...There are few hostels under the NATA(NGO working for TB patients).....These patients are doing income-generate activities so that they can earn money even after leaving the hostel to support their family members...This is very important… if every province gets a hostel then patients will be segregated from the community and we will be able to make patients complete their medicine… they can leave medicine if they are not properly supervised…..The nutrition allowance and travel allowance provided by the government are not sufficient for patients…if not in the hostel patients can lack a nutritious diet, as most of them have low economic status… Being in a hostel provide sufficient hygienic food for patient.....Nutrition and psychological support can be maintained in a hostel.....By looking at other patients like them, they get the motivation of groupism.....It develops positive thinking in patients.....So, I think there should be mandatory rules to put DR patients in hostel….." (Participant 3, nursing officer, IDI)

This was the discussion of FGD. The saying of one participant is:

"MDR-TB should be isolated completely even with their family members…..so that we can control its transmission …..they should be under the supervision and treatment of the doctor on regular basis to have medicines....this is the best thing we can do… it is difficult for patients to travel daily for checkup… they cannot even get rent easily as this is communicable disease….NTCC hospital building should be quickly completed as it is under construction for 4 years..... So, patents could get services from there...." (Participant 14, HA, FGD)

3.8 Establishing proper implementation of DOTS programme

Participants in earlier sessions discussed difficulties in following DOTS and explained DOTS as the reason for the increment of MDR-TB. Here, in this section, they have discussed how the DOTS program can be effectively run to control MDR-TB in the community. Participants explained some methods for successfully implementing the DOTS program as assigning a trustable person for DOTS, implementing DOTS in the continuous phase, and adding incentives to those who visit health facilities for DOTS.

Participants proposed appointing a reliable person to observe the individual taking medicine after discussing the issue that it is physically difficult for patients to access the health service regularly. A participant explained:

"The main thing is we are not playing our role… We should see that the patients sallow the medicine by our eyes according to the DOTS rule... Geographically, all patients cannot come into the health post as they need to walk for 1 or 2 hours so.... we need to have one response that can be one of the family members, FCHV, teachers etc. to see patients eating drugs... MDR-TB can be controlled by this" (Participant 2, nursing officer, IDI)

Another participant supported the above statement by adding a focus on FCHVs.

"The way of treatment must differ according to the community… FCHV plays a key role as they have very strong accessibility in the community… FCHV knows that this is a major public health disease and about the symptoms of TB.... They are from the same community so they know the nature of the person and can follow the patients easily…. they can play a strong role from diagnosis up to treatment…So, effective training on DOTS should be provided to them along with the healthcare workers…. This can bridge a huge gap to control MDR-TB…." (Participant 1, lab officer, IDI)

Participants in the FGD debated the need to fully adhere to DOTS in every circumstance. They talked about the significance of DOTS in a continuous phase of controlling MDR.

"In my opinion, we should give medicine to patients according to the protocol of DOTS... to control MDR-TB we have to hit the source…..MDR-TB is because of DSTB so, we have to end DSTB first…..we should stop giving medicines for 1 or 2 weeks at once without knowing about the patients….we should see patients swallowing medicine by ourselves….Also, we are taught to give medicine in front of our eyes in the intensive phase only but it should be continued up

to a continuous phase…In the continuous phase, we give them medicines for certain weeks...But patients should be seen eating medicine until they eat rifampicin medicine….. Rifampicin is in continuous phase also, So, if we see patients swallowing medicine up to continuous phase then we can control MDR….” (Participant 11, AHW, FGD)

Participants in the FGD advised raising incentives and increasing services to encourage more patients to receive DOTS treatment.

“Mainly the patients are from the poor and disadvantaged group so the allowance should be sufficient for them to come to the health post…. Allowance should be increased to have nutritious food, or it should be organized in the health sector… Patients will be motivated to come to the DOTS center if they are provided with nutritious food along with the drugs…. And it is also a must for them to have nutritious food as they will be taking high doses of medicine....” (Participant 15, AHW, FGD)

3.9 Improving MDR-TB knowledge among healthcare professionals and public

Participants believe that awareness among healthcare workers and the general public is key to controlling MDR-TB.

According to participants, there is a lack of general and refresher training mostly at the local level, so it is very important to conduct training to let healthcare workers know about MDR-TB. If healthcare workers properly know about MDR-TB, then only they can guide patients for MDR-TB, and it can be controlled. One participant explained.

“All healthcare professionals giving services to TB patients are not doctors…People at higher levels should know this…… They are HA or AHW (auxiliary healthcare workers) who provide clinical services in HP of rural areas… Many healthcare workers know about TB but are unaware of MDR-TB…They treat the patients by themselves so they should be provided with enough training… In the microscopic centre, people are transferred frequently from one place to another… So, refresher training is needed from time to time....” (Participant 1, lab officer, IDI)

Another participant added:

“There is the huge stigma of discrimination of TB patients globally... all healthcare workers do not use polite words with patient….some even do discrimination to them…patients already are frustrated with their condition…little hard word can pinch them….so healthcare workers need to be properly trained to provide proper care, support, medication and motivate

patients….it is said "and rog ta hausala le nai thik parcha"(meaning in English: half diseases is already cured if patients are properly motivated) healthcare workers should be confident enough on themselves to counsel patients and ensure patients that their treatment will cure them…health worker should be trained enough to explain the importance of treatment until they understood…so that the patient can recover soon…"(Participant 10, liaison officer, IDI)

Participants explained how COVID-19 has affected capacity-building training. They described how they had to read the treatment protocol on their own and give patients medication. A participant explained:

"After the covid case, there is not any conduction of DR related training program....so many of us must work without having effective training..... Patients are given medicine just by looking and getting information from protocols……. From this simple guideline we might not be giving proper treatment….and this all might result in negative outcomes…So, to have effective implementation of the program we all need training… at least we should get an orientation program before starting our duty if it's difficult to organize any training…." (Participant 3, nursing officer, IDI)

Participants in the FGD addressed the fact that while there is training on TB, there isn't any on MDR-TB. They also discussed the need for an MDR-TB treatment booklet in each health post. One participant explained

"Training program should be there to develop the skill of healthcare workers...Many healthcare workers are clear on general TB but there is still confusion about MDR… Most healthcare workers are not clear about the MDR-TB regime…So, training should be organized on MDR-TB. There should also be a booklet with clear instructions in each treatment center..." (Participant 16, AHW FGD)

Another FGD participant emphasized the importance of training, including private service providers.

"I knew about MDR-TB only after working for a certain time as a health worker…. when I had started to work as a health worker, I knew only about TB and HRZE… there is a lack of proper awareness about MDR-TB in society as well as in healthcare workers.... so proper training should be given before starting work……private sector service provider should also be included in the training…." (Participant 14, HA, FGD)

Participants believe that increasing public awareness can decrease MDR-TB in the community. They recommended educating the public about MDR-TB through the media, conducting campaigns in high-burden areas, and including the topic in regular monthly meetings held in most villages.

Participants talked about controlling MDR-TB by promoting awareness through the media. One participant explained:

"And also, we have to do the different mass awareness programs about the MDR-TB through TV, radio and different social media.... many people don't know about the MDR-TB…. community people do not know how costly the treatment is and how much the government is paying for their treatment..... This information should also be passed massively along with the diseases…so people will not hide their diseases and come for treatment…." (Participant 8, NTCC director, IDI)

Some participants supported the concept of raising awareness of the MDR-TB through the media and conducting a campaign in high-burden areas.

"TB is more dangerous than COVID...COVID transfer is just by touching but TB transfer very easily in public through air…I think people are taking TB very lightly as it can be cured by taking medicine for a limited time… So, people are not more conscious of its severity…. I think there is a lack of education about it…So, we should launch a campaign program in high-burden areas… And let all the patients know about it through social media…. This disease can be prevented only when mass is aware and seek themselves for medical care…." (Participant 3, nursing officer, IDI)

In FGD, participants discussed public awareness through meetings that go regularly in the community. One participant explained:

"From our peripheral level we should do public awareness by attending FCHV meeting, mothers group meeting that goes monthly in the community… we should take their time for short and let them know about TB symptoms.....its treatment…. consequences if not treated timely…… TB is not due to curse…This can motivate people to come for a treatment and in the identification of the cases if symptoms appeared in anyone…" (Participant 16, AHW, FGD).

CHAPTER 6: DISCUSSION

1. Knowledge of healthcare workers on MDR-TB and its emergence

1.1 Definition of MDR-TB

In my research, it was observed that most of the healthcare workers had a basic knowledge of MDR-TB. Participants defined MDR-TB in three ways.

First, very few healthcare workers knew the WHO definition of MDR-TB. Some participants explained resistance to both isoniazid and rifampicin in the first-line regimen as MDR-TB. These participants thus have accurate knowledge of MDR-TB.

Secondly, some healthcare workers perceived that resistance to at least on drug of the first-line regimen is MDR-TB, where they mainly focused on Rifampicin resistance. In my opinion, this definition is based on their working practices. Resistant to only rifampicin doesn't fall under MDR-TB but we cannot say participants have mistaken this. According to WHO, recommendation guidelines adopted by Nepal, if RR resistance is seen it should be treated as MDR-TB because 95 per cent of rifampicin-resistant TB is also resistant to isoniazid. (NTC, 2019, p. 12). Therefore, according to participants, RR resistance found from the GeneXpert machine is MDR-TB.

Thirdly, some participants simply defined MDR-TB as a disease caused mainly due to improper treatment of TB. I perceive that the knowledge of participants is correct as MDR-TB is a consequence of ill-treated TB disease.

1.2 The emergence of MDR-TB in Nepal

Participants were not entirely sure about the actual origin of MDR-TB in Nepal. However, participants gave mainly three concepts behind the disease's emergence. These reasons included disruption in Tuberculosis medicine intake, no adjustment in the drug intake or bacterial mutation, and import from India.

Some healthcare workers pointed out that MDR-TB originated in Nepal due to interruption in medicine intake by TB patients. The interruption could be due to either patient or health system errors during TB treatment. A similar concept was pointed out by Sharma, Lalwani, Pandey, and Thakur (2019) in India, who found that treatment interruptions affect the emergence and span of MDR-TB. Another study in India also explained that the consequences of medical interruption in TB treatment resulted in MDR-TB (Shukla & Chaudhary, 2019).

Similarly, many health professionals had the opinion that MDR-TB originated because the TB patient's physical body transformation was not considered while treating the disease. TB patients' body weight varies during each stage of their medication period, and their medication should be adjusted accordingly. Participants also believed that patients' medical dose should be adjusted according to their body weight to avoid MDR-TB. According to the recent National Tuberculosis Guidelines of Nepal, every TB patient should consume medicine through DOTS using a fixed-dose combination (FDC). National Tuberculosis Guidelines of Nepal contain calculation guidelines on the number of FDC tablets that a TB patient should receive during TB treatment phases according to the TB patient's body weight. (NTCC, 2019a, p. 37)

Some participants also considered the process of bacterial mutation to be one of the possible causes behind the emergence of MDR-TB. These participants believed that bacterial mutation causes bacterial drug resistance, and these resistant bacteria may develop MDR-TB in the human body. According to Daniel, mutations in mycobacterium tuberculosis are developed due to misuse of anti-TB drugs (T. M. Daniel, 2006). The emergence of MDR-TB and treatment problems due to gene mutation with anti-TB drugs mainly rifampicin and isoniazid were also pointed out in studies performed by (Mishra, Shukla, Huang, & Hu, 2015). Several studies support that mutation causes MDR-TB (Liu et al., 2021; Müller, Borrell, Rose, & Gagneux, 2013).

A part of the total participants also assumed that MDR-TB might have been imported from India. As Nepal shared an open border with India, MDR-TB-infected people may have come to Nepal at any point. According to Comas et al. (2013), MDR-TB expands due to human migration. A study was performed by Malla and his colleagues to investigate TB patients' genetic backgrounds to know the emergence of MDR-TB in Nepal. Four lineages of TB (1. Indo-Oceanic lineage, 2. East-Asian lineages including the Beijing family, 3. East African

Indian that including the Central Asian Strain CAS/Delhi family, and 4. Euro-American family) were investigated to link them to MDR-TB. However, the study concluded that Delhi family in non-MDR-TB strains aren't responsible for MDR-TB origination in Nepal. (B. Malla et al., 2012)

It would require further research investigation to conclude if the above four reasons caused MDR-TB in Nepal. Similarly, MDR-TB could have emerged due to several other anthropogenic activities in Nepal. For example, the outbreak of MDR-TB was documented between 1985 and 1992, especially among HIV-infected patients in Florida, New York, and other states (Cegielski, 2010; Keshavjee & Farmer, 2012). United States outbreaks of MDR-TB foreshadowed the coming pandemic, and it was found in almost all areas where diagnostic capacity existed to detect MDR-TB (Keshavjee & Farmer, 2012). The outbreak of MDR-TB in the United States may have a footprint in Nepal as well.

2. Reasons for the increasement of MDR-TB

There are various reasons explained by the healthcare workers for the increment of MDR-TB based on their working experiences which were grouped into different categories by coding. According to healthcare workers' explanation, below are the reasons categorized that are associated with the patients, the healthcare workers and the health system that increases MDR-TB. Further, a patient-associated increment reason is divided into two categories: barriers to access to health services and discontinuation of treatment by patients.

2.1 Patient-associated

In many cases, the rise in MDR-TB might be attributed to the patients themselves. Mostly, when patients do not seek medical services or stop taking their medication, they are more likely to develop MDR-TB or spread the disease to many others, resulting in an increase in the number of TB cases.

According to participants, three categories prevent people from having easy access to healthcare services. These are social stigma, poverty, and their health-seeking behaviour.

Participants categorized social stigma as one of the barriers to MDR-TB control which should not be ignored. Participants claimed that the stigma associated with MDR-TB patients spreading the disease to others is what drives people's animosity towards patients. The fear of MDR-TB patients being hated in society leads to them choosing death over treatment, hiding their diseases, and trying to buy medicine from far medicine stores, all of which ultimately increase MDR-TB. Most people and healthcare workers are not aware that, having prolonged close contact with untreated positive acid-fast smears TB patients can greatly increase the risk of transmission, but they are unlikely to transmit the disease after two weeks of treatment (WHO, 2010b). Several studies have supported the claim made by the participants that social stigma increases MDR-TB. For example, some investigators observed treatment delays and complications due to patients' reluctance to treat the disease (Courtwright & Turner, 2010; Cremers et al., 2015). Stigma was considered a major barrier to early diagnosis and complete treatment by (Craig, Daftary, Engel, O'Driscoll, & Ioannaki, 2017). As social beliefs have resulted in the spread of MDR-TB through delay in diagnosis and treatment complications, it is an important health issue. Social stigma in MDR-TB treatment requires much higher attention from medical professionals. Although TB communities have acknowledged that social stigma surrounds MDR-TB, not much practical effort has been made yet (Courtwright & Turner, 2010; Sommerland et al., 2017). Consideration of social stigma in the fight against AIDS might serve as a helpful lesson for MDR-TB control which was also explained by Macq as "It is striking to see that stigma is at the center of global strategies to fight AIDS and it is so little present in the international priorities of TB control (Macq, Solis, & Martinez, 2006, p. 351)."

Another barrier to controlling MDR-TB that was mentioned by participants is poverty. They said that although poor individuals are not the only ones affected by TB, the majority of TB patients come from underprivileged and low-income groups. Participants explained mobility, crowded environments, and malnutrition as factors that potentially enhance MDR-TB. These factors were coded under the poverty category because participants explained them to be a consequence of poverty. Similar to my studies, poverty for MDR-TB increment was mentioned in the studies of (Benatar & Upshur, 2010). Similarly, a recent study on South Africa has defined a positive relationship between labour migration and TB burden on individuals (Petersen et al., 2021). As of my study, (Doganay & Demiraslan, 2016); Workicho, Kassahun, and Alemseged (2017) revealed that living in crowded places can be a good platform to develop and transmit MDR-TB. Similarly, a study conducted in India identified that patients

who do not get nutritional support had a 50% higher risk of unsuccessful treatment. The study concluded patients living below the poverty line who received food support had a lower risk of TB treatment failure Samuel et al. (2016) which is similar to the explanation of my participants. These findings validate the assertion made by my participant that poverty increases MDR-TB.

Similarly, participants discussed patients' poor health-seeking behaviours and their decision to use the health system as their last option for treatment as barriers to MDR-TB control. A similar kind of practice by patients was reported in a study done in India and Ethiopia which ultimately increases MDR-TB (Samal, 2016; Senbeto, Tadesse, Tadesse, & Melesse, 2013). ten Asbroek et al. (2008) explained that the health-seeking behaviour of Nepalese patients, that they often included beginning their treatment at the medical shop by taking self-referral medicine and then following convoluted pathways with multiple providers before getting diagnosed with highly skilled and competent TB staff. This is similar to the explanation given by my participants. More to this, allopathic healthcare systems and treatment from traditional practitioners are also widely available in Nepal which increases the chance of delayed diagnosis and MDR-TB increase (ten Asbroek et al., 2008).

According to participants leaving the treatment without completing the full treatment course can be one of the reasons for barriers to MDR-TB control. Some of the reasons given by participants for discontinuation of treatment are healthcare services far from residential areas, long treatment procedures, illiteracy, side effects and patients feeling better after having medicines for a certain time. The first two reasons for an MDR-TB increment are provided with control measures by my participants so these two will be discussed later in the MDR-TB control section. Another reason illiteracy is responsible for the discontinuation of treatment causing increment of MDR-TB is also pointed out by many authors including (Bishwajit, Ide, & Ghosh, 2014). Discontinuation of treatment when patients feel better after having medicines for certain days or when they develop lots of side effects is mentioned by Wares, Singh, Acharya, and Dangi (2003) and Skinner and Claassens (2016) respectively in their studies. Thus, a variety of factors might impact a patient's decision to stop receiving treatment, which eventually may contribute to the rise of MDR-TB.

2.2 Healthcare workers associated

Healthcare workers are crucial to the functioning of peripheral health structures in resource-scarce settings like Nepal (Devkota et al., 2013; Hongoro & McPake, 2004). Treatment adherence of patients is influenced highly by the behavior of healthcare workers. Participants pointed out some of the reasons that are related to healthcare professionals which can increase MDR-TB. Three main categories coded under healthcare workers are: DOTS not followed properly, poor precaution practices by healthcare workers and scarcity of healthcare workers in rural areas.

According to some participants, healthcare professionals are not able to implement DOTS properly due to challenging rural geographical settings. DOTS was implemented all over Nepal by WHO in April 2001 for effective diagnosis and standardized treatment in TB (Gautam, Karki, & Khanam, 2021). According to the DOTS guideline, healthcare workers must see patients swallowing medicines at a minimum in the intensive phase (WHO, 1999). However, it is impossible for healthcare professionals in rural Nepal to treat MDR-TB patients in their physical presence. Nepal's challenging geographical settings and poorly connected transportation routes make it difficult for patients to reach healthcare centers. While walking time to reach healthcare centers may take up to several hours depending upon the patient's location, it is even more troublesome for them during the illness. According to some participants, healthcare professionals in such conditions have no option but to show empathy to their patients and provide medicine for several days. This means patients consume their medicine judgmentally in their homes without trained experts' guidance. As a consequence, the risk of health complications for risk of patients increases. Therefore, MDR-TB is increasing in Nepal because the geographical setting hinders health professionals from proper implementation the DOTS programme.

Based on participants' responses, the second healthcare worker-related reason for the MDR-TB increase is poor precaution practices of healthcare workers. I found that participants were aware of some MDR-TB-related WHO precautionary measures for the prevention of TB in healthcare facilities of resource-limited settings, including maintaining proper distance, sitting in a cross position with patients, and safe disposal of sputum (WHO, 2019b). However, participants were not aware of all the WHO guidelines. Further, it was found that they only had a theoretical background in basic precautionary knowledge. Participants expressed difficulties

in applying MDR-TB-related WHO precautionary measures practically. A similar struggle for practical implementation of recommended guidelines for TB control in hospitals was pointed out in a study done in the US, UK, and Germany. This research recommends some practical changes and threatens that the practices might be disrupted if the guidelines are not amended quickly (Diel, Nienhaus, Witte, & Ziegler, 2020). Similarly, a study done in Nepal found a dissatisfactory level of theoretical knowledge and practices among healthcare workers mostly in lower-level positions and staff in the TB infection control field (A. Shrestha et al., 2017). In another study done on nurses of TB Regional Hospitals of Nepal, it was found that most of the nurses had a low level of knowledge and used poor safety measures to prevent TB (M. A. Baral & Koirala, 2021). In contrast to my study a cross-sectional study done to know "Knowledge, Attitude, and Practices on Drug-Resistant Tuberculosis Infection Control in Nepal" found that healthcare workers of DRTB centers had a good understanding of DRTB infection control. However, this study also found that there is a lack of appropriate practices (S. K. Shrestha et al., 2021).

Participants mentioned the scarcity of equally distributed trained manpower all over Nepal as a third barrier to MDR-TB control that could be categorized under healthcare professionals. Participants mentioned mainly two reasons for the scarcity of healthcare workers. First, they mentioned no timely fulfilment of vacant posts of both healthcare workers in rural health posts and watchmen running the services. Second, they mentioned the frequent transfer of qualified staff. The scarcity of skilled healthcare workers mostly in rural areas of Nepal was also found in the study done by (B. Baral, Prajapati, Karki, & Bhandari, 2013). Similarly, a high supply of nurses in Kathmandu and numerous vacant post in rural areas was mentioned by (R. Adhikari, 2015). Transferring staff from one working place to another or from one health unit to another makes healthcare workers completely new to the situation. This can lead to missing useful information as well as patients avoiding treatment until the health worker settles in the new place. Transferring to a new unit requires additional training and orientation for the healthcare workers, which can be time-consuming and sometimes delayed due to various reasons. This can decrease the quality of treatment for patients. Frequent transfer of staff thus can create a gap and increase MDR-TB. WHO (2007) also commented that high turnover of staff reduces the continuity and quality of the services.

2.3 Health System-associated

Barriers explained by participants inherent in the health system of Nepal are created due to the geographical structure of Nepal and the government not being able to provide services equally all over Nepal. Easy access to health services for people is highly affected by the geographical landscapes of Nepal (B. Adhikari et al., 2017). Most of the health services are concentrated in urban areas. There are comparatively fewer services for the people of the mountain and hilly region as compared to Terai (Wares D et al., 2001). Some districts in hills and mountains are not even in touch with roads and electricity, so it is very difficult to provide health services. Due to the health system's failure to provide services to healthcare throughout Nepal, MDR-TB is on the rise in three major categories: unavailability of drugs or poor quality of available drugs, unreliable private sectors, and fewer MDR-TB treatment sites.

Participants mentioned the unavailability of drugs or poor-quality of available drugs to be one reason for the increment of MDR-TB. Participants further added that there are TB medicines in all health services with TB treatment, but they emphasized that the medicines were out of stock during the rainy season, earthquakes, and lockdown due to the corona crisis. Participants also commented that the quality of the drugs degraded at the time of transportation or storage. Geographically, due to lack of transportation, in most hill and mountain regions of Nepal, it is very difficult to transport medicines. The situation becomes worse during the rainy season when the road gets blocked due to floods and landslides. Adhikari and his colleagues also found similar kinds of transportation problems for essential medicines to peripheral health services in Nepal (S. R. Adhikari, Pandey, Ghimire, Thapa, & Lamsal, 2018). For the quality assurance of drugs, there are recommendations in the transportation of medicines by (WHO, 2016, 2017a). The difficulties in the implementation of WHO guidelines to maintain quality in developing countries were pointed out by (Giralt et al., 2020). Nepal is also among those developing countries which is not able to transport medicines safely. A recent analysis of the WHO literature survey reveals, that 10 % of all medicines in low- and middle-income countries are of poor quality (WHO, 2017b). Therefore, Nepal urgently needs a workable strategy that considers the changing climate and topography of the country to preserve the quality of the medications throughout transportation and storage. Without addressing this issue, improving other factors won't lead to control of MDR-TB.

Participants explained that the health system not being able to regulate public and private services is one of the barriers to MDR-TB control. Participants claimed that mostly urban sector patients go to the private sector for their treatment. In the private sector, they do not get treatment consistent with the guidelines provided by the Nepal Government, which increases MDR-TB in patients. Private sectors not following the guidelines provided by WHO and Nepal government to treat TB patients is also well explained in the studies of (Nepal, Shrestha, Baral, Bhattarai, & Aryal, 2012). In spite of the such situation, we cannot neglect the fact that the private sector contributed 23%,19% and 18% in the year 2017, 2018 and 2019 respectively to the referral and diagnosis of TB patients in Nepal (NTCC, 2019b). The shortage of medical personnel needed to treat TB cases can be lessened by including the private sector in TB treatment and by training the employees of private organizations. To address TB care and control, PPM (Public-private mix) DOTS is a key component of the WHO STOP TB Strategy (2006-2015) in a high-burden country like Nepal (WHO, 2006). Therefore, if the health system can strike a balance between the public and private sectors' roles and duties, it might be able to break down the barrier to MDR-TB control.

Participants explained that the health system of Nepal lacks enough medical equipment and MDR-TB treatment centers, which prevents the diagnosis of hidden cases and leads to an increase of MDR-TB. Therefore, participants frequently explained the necessity and availability of the GeneXpert machine in terms of Nepal for early case detection. The importance of the GeneXpert machine in the diagnosis of MDR-TB in Nepal was also explained by (Pandey et al., 2017; P. Shrestha, Khanal, Dahal, & Dongol, 2018). In Nepal, we lack both the GeneXpert machines themselves and the supply of cartridges for existing machines. If any modules fail to work, then there is a delay in maintenance. The instalment of the GeneXpert machine is not possible in areas without electricity, of which there are many in Nepal. Not having a regular power supply for the implementation of GeneXpert machines in Nepal was also explained by Joshi et al. (2018) in their studies and the problem of irregular cartridge transportation and maintenance in Nepal was documented by (Joshi et al., 2018; Paudel, Padmawati, Ghimire, Yonzon, & Mahendradhata, 2021). Due to a lack of medical equipment and the inability of making the existing equipment function, MDR-TB is not diagnosed properly, which ultimately increases MDR-TB.

3. MDR-TB Control measures

Participants in my study had shared their views on some of the control measures that could be initiated to mitigate barriers to MDR-TB control. There are nine categories coded under the control measures of MDR-TB: updating current MDR-TB guidelines, shortening treatment regimen, digitalizing functional recording and reporting system, maintaining good quality and quantity of drugs, ensuring effective monitoring and counselling practice, increasing MDR-TB treatment sites, increasing hostels, establishing proper implementation of the DOTS programme, and improving MDR-TB knowledge among healthcare workers and the public.

Participants recommended certain changes to the current guidelines regarding increasing patient allowance related to transportation, family caretaker facilities, health insurance costs, and more to control MDR-TB. These subsidies to poor patients can help them to reduce their financial burden. A recent study by Dixit and his colleagues discussed how the socioeconomic burden of the patients and their household members decreases if the patients get financial support from the government (Dixit et al., 2021). So, financial help to patients could increase treatment adherence and therefore increase the control rate.

Additionally, participants emphasize a need for a shorter treatment regimen in order to have MDR-TB control. A shorter MDR-TB treatment regimen was recommended for use under certain conditions by WHO in May 2016 (WHO, 2019c). With the support of the Damien Foundation, the NTP of Nepal has approved the 9-month shorter treatment regimen for eligible MDR-TB in all TB treatment centres since January 2018. The positive outcome of the program and its necessity to be in programmatic care was pointed out by many authors including (Ghimire et al., 2020). A recent study on Niger also concluded shorter treatment regimens are effective and safe (Piubello et al., 2020). If shorter treatment regimens are implemented properly, there is an improvement in adherence to the therapy (Ma, Lienhardt, McIlleron, Nunn, & Wang, 2010). Thus, a short treatment regimen could increase the adherence of patients to treatment.

Also, participants recommended digitizing all data at each health post to ensure accurate recording and reporting of cases to combat MDR-TB. A good recording and reporting system

can set everything on track by allowing necessary updated data for decision-makers and disseminating important information to a lower level for implementation without any delay. Healthcare workers in my study frequently complained that they do not get up to date information about any changing guidelines. This creates an implementation gap which will ultimately affects the treatment of the patients, as described in (Pai & Temesgen, 2016). Healthcare providers with the information in hand can solve many problems, as they can trace the patients, send reminders for medicine intake, or call for follow-up when necessary. This can increase treatment adherence of patients, which finally can control MDR-TB. Digitalization of health records for patients' adherence and decision-making was also pointed out in studies by (S. M. Ali et al., 2018; Falzon et al., 2016; Subbaraman et al., 2018). Further, through digitalization, awareness can also be spread quickly among many people at once. A strategy to make healthcare professionals aware by giving them information through mobile phones at the regional level of Nepal was also discussed by (Iwaki, Rauniyar, Nomura, & Huang, 2021). Therefore, the digitalization of all information may help to overcome some obstacles to the management of MDR-TB.

Furthermore, participants recommended providing patients with high-quality drugs in proper quantities in order to have MDR-TB control. Participants suggested some ways to transport and maintain the quality of drugs to rural areas, including the use of drones for drug transportation and the provision of maximum expiry date drugs. Proper quality and quantity of medicine is essential to prevent avoidable drug-resistant TB and mortality from TB, which is also well explained by (Newton et al., 2011). From a recent study, it is known that for the transportation of drugs, there is increased use of aerial vehicles after the earthquake in Nepal (Pageni, UttamPudasaini, & Pradhan). The effectiveness of using drones in a health facility and at a time of emergency while there is road blockage in Nepal was explained in an article by (Balasingam, 2017; Berninzon, Vongasemjit, Russell, & Sheffi, 2021). So, the government may take the use of drones seriously and promote the use of drones in transporting medicines mainly to the hill and mountain regions of Nepal.

Participants recommended that regular monitoring and counselling to patients and their family members might aid in MDR-TB control. They advised using the private sector's workforce to assist with monitoring and counselling. Due to the challenges, patients need to overcome, such as side effects, lengthy travel, discomfort, etc., effective monitoring and counselling of participants and their families might assist to promote treatment adherence.

Effective counselling to increase treatment adherence of patients is also suggested by (Aamir, Latif, & Basit, 2016; S. C. Baral, Aryal, Bhattrai, King, & Newell, 2014; Lange et al., 2014). If counselled properly, family members can also monitor whether the patient is taking medicines or not. The effectiveness of counselling and monitoring for MDR-TB management was noted in research conducted in China by (Ruan et al., 2021). Better monitoring and counselling was advised by S.C. Baral to decrease the additional burden of the illness and to boost the cure rate for MDR-TB (S. C. Baral et al., 2014). So, monitoring and counselling effectively might help in MDR-TB control.

Besides the above suggestions, participants proposed an increment of diagnosis and treatment sites throughout urban and rural Nepal equally so that all the patients could be diagnosed in time and come under treatment to have MDR-TB control. Participants further emphasize the increment in the number of GeneXpert machines and the efforts that should be made to have all GeneXpert machines functioning. Decentralization of the health diagnosis and treatment sites is very important to have MDR-TB control. In Nepal, there is already a lack of GeneXpert machines, and those which are present are not well functioning. This situation in Nepal and the importance of the optimal utilization of the machines were explained in their studies for MDR-TB control by (Joshi et al., 2018). Participants in my research offered suggestions, such as couriering samples from areas with fewer TB cases to GeneXpert locations and training lab staff on the value of the GeneXpert equipment to ensure full use of it. A minimum of five days of practical training for the GeneXpert site's staff for optimal utilization was pointed out by (Joshi et al., 2018). Participants in my study also explained that healthcare workers should be trained to fix small errors that come while using the machine to keep it functioning which is also the suggestion of (Albert et al., 2016; Joshi et al., 2018). Thus, proper use of the GeneXpert machine can play a crucial role in the management of MDR-TB.

Likewise, participants discussed the necessity of hostels for TB patients who do not have easy access to treatment facilities to manage MDR-TB. Because of the lack of enough GeneXpert machines and DR sites, patients from hill and mountain regions need to rent a room in the Terai region or those from rural areas need to rent a room in urban areas. This is similar to the findings of S.C. Baral, who discusses the difficulties of having rented rooms for TB patients (S. C. Baral et al., 2014). Most patients are economically poor, so it is exceedingly challenging for them to pay for their daily costs as well as their medical care while living in a rented room. There is a high chance that they will not complete their treatment in such a

situation. Farther health facilities to reach was one of the reasons for the incomplete treatment described by (Wares et al., 2003). For the patient to have a rented room and finish their treatment is not viable. Additionally, the landlord will never rent a place if they know patients are TB sufferers. Therefore, having hostels and receiving complete care might lessen the cost of an unequal distribution of health services. There are 6 DR hostels, one DR home, one DR referral center and one TB hospital in different parts of Nepal (NTCC, 2018). Various NGOs and INGOs have supported the government, and some have run hostels on their own to provide nutritional support, food, lodging, and income-generating skill development training to the patients. But according to the recommendation of participants, there are not enough hostels, and more should be made available. Wares D in his findings also discussed access issues to the health post and the significance of hostels for patients to finish their treatment. He focused mostly hill region of Nepal (Wares D et al., 2001). Therefore, having a sufficient number of hostels to accommodate the patients could reduce the number of TB cases.

Participants in the previous session addressed the challenges of implementing the DOTS programme in the context of Nepal whereas in the current session they offered their ideas on how DOTS might be maintained and used to manage MDR-TB. DOTS, if not followed effectively, can be one of the reasons for the MDR increment (Liang et al., 2012). So, some workable solution for TB treatment is needed in a country like Nepal. Participants recommended that DOTS be community-based, family-based, or under the supervision of FCHV for a higher chance that the patients will get appropriate monitoring. To accomplish this, community people, family, and FCHV should be included in training practices. The effectiveness of these community-based DOTS was explained by many authors including (Arshad et al., 2014; Mirzoev, Baral, Karki, Green, & Newell, 2008; Zhang, Ehiri, Yang, Tang, & Li, 2016). Any measures taken should be patient-friendly, and community-based DOTS might ease the stress on patients to travel to the health facility. Another solution traced out by the participants was to give incentives to the patients when they come to the health post for a checkup so that they will be motivated to visit the health sector on regular basis. A similar concept was suggested that increasing incentives resulted in better adherence to TB treatment by (Davidson et al., 2000; Orlandi, Pereira, Biagolini, França, & Bertolozzi, 2019; Wei et al., 2012). However, contrary to the participants' assertions on the support of incentives, Lutge and his colleagues discovered that in the majority of marginal populations, incentives can only have short-term positive effects while in long run, patient adherence is not sure (Lutge, Wiysonge,

Knight, Sinclair, & Volmink, 2015). Therefore, the DOTS program may need some alterations as recommended by the participants to achieve its full impact on patients.

Apart from above suggestions, participants suggested that adequate general and refresher training for all medical personnel and public awareness campaigns on MDR-TB might aid in the disease's management. Health professionals in this study found a knowledge gap about MDR-TB, and some admitted that they had not attended any TB-related training. If healthcare professionals are not adequately trained, they will not be able to give proper treatment or counselling. The importance of training and orientation on TB due to inadequate knowledge of healthcare workers in Nepal was also suggested by (A. Shrestha et al., 2017). Participants added that raising public knowledge is a crucial component of MDR-TB control. If people are informed, they will seek treatment on their own when experiencing any symptoms and will also cooperate fully for the duration of the treatment. Bhatt in his findings also mentioned that the reduction of disease transmission and prevention of MDR-TB can be accomplished in Nepal by educating patients, the local population, and family members (Bhatt, Bhatt, & Shrestha, 2009).

CHAPTER 7: METHODOLOGICAL CONSIDERATIONS

Strength

- There hasn't been any qualitative research conducted in Nepal that examines healthcare professionals' perceptions and knowledge of MDR-TB control. As a result, this study might enrich the existing body of knowledge on the subject and suggest other areas for future investigation.
- The researcher tried to build a positive relationship with participants and repeatedly assured them of confidentiality, which made it simpler to get over people's obstacles to opening for a talk in this study.
- Data was gathered through in-depth interviews with higher-level authorities who develop plans and focus group discussions with the health post incharge who carry out programs on the ground. It was thus beneficial to get comprehensive data from a range of healthcare facilities and individuals.

- The study was conducted in the researchers' native nation, where both the participants and researcher share a common language. This made it simpler for the researcher to understand the body language and gestures of participants while gathering data.
- The researcher participated in all phases of the study process, including the formation of the project, fieldwork, data analysis, interpretation, and thesis submission. Thus, this thesis maintained the coherence of the research.
- Since the entire study was conducted online and recorded, its accuracy was maintained.

Limitation

- As participants were chosen purposefully based on the NTCC's advice, and using a snowball sampling approach, therefore there may have been bias in the selection process.
- The original plan for this study was to travel to Nepal. Due to COVID-19 travel restrictions, the researcher had to use online data gathering methods instead. Therefore, this might have limited the data's richness.
- The information gathered through in-depth interviews is mostly generalizable across Nepal, whereas the information gathered through FGD was concentrated in Nepal's Sindhupalchowk districts. The results of this investigation are therefore only partly transferrable.

Recommendations

- Promote educational and training opportunities for health professionals, such as counsellors, volunteers, and employees of the private health sector, who work in the field of MDR-TB
- Facilitate patients and their caretakers with more incentives
- Increase the number of MDR-TB treatment centres and hostels
- Public education campaigns on MDR-TB should be conducted
- The mechanism for recording and reporting MDR-TB information should be digitalized.
- Every health sector should have access to MDR-TB manuals.
- Create a patient-centred, comprehensive strategy to combat MDR-TB

Areas of further research

- Healthcare professionals lacked clarity regarding the precise emergence of MDR-TB in Nepal. Therefore, it may be possible to investigate healthcare providers' knowledge and experience on the origin of MDR-TB in Nepal.
- Transporting medicine to remote locations in Nepal without access to roads during the rainy season and during political chaos is still an important problem that both patients and medical professionals should tackle each year. It is, therefore, possible to research how healthcare professionals perceive and experience working during emergencies and political crises to control MDR-TB in Nepal.

CHAPTER 8: CONCLUSION

As MDR-TB is increasing rapidly in Nepal, it is included on the WHO's list of 30 countries with a high MDR/RR TB burden for the years 2021 to 2025. Many MDR-TB patients in Nepal are dying because they are not properly diagnosed or well treated. Understanding knowledge and perception of healthcare professionals in diagnosis process and treatment procedure is regarded as one of the primary ways outs for MDRTB control. However, there is gap in literature about knowledge and perception of healthcare professionals regarding MDRTB in Nepal. A qualitative exploratory study was conducted using in-depth interviews and FGD to examine the knowledge and perception of healthcare professionals on the origins and control of Multidrug-Resistant Tuberculosis outcomes in the Sindhupalchowk district of Nepal.

In my study, participants defined MDR-TB in three different ways. Some participants knew the WHO definition of MDR-TB. Some participants defined MDR-TB as resistance to at least one drug of the first-line regimen, where they mainly focused on Rifampicin resistance. This is not a complete definition of MDR-TB, but it is partially correct. Some participants generalized MDR-TB by defining it as a disease caused mainly due to improper treatment of TB.

Although participants were not sure about the actual cause of MDR-TB in Nepal, they provided three concepts for the disease's emergence in Nepal. First, some participants believed that interruption in medicine intake either due to patients or health system errors during TB could have originated MDR-TB in Nepal. Similarly, some participants believed that MDR-TB could have originated because patients' medical doses were not adjusted proportionally to their changing physical body size during treatment or bacterial mutation causes bacterial drug resistance, and these resistant bacteria may have developed MDR-TB in the human body. Third, a few participants also assumed that MDR-TB might have been imported from India; however, no studies were found to support this claim. It would require further research investigation to conclude if the above four reasons caused MDR-TB in Nepal.

Participants reasoning for the increment of MDR-TB is categorized into 3 groups: patient associated, health worker associated, and health system associated. According to some participants, patient social stigma, poverty, and health-seeking behaviour as well as the discontinuation of MDR-TB treatment due to personal reasoning increase MDR-TB cases. Similarly, participants reasoned that limited number of healthcare workers in rural areas, poor precautionary practices, and ineffective DOTS programs would spike MDR-TB cases. Similarly, problems in the health system such as unavailability of drugs, access to only poor-quality drugs, low-quality disease treatment, and shortage of medical equipment and treatment centers would increase MDR-TB cases in Nepal.

Control measures provided by participants are categorized into nine groups: current MDR-TB guidelines, shortened treatment regimens, digitalized functional recording and reporting system, maintenance of good quality and quantity of drugs, effective monitoring and counselling practice, increased MDR-TB treatment sites, increased hostels, proper implementation of DOTS programme, and improved MDR-TB knowledge among healthcare workers and the public

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APPENDICES

Appendix A -Ethical Clearance from Helsam

UiO : Faculty of Medicine
University of Oslo

Ramila Acharya

Date: 16.10.2020

Statement from the Program Ethical Committee

The Program Ethical Committee have processed your application, number 9512516 about your project *"Knowledge and Perception of healthcare professionals on the origins and control of Multidrug Resistant Tuberculosis outcomes in Sindhupalchok district of Nepal"*

The committee believe your project does not fall under the Norwegian Health Research Law (helseforskningsloven and forskningsetikkloven) and you do not need to apply to the Regional Committees for Medical and Health Research Ethic (REC). However, person sensitive information might be collected and therefore you need to apply to Norwegian Centre for Research Data (NSD) for approval.

If your project is to be conducted outside of Norway, you also need to submit the project to local authorities for approval.

Supervisors for **Ramila Acharya** master project are:
- **Christoph Gradmann-** Professor- Institute of Health and Society, UiO

Sincerely yours

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Appendix B-Ethical Clearance from NSD

Notification form / Knowledge and Perception of healthcare professionals on the ... / Assessment

Assessment

Given
12.05.2022

Type
Standard

Reference number
762714

Project title
Knowledge and Perception of healthcare professionals on the origins and control of Multidrug Resistant Tuberculosis outcomes in Sindhupalchok district of Nepal.

Institution responsible for processing
University of Oslo / Faculty of Medicine / Department of Health and Society

Project manager
Professor Christoph Gradmann

Student
Ramila

Project period
01.12.2020 - 30.09.2022

Notification form

Comment
Data Protection Services has assessed the change registered on 11.05.22.

The period for processing personal data has been extended until 30.09.2022.

Please note that in case of further extensions, it may be necessary to inform the sample.

We will follow up the progress of the project at the new planned end date in order to determine whether the processing of personal data has been concluded.

Contact person: Line Raknes Hjellvik
Good luck with the rest of the project!

Appendix C-Ethical Clearance from NTCC

Government of Nepal
Ministry of Health and Population
Department of Health Services
National Tuberculosis Control Centre
Thimi, Bhaktapur, Nepal
(..... Section)

Ref. No: 2077/78

Date: 30 March 2021

To
Ramila Acharya
Student of MPhil in International Community Health
University of Oslo
Norway, Oslo

Subject: Permission to conduct research in Nepal

Dear Ramila,

We are pleased to inform you that we give permission to conduct your study project on "**Knowledge and Perception of healthcare professionals on the origins and control of drug Resistant Tuberculosis outcomes in Sindhupalchok district of Nepal**". We have reviewed the study procedures and understood the researcher(s) plan for conducting research activities at Sindhupalchok district.

We wish you all the best in your research.

Thanking you.

.....
Dr Anuj Bhattachan
Director

Phone: 6630706, 6630033, Fax: 6635986, ntpdirector@nepalnp.gov.np

Appendix D-Ethical Clearance from NHRC

Government of Nepal

Nepal Health Research Council (NHRC)

Estd. 1991

Ref. No.: 2800

Date: 1 April 2021

Ms. Ramila Acharya
Principal Investigator
University of Oslo
Norway

Ref: Approval of thesis proposal

Dear Ms. Acharya,

This is to certify that the following protocol and related documents have been reviewed and granted approval by the Expedited Review Sub-Committee for implementation.

ERB Protocol Registration No.	858/2020	**Sponsor Protocol No**	NA
Principal Investigator/s	Ms. Ramila Acharya	**Sponsor Institution**	NA
Title	Knowledge and Perception of healthcare professionals on the origins and control of Multidrug Resistant Tuberculosis outcomes in Sindhupalchok district of Nepal		
Protocol Version No	NA	**Version Date**	NA
Other Documents	1. Data collection tools 2. Acceptance letter from the study site	**Risk Category**	Minimal risk
Expedited Review	Proposal √ Amendment Re-submitted **Meeting Date:** 15 March 2021	**Duration of Approval** 1 April 2021 to 1 April 2022	**Frequency of continuing review**
Total budget of research	**Self-Funded**		
Ethical review processing fee	**NRs 10,000.00**		
Investigator Responsibilities : • Any amendments shall be approved from the ERB before implementing them			

Tel: +977 1 4254220, Fax: +977 1 4262469, Ramshah Path, PO Box: 7626, Kathmandu, Nepal
Website: http://www.nhrc.gov.np, E-mail: nhrc@nhrc.gov.np

Appendix E - Information sheet and Informed consent (English and Nepali)

Information sheet and Informed Consent form

Information sheet

Invitation to participate!!!!!!

Research title: Knowledge and Perception of healthcare professionals on the origins and control of Multidrug-Resistant Tuberculosis outcomes in Sindhupalchowk district of Nepal.

This research aims to know the knowledge and perception on the origins and control of drug-resistant TB. One of the aims behind this is to know the reason for the increment of MDR-TB patients so that an effective control mechanism could be suggested. This research aims to point out the obstacles to implementing control mechanisms and the problem faced by the patients to get effective treatment.

This research is going to be under the master's programme in International Community Health at the Department of Community Health and Medicine, University of Oslo.

As you all are the staff engaged in the field of Drug-resistant TB, you all are kindly invited to be a part of this research. The method in this research (In-depth interview and FGD) are designed to get your knowledge and perception of the field of drug resistance TB as it is the main aim of our research. Your knowledge and perception will not be judged. Results will be provided to all participants after the completion of the research.

You can participate in this research of your own will and can withdraw anytime in the process of information gathering though you have signed the agreement. Participation is voluntary, and no justification will be asked if you change your mind.

If you wish to take part in this research, you will be asked certain questions and you can answer those questions based on your knowledge. The interview will last for about an hour. Your interview will be recorded and will only be accessible by the researcher. Information gathered here will only be used for this research and anonymity will be maintained throughout the research process. Your confidentiality will be fully maintained by the researcher and only the researcher will know about the information provided by you. All the information provided by you will be processed under the General Data Protection Regulation and Personal Data Act. All your information will be stored safely in TSD (Services for sensitive data) provided by UIO.

Further, if you have any concerns or want to know more about this research you can contact

Researcher: Ramila Acharya,
Email:(ramilaacharya386@gmail.com)
Telephone number: +4796757356

Project supervisor: Christoph Gradmann,
Email: (Christoph.gradmann@medisin.uio.no)
Telephone number: +4722850615

NSD (The Norwegian Centre for Research Data)
Email: (personverntjenester@nsd.no)
Telephone number: +4755582117

Thank you!

Ramila Acharya
ramilaacharya8@gmail.com
(+47) 96757356

Consent form

Declaration of consent to participate in the research

I have read all the information about the project "Knowledge and Perception of healthcare professionals on the origins and control of drug Resistant Tuberculosis outcomes in Sindhupalchowk district of Nepal. I am well informed about this project and thus willing to participate voluntarily.

_____

Name of participant

_____

Participant's signature

_____

Date

I declare that I gave the participant enough information about the research.

_____

(Researcher's signature and date)

सूचना पाना र सूचित सहमति फारम

सूचना पाना

भाग लिन आमन्त्रित!!!!!!!!!!!!!

अनुसन्धान शीर्षक: नेपालको सिन्धुपाल्चोक जिल्लामा मल्टिड्रग प्रतिरोधक क्षयरोग परिणामको उत्पत्ति र नियन्त्रणमा स्वास्थ्य पेशेवरहरूको ज्ञान र अनुभूति।

यस अनुसंधानको उद्देश्य औषधि प्रतिरोधी टिबीको उत्पत्ति र नियन्त्रणको बारेमा ज्ञान र धारणा जान्नु हो। यसको पछाडिको उद्देश्य MDR-TBबिरामीहरुको बृद्धि हुनुको कारण जान्नु हो ताकि एक प्रभावी नियन्त्रण संयन्त्र सुझाव गर्न सकियोस्। । यस अनुसन्धानले नियन्त्रण संयन्त्र लागू गर्नका लागि अवरोध र प्रभावकारी उपचार प्राप्त गर्न बिरामीहरूले भोग्ने समस्या औंल्याउनेछ।

यो अनुसन्धान, सामुदायिक स्वास्थ्य र चिकित्सा विभाग, ओस्लो विश्वविद्यालय अन्तर्गत पर्ने, अन्तर्राष्ट्रिय समुदाय स्वास्थ्य मास्टर कार्यक्रम अन्तर्गत हुन गइरहेको छ ।

तपाईं सबै ड्रग प्रतिरोधी टिबीको क्षेत्रमा संलग्न कर्मचारी हुनुभएकोले, तपाईं सबैलाई यस अनुसन्धानको एक हिस्सा हुन आमन्त्रित गरिएको छ। यस अनुसन्धानको विधि (गहन अन्तर्वार्ता र FGD) औषधि प्रतिरोध टिबीको क्षेत्रमा तपाइँको ज्ञान र धारणा प्राप्त गर्न डिजाइन गरिएको हो किनकि यो हाम्रो अनुसन्धानको मुख्य उद्देश्य हो। तपाईंको ज्ञान र धारणाको मूल्यांकन गरिने छैन । सबै अनुसन्धान समाप्त भए पछि सबै सहभागीहरूलाई परिणाम प्रदान गरिनेछ।

तपाई यस अनुसन्धानमा तपाईको आफ्नै इच्छाले भाग लिन सक्नुहुन्छ र तपाईले सम्झौतामा हस्ताक्षर गरे पनि सूचना संकलनको प्रक्रियामा कुनै पनि समय फिर्ता लिन सक्नुहुन्छ। सहभागिता बिल्कुल स्वैच्छिक हो, र यदि तपाईले आफ्नो मन परिवर्तन गर्नुभयो भने कुनै पनि स्पष्टीकरण मागिने छैन ।

यदि तपाईं यस अनुसन्धानमा भाग लिन चाहनुहुन्छ भने, तपाईंलाई केहि प्रश्नहरू सोधिने छ र तपाईंले ती प्रश्नहरूका उत्तरहरू आफ्नो ज्ञानको आधारमा दिन सक्नुहुन्छ। अन्तर्वार्ता करीव एक घण्टा सम्म हुनेछ। तपाईंको अन्तर्वार्ता रेकर्ड गरिनेछ र केवल अन्वेषकहरू द्वारा पहुँच योग्य हुनेछ।

यहाँ भेला भएका सूचनाहरू यस अनुसन्धानको लागि मात्र प्रयोग हुनेछन्। तपाइँको गोपनीयता पूर्ण रूपमा अन्वेषक द्वारा राखिन्छ र केवल अन्वेषकले तपाइँ द्वारा प्रदान गरिएको जानकारी को बारे मा थाहा हुनेछ ।तपाईं द्वारा प्रदान सबै जानकारी सामान्य डाटा संरक्षण नियमन र व्यक्तिगत डाटा ऐनको (Data Protection Regulation and Personal Data Act) आधारमा संसाधित हुनेछ। तपाईका सबै जानकारी TSD (संवेदनशील डाटाका लागि सेवाहरू) UIO द्वारा प्रदान गरिएको प्लेटफर्ममा सुरक्षित राखिनेछ ।

थप, यदि तपाईंसँग कुनै चिन्ता छ वा यस अनुसन्धानको बारेमा अधिक जान्न चाहनुहुन्छ भने तपाईं सम्पर्क गर्न सक्नुहुन्छ:

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धन्यवाद! रमिला आचार्य

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अनुसन्धानमा भाग लिने सहमतिको घोषणा

मैले "नेपालको सिन्धुपाल्चोक जिल्लामा मल्टिड्रग प्रतिरोधक क्षयरोग परिणामको उत्पत्ति र नियन्त्रणमा स्वास्थ्य पेशेवरहरूको ज्ञान र अनुभूति " परियोजनाको बारेमा सबै जानकारीहरू पढेको छु। म यस प्रोजेक्टको बारेमा राम्रोसँग जानकारी दिइएको छु र स्वेच्छाले सहभागी हुन इच्छुक छु।

_____

(सहभागीको हस्ताक्षर र मिति)

मैले घोषणा गरेको छु कि मैले सहभागीलाई अनुसन्धानको बारेमा पर्याप्त जानकारी दिएको छु

_____

(अन्वेषकको हस्ताक्षर र मिति)

Appendix F-Payment receipt (English and Nepali)

PAYMENT RECEIPT

Payment information

On today's date ……. I would like to inform you through this paper that I received the money of Rs…… as transportation cost for participating in the research entitled "Knowledge and Perception of healthcare professionals on the origins and control of Multidrug-Resistant Tuberculosis outcomes in Sindhupalchowk district of Nepal."

Paid by: …….	Recipient Name: ……
Date: ……	Date: ……
Signature: …….	Signature: ……

भुक्तानी रसिद

भुक्तान जानकारी

आज मिति..... गतेका दिन तद अनुसार ..... तारिक का दिन "नेपालको सिन्धुपाल्चोक जिल्लामा मल्टिड्रग प्रतिरोधक क्षयरोग परिणामको उत्पत्ति र नियन्त्रणमा स्वास्थ्य पेशेवरहरूको ज्ञान र अनुभूति" सिर्सक नामक अनुसन्धान मा सहभागी भए बापत यातायात खर्च स्वरुप रु..... बुझिलिएको यो फारम मार्फत अबगत गराउन चाहन्छु।

भुक्तानी दिने: .....

मिति: .....

हस्ताक्षर: .....

प्रापकको नाम: .....

मिति: .....

हस्ताक्षर: .....

Appendix G- Interview guide (English and Nepali)

Questionnaire

Interview guide

Background information
Can you introduce yourself?
What is your educational background?
In which post are you working?
How long have you been in this profession?
What are your roles and responsibilities when you are working in Tuberculosis?

In-depth interview

What do you know about MDR Tuberculosis?
What do you think you should be aware of while working with TB patients?
What do you think about the origin of Drug Resistant TB?
According to you what might be the reason for the increase in MDR-TB cases?
What can be your role to control MDR-TB?
In your view, what can be the barriers to the successful treatment of MDR-TB cases?
In your opinion, what might be the reason for not completing the treatment by MDR-TB patients?
What do you think about patients' health-seeking behaviour if they see symptoms in them?
Do you want to add anything?

Focus Group Discussion Guide

What is your knowledge of MDR-TB?
What is your opinion on the adequacy of funding and staff working on MDR-TB?
According to you, what can be the role of healthcare workers to reduce MDR-TB?
In your opinion, which area of the treatment system is lacking to have successful diagnosis and treatment of MDR-TB?
According to you what might be the reason for TB patients to discontinue their treatment and what role you might play in this?
Do you want to add anything?

अन्तर्वार्ता गाईड

पृष्ठभूमि जानकारी

के तपाई आफ्न परिचय दिन सक्नुहुन्छ?

तपाईको शैक्षिक पृष्ठभूमि के हो?

तपाई कुन पद मा काम गर्दै हुनुहुन्छ?

तपाई यस पेशामा कति समयदेखि हुनुहुन्छ?

तपाई क्षयरोगमा कार्यरत हुदा तपाईका भूमिका र जिम्मेवारी के के हुन्?

स्वास्थ्यकर्मीहरुको धारणा

तपाईलाई औषधि प्रतिरोधक क्षयरोगको बारेमा के थाहा छ?

TB बिरामीहरूसँग काम गर्दा तपाईलाई के सचेत हुनुपर्दछ जस्तो लाग्छ?

तपाईं औषधि प्रतिरोधक TB को उत्पत्ति बारे के सोच्नुहुन्छ?

तपाईका अनुसार MDR-TB को बिरामी बढ्नुको कारण के हुन सक्छ?

MDR-TB लाई नियन्त्रण गर्न तपाईंको भूमिका के हुन सक्छ?

तपाईंको विचारमा, MDR-TBकेसहरूको सफल उपचारका लागि के अवरोधहरू हुन सक्छन्?

तपाईंको विचारमा, MDR-TB बिरामीहरूले उपचार पूरा नगर्नुको कारण के हुन सक्छ?

यदि बिरामीहरुमा लक्षण देखियो भने उनीहरूको स्वास्थ्य सेवा खोज्ने व्यवहारको बारेमा तपाई के सोच्नुहुन्छ?

के तपाइँ अरु केहि थप्न चाहानुहुन्छ?

फोकस समूह छलफल गाइड

MDR-TB मा तपाइँको ज्ञान के हो?

क्षयरोगकालागि विभाजित रकम र MDR-TB मा काम गर्ने स्वास्थ्यकर्मीहरूको पर्याप्तताको बारेमा तपाईको राय के हो?

तपाईका अनुसार, MDR-TB लाई कम गर्न स्वास्थ्यकर्मीहरूको भूमिका के हुन सक्छ?

तपाईंको विचारमा, MDR-TB को सफल निदान र उपचार गर्न उपचार प्रणालीको कुन क्षेत्र पछाडि छ?

तपाईका अनुसार TB बिरामीहरूले आफ्नो उपचार रोक्न सक्ने कारण के हुन सक्छ र यसमा तपाईले कस्तो भूमिका खेल्न सक्नुहुन्छ?

के तपाइँ केहि थप्न चाहानुहुन्छ?

Appendix H- List of codes

Name	Description	Files	References
Counselling		5	7
Counselling to family members		1	1
Counselling to patients		1	1
Behaviour they should have		2	2
Description of diseases		3	3
Follow up		1	1
Give time		1	1
Medicine		1	1
Privacy		1	1
Side effects		2	3
Criteria to be in hostel		2	3
Diagnosis at first (TB or MDR)		3	4
Case identification methods		2	2
FGD Observation		1	3
Gene expert machine		4	6
Good things going on		2	2
Health seeking behavior		5	7
FCHV		1	1
HS last option	Goes directly to health sector after the situation gets worse or they travel many sectors before going to HS	4	5
Passive case findings		3	4
Themselves		5	7
Barriers in MDR-Control		6	18
Increasement in MDR-TB		7	22
Close Contact		1	1
Crowded settings		2	2
Defaulter		0	0
Defaulter		2	3
Feels better		7	14
Side effects		2	5

Name	Description	Files	References
HIV, Drug user, kalazar		2	3
Institutional Problems		0	0
Drugs Unavailability		3	7
Insufficient Diagnosis		4	12
Lack of counselling		4	5
Less DR Hostels		3	6
Less DR sites		2	2
Less Follow up		2	2
Not easily assessable		6	18
Poor management		3	8
Quality of drugs		5	6
Lack of family support		1	1
Malnutrition		1	1
Mobility		4	7
Patients' problems		0	0
Family support		1	1
Illiteracy		3	5
Poverty		4	6
Social Stigma		4	7
Treatment Regimen		0	0
Changing Guidelines		1	1
Long Treatment Period		3	4
Not implementing rules		4	7
Undetected Cases		2	2
Unreliable private sectors		5	6
Local province role		1	1
MDR-Control		7	42
Awareness		2	2
HW		2	2
Public		5	7
DOTS		2	12
Early diagnosis		5	14
Follow up		1	5
Hostels		4	4

Name	Description	Files	References
Income generating activities		1	1
Increase Feasibility		3	4
Increase services		0	0
Increase Gene expert sites		4	6
Service site expansion		4	6
Patient HW relation		1	1
Proper Counselling		3	18
Proper monitoring		2	2
Quality and Quantity of medicines		5	7
Recording and reporting		1	1
Safe sample Transport		1	2
Short treatment period		2	3
Update guidelines		5	6
MDR-Introduction		7	22
Origin of MDR-TB in Nepal		6	6
Present scenario of MDR		3	8
Protection from TB		5	6
Recommendation		3	4
Training		2	3