

# **Access to healthcare for tuberculosis patients in Nepal**

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*Access to healthcare for tuberculosis patients in Nepal*

A thesis submitted in partial fulfilment of the requirement for the degree of  
Master of Science in International Health

by

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## Abstract

**Background:** Tuberculosis ranks within the top ten causes of death in Nepal. With currently ca. 117.000 people living with active tuberculosis disease and almost half the population infected, tuberculosis poses a major threat to public health in Nepal. Providing unimpeded access to healthcare for tuberculosis patients sits therefore high on the ministry of health's agenda.

**Methods:** In this literature review Levesque et al.'s framework on patient centred access to healthcare was used to analyse and describe barriers to tuberculosis healthcare in Nepal, identify knowledge gaps and give recommendations to stakeholders on how to improve access to tuberculosis healthcare.

**Results:** A lack of transportation infrastructure in the mountainous and rural areas of the country is impeding patients' ability to reach healthcare facilities. The indirect costs of transportation, food, and accommodation near treatment centres as well as a loss of income during lengthy treatment regimens are making tuberculosis healthcare less affordable. While a lack of tuberculosis related knowledge is obstructing patients' ability to perceive healthcare needs, institutional stigmas are making healthcare for tuberculosis patients less acceptable. There are still knowledge gaps around the topics of gender related barriers to tuberculosis health care and the occurrence of tuberculosis related catastrophic health expenditure.

**Conclusion:** Although Nepal has managed to make progress in the reduction of tuberculosis cases in the past, patients are still facing numerous obstacles when trying to gain access to tuberculosis healthcare. These barriers must be addressed in the form of additional health literacy programs, the extension of active case finding and community-based DOTS programs as well as by actions to make healthcare more accessible to communities in rural parts of the country.

**Keywords:** Access to healthcare; Tuberculosis; Nepal

Word count: 11.043

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## Abbreviations

ACF	Active case finding
CB DOTS	Community based direct observational therapy
CHE	Catastrophic health expenditure
DOT	direct observational therapy
DST	Drug susceptibility testing
DS-TB	Drug susceptible tuberculosis
FAST	Find cases actively, separate safely and treat effectively
FB DOTS	Family based direct observational therapy
LAMP	Loop mediated isothermal amplification test
LMICs	Low- and middle-income countries
MDR-TB	Multidrug resistant tuberculosis
MPI	Multidimensional poverty Index
NTP	National tuberculosis program
OOP	Out of pocket health expenditure
PCF	Passive case finding
RR-TB	Rifampicin resistant tuberculosis
SDG	Sustainable development goals
TB	Tuberculosis
TSR	Treatment success rate
XDR-TB	Extensively drug resistant tuberculosis

## Introduction

As part of my clinical rotation during medical school my university offered an exchange program with a teaching hospital in the Nepalese town of Dhulikhel about 30 kilometres east of Kathmandu. Austrian medical students were able to spend a month in the paediatrics department of Dhulikhel hospital learning from local healthcare professionals, while Nepalese paediatricians were being trained in our paediatric department back home. During my time in Dhulikhel the paediatric outpatient's department was often filled with children suspected to have contracted tuberculosis, and their parents who often had to travel great distances to reach our hospital. The loss of income because of the time they had spent traveling and caring for their sick children often meant additional financial distress for the already worried mothers and fathers. It was this experience that sparked my interest in the field of international health.

With this thesis I want to analyse the current state of access to healthcare for tuberculosis patients in Nepal, identify barriers that might exist and describe knowledge gaps that still need to be closed.

## Background

Tuberculosis (TB) consistently ranks within the top twenty causes of death worldwide, in fact in their latest global tuberculosis report from 2021 the WHO reported 1.3 million TB deaths among HIV negative and 214,000 TB-deaths among HIV positive patients globally (1).

Especially low- and middle-income countries (LMICs) have always been heavily afflicted by the burden that TB laid upon their healthcare system (2–4). Alarmingly the number of TB related deaths in the WHO region of southern and eastern Asia has been rising for the first time since decades (Figure 1). This rise in cases has been largely attributed to the effects of the global COVID-19 pandemic and the country of Nepal has as of the time of writing of this thesis not been able to return to pre-pandemic levels (1). Nepal is facing

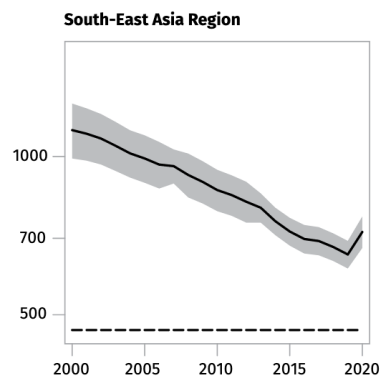


Figure 1 TB-deaths south-east Asia region, shaded area represents uncertainty intervals, dashed line shows 2020 End TB milestone (1)

multiple challenges regarding their fight against TB. To this day TB continues to be a major burden for the Nepalese healthcare system. As of 2021, TB still ranks in the top ten causes of death in Nepal, with almost half the country’s population being infected and currently ca. 117,000 people living with active TB disease (5). The total incidence rate as of 2020 was

estimated at 238 cases per 100,000 population, (or 68,000 people in absolute numbers) with men over the age of 65 being the most affected population group and 63% of all cases being male (Figure 2).

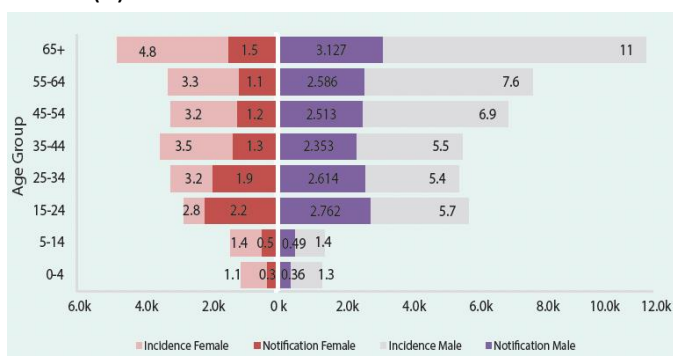


Figure 2 Estimated Incidence and Notified Cases by age group and Sex, Nepal (6)

The HIV-tuberculosis coinfection incidence rate was found to be 1.7 cases per 100,000

population and MDR/RR-TB (Multidrug/Rifampicin resistant tuberculosis) cases stood at an incidence rate of 7.6 per 100,000 (6). Unfortunately, many individuals are not diagnosed; with 27,232 registered cases in 2020 less than half of the 68,000 estimated cases were detected (6). Within the population of registered TB patients Nepal’s healthcare providers were able to achieve a treatment success rate (TSR) (proportion of TB cases registered in a year that were successfully treated) of approximately 89.4% (down from 91% in 2019) in 2020/21. However,

multidrug resistant tuberculosis (MDR-TB) and extensively drug resistant tuberculosis (XDR-TB) which account for 2.2% of new and 15% of previously treated cases respectively show a TSR of only 78% and 67% and are continuing to pose a major threat to the government's efforts to mitigate the spread of the disease (6). In their latest annual global tuberculosis report the WHO defined 30 high MDR/RR-TB burden countries. Nepal has unfortunately joined the list in 2021 (1). If Nepal does not want to risk being left even further behind, efforts in TB control must be ramped up and possible pitfalls and barriers in access to diagnosis and treatment must be identified. TB therapy itself is inherently complex and involves among other things, long drug regimens, regular check-ups by trained healthcare workers, health education and ideally direct observational therapy (DOT). It is therefore important to guarantee unobstructed access to healthcare and properly trained healthcare workers. Barriers to access might lead to treatment failure, which is detrimental to any tuberculosis program, but also always carries the risk of further advancing the spread of multi drug resistant patterns, impeding future tuberculosis control efforts (7). The situation in Nepal is of particular interest as multiple barriers to TB healthcare (including geographical barriers due to Nepal's highly diverse landscape (8–10)) seem to only further perpetuate the emergence and spread of MDR-TB (9–13). A combined effort by stakeholders is thereby needed not only to better access to healthcare for TB patients but also to prevent the spread of MDR-TB (7).



## Problem statement, Justification, Objectives

### Problem statement and Justification

As previously established, TB is still a major burden on the healthcare system of Nepal. With almost half the population infected (6) and rising numbers of MDR/RR-TB and XDR- TB cases (6,14,15) Nepal's government made promises and commitments to stop the spread of the disease. Next to the adoption of the United Nations sustainable development goals (SDG) in 2015 in which Nepal promised to ensure healthy lives and promote well-being for all at all ages by the year 2030 (Goal 3) (16) Nepal's government also adopted the End TB strategy by the WHO, with its goals of reducing TB related deaths by 95% and TB incidence by 90% on a global scale by 2035 (17). Nepal has made numerous achievements in the last decades such as the inclusion of treatment for drug susceptible as well as resistant TB into their basic health service package, the introduction of a digitalized case-based surveillance system and the establishment of modern drug susceptibility testing (DST) centres in the nation's capital (15). Because of this the National tuberculosis program (NTP) was able to achieve a significant reduction in TB incidence and mortality over the last decades (18). However, Nepal's fight against TB is far from over and if nothing is done Nepal not only risks missing their targets but also risks jeopardizing decades of work. Even though Nepal's government is offering free TB treatment, many populations are still facing barriers in accessing TB healthcare (9,10,12,19). The reasons for this inability to access the right treatment, diagnosis or support are manyfold, complex, and interconnected and shall be explored in this thesis.

Next to geographical reasons, whereas people living in remote mountainous areas of the Himalayas are cut off from healthcare by insufficient transportation infrastructure (lack of, or poor condition of: roads, transportation services etc.) (10,11,20), people are still facing monetary issues when seeking healthcare for TB. Patients are often struggling to pay for costs that are either directly or indirectly (e.g. cost of travel and food) connected to TB related healthcare (9,21). Together with a resulting loss of income during the duration of treatment many Nepalese citizens are still facing catastrophic health expenditure (CHE) because of their TB infection (22,23). Furthermore, social aspects such as a strong stigmatization of people living with TB, or traditional beliefs which lead to a delay in diagnosis (24) are strongly related

to an overall lack of healthcare education and general knowledge around TB among patients and healthcare staff (25). In addition, an overall lack of resources in terms of trained personnel to accommodate patients, testing and treatment facilities and general equipment, lead to people being left undiagnosed and untreated (9–12).

Although numerous studies have been conducted about different aspects of access to TB healthcare in Nepal, there is a lack of reviews that put those studies into a broader context. Describing access to healthcare is an inherently complex task since access is influenced by various social, economic, cultural, and geographic factors that influence each other (26–28). A single study would never be able to shed light on every aspect of access to TB healthcare. Therefore, a review of already available literature will be done to gain further insight into how access to TB healthcare in Nepal works and where there might be potential to tear down barriers. Over the last few decades different authors have already spent time and effort to come up with clear definitions of terminology and frameworks to guide potential analysis of access to healthcare in LMICs. One of those frameworks is the framework on patient centred access to healthcare by Levesque et al. (27), which has already successfully been used by other authors to analyse access to healthcare and unmask systemic problems and barriers in different LMICs (28). This framework and how it will be used in this thesis will be further described in the upcoming sections.

## Objectives

- Analyse the current situation of access to healthcare for tuberculosis patients in Nepal by creating a literature review using Levesque's et.al. framework in which patient centred healthcare is influenced by factors from a demand-side as well as the supply-side perspective (27). By considering both the supply as well as the demand side, barriers for tuberculosis patients in Nepal, as well as potential systemic issues and existing knowledge gaps shall be identified/ highlighted.

The results of the literature review will be further broken down into the following subsections according to the framework:

- ☞ Approachability and ability to perceive: Literature regarding elements such as transparency, information sharing, health literacy and beliefs etc. will be searched and analysed.

- ☞ Acceptability and ability to seek: Literature regarding elements such as professional/ cultural and personal values and norms etc. and how they relate to the topic of access to TB healthcare will be identified and analysed.
  - ☞ Availability/Accommodation and the ability to reach: Issues such as geographical barriers, housing, living environments transport etc. and their impact on access to TB healthcare will be investigated.
  - ☞ Affordability and ability to pay: Factors such as the impact of direct and indirect costs, the situation around health insurance and income and its effects on access to healthcare for TB patients will be analysed.
  - ☞ Appropriateness and ability to engage: Elements such as the adequacy of services and the involvement of the patients themselves into the diagnostic, treatment and decision-making process will be analysed and put into the context of access to TB healthcare.
- Recommendations on how to improve upon these identified barriers and issues in the future by either the government of Nepal or organizations concerned with the improvement of access to healthcare for TB-patients in Nepal will be made.

## Methods

This thesis is written in the form of a literature review with a systematic approach. By combining general search terms like ((tuberculosis) AND (Nepal)) in combination with search terms specific to the individual subsections of the review like (knowledge) OR (geography) corresponding articles were found using search engines like PubMed and Google scholar. A full list of search terms can be found in table 1. Only material from sources that were deemed credible were used. This includes peer reviewed articles and grey literature from sources such as the Ministry of Health of Nepal, the National Tuberculosis Control Centre of Nepal, and the WHO. Furthermore, every piece of literature has been subject to several exclusion and inclusion criteria.

**Inclusion:** The articles context is relevant to the problem statement. The articles focus is on the country of Nepal or its (international) context is relevant to the problem statement in a broader context. The material has been published within the last 10 years (2012-2022) with an exception for literature concerned with fundamental principles. The material has been published in English.

**Exclusion:** Material that has been published outside of the proposed timeframe, not published in English, published from sources that were deemed uncredible or not concerned with either the country of Nepal or generally applicable principles were excluded.

The following search engines, websites and databases were used: PubMed/Medline, Google/Google Scholar, the websites of the Ministry of Health of Nepal, the National Tuberculosis Council of Nepal, and the website of the WHO. Additional literature was found using the “snowball technique”.

To create a more inclusive set of results when using PubMed/Medline Mesh terms were used.

Table 1 Search terms used in PubMed/ Medline and Google scholar

Category	Search terms
General	((Nepal) AND (tuberculosis)) ((Nepal) AND (access) AND (healthcare) AND (tuberculosis)) ((Nepal) AND (access) AND (healthcare) AND (tuberculosis) AND (barrier)) AND
Approachability / Ability to perceive	(traditional beliefs) OR (knowledge) OR (literacy) OR (education) OR (educational status) OR (health promotion) OR (active case finding) (transparency) OR (outreach)
Acceptability / Ability to seek	(stigma) OR (perception) OR (knowledge) OR (gender) OR (values) OR (culture) OR (norms)
Availability and accommodation / Ability to reach	(roads) OR (transport) OR (infrastructure) OR (mobility) OR (geography) OR (location) OR (accommodation) OR (environment) OR (social support)
Affordability / Ability to pay	(health insurance) OR (catastrophic cost) OR (expenditure) OR (poverty) (income) OR (direct cost) OR (indirect cost) OR (out of pocket)
Appropriateness / Ability to engage	(Adequacy) OR (adherence) OR (support) OR (decision making) OR (communication) OR (treatment regimen) OR (family-based DOTS) OR (community-based DOTS)

## Framework

To structure the literature search as well as the analysis, Levesque et al.'s framework on patient centred access to healthcare was used (27). In their work the authors aimed to provide a structured approach to analysing access to healthcare, by describing several areas and influencing factors that determine the utilization of healthcare. Furthermore, the authors enable the operationalization of access to healthcare by providing a comprehensive framework that considers both the healthcare providers on the supply-side as well as the healthcare seeking patients themselves on the demand-side. Levesque et al.'s framework is building upon their definition of access to healthcare which is dependent on several factors. Access is hereby seen as the ability to recognize healthcare needs as well as to actually seek and reach the needed facilities and resources to attain appropriate services. Utilization of healthcare is therefore seen as realized access. In this sense access works as an enabler for people to get into contact with the healthcare system and receive appropriate care. In their article Levesque et al. build upon the work of Penchansky and Thomas who describe five important dimensions of access in their article *"The concept of access"*: availability,

accessibility, accommodation, affordability, and acceptability (26). Levesque et al. further developed this concept by adding another dimension (approachability) to the framework as well as 5 corresponding abilities of people to interact with these dimensions of access. These abilities include the ability to: perceive, seek, reach, pay and engage and represent the *demand side* of their patient centred approach. These dimensions and corresponding abilities are further described in the upcoming section and are visualized in figure 3.

*Approachability and the ability to perceive:* The concept of approachability describes the capabilities of healthcare services to make themselves known among the general population. Via various elements such as transparency, community outreach, information sharing, and screening programs healthcare services make sure that people can identify the available services and treatments. On the demand side of the spectrum the ability to perceive healthcare needs by the patients themselves is influenced by factors such as health literacy, beliefs as well as trust and expectations in the healthcare system.

*Acceptability and the ability to seek:* Levesque et al. relate acceptability to social and cultural norms and values that influence whether a service or treatment can be accepted by the person who is seeking care. An example provided by the authors relates to a hypothetical society where access to healthcare for women is reduced by a social norm that forbids physical contact between women and unmarried men, in a healthcare system mainly staffed with male healthcare workers. On the demand side of the model the ability to seek relates to factors such as personal autonomy or the ability to attain knowledge about healthcare options and individual rights and ultimately the ability to make personal choices in the healthcare seeking process.

*Availability and accommodation and the ability to reach:* Availability and accommodation relate to healthcare services being reachable both physically and in an acceptable amount of time. Examples of corresponding factors are geographical location of services, opening hours and appointment mechanisms. The ability to reach healthcare services is influenced by factors that enable the free movement of people. These include (among others) transportation services, occupational flexibility, and social support.

*Affordability and ability to pay:* this section of the framework is concerned with both the direct prices of services and additional costs or loss of income as a result of attaining healthcare as well as the ability to pay for healthcare by the people themselves. The ability to pay is hereby influenced by the ability to generate income, the availability of loans or savings and the ability to acquire health insurance.

*Appropriateness and the ability to engage:* Appropriateness describes the relation between patients' needs and the provided services and includes the dimension of adequacy of services (what is provided and how does the quality of the service relate to the need of the patient). The ability to engage in healthcare on the other hand describes the involvement of the patient into the healthcare provision process. Elements such as joint decision making between healthcare provider and patient, health literacy and self-efficacy can strongly influence the patient's capacity to communicate with the healthcare provider and complete treatment regimens.

Although there have been suggestions on how to further improve Levesque's et al.'s framework (e.g., with the introduction of a stronger focus on time related elements into the framework) it has been used successfully on numerous occasions to analyse access to healthcare and has enabled authors to describe the complex relationship between healthcare systems and the population (28). In the context of access to healthcare for tuberculosis patients in Nepal the addition of appropriateness and the ability to engage is of particular importance, as treatment regimens are often lengthy and accompanied by side effects. To ensure adherence to these regimens the ability to engage with the healthcare system is integral to ensure treatment success (7).

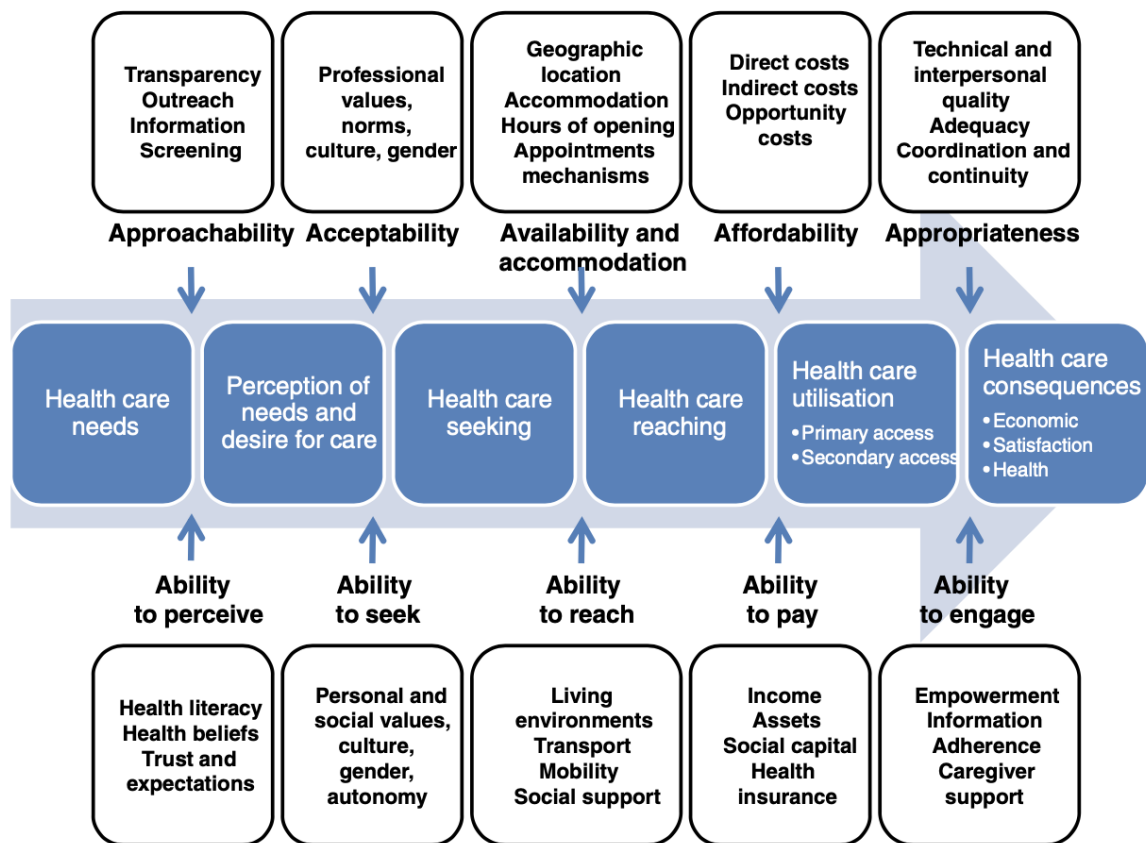


Figure 3 Levesque et al. conceptual framework of access to healthcare (27)



## Results

### Approachability and ability to perceive

#### *Approachability*

In their 2021 TB-Free Nepal Implementation Guideline the Ministry of Health included a section on health promotion, which among other topics addressed information on how to get tested for TB and how to access TB healthcare in general. This information, according to the guideline should be disseminated via print and electronic media, posters, pamphlets and even street dramas. Furthermore, a section on community mobilization included the recruitment of local volunteers and community health workers. These volunteers and health workers should help with the distribution of TB drugs, the monitoring of the program, and the dissemination of TB related information to increase speedy referrals of TB patients (14). These recommendations come based on research that calls for stronger actions from stakeholders to make healthcare more accessible for TB patients. For instance, a 2021 exploratory qualitative study on barriers and facilitators to TB-care in Nepal found that among TB patients the knowledge about where and how to access healthcare for TB (i.e. how to get tested and how to access treatment) was low. This lack of TB education was attributed to a lack of advocacy, political commitment and the resulting scarcity of education and information campaigns and programs. Community stakeholders called for information campaigns using social media and television (9).

The WHO endorses active case finding (ACF) as a way to identify TB patients who have been missed by the current health services (17). By actively going out into the community and systematically identifying supposed active TB cases with rapidly available tests or examinations (29), ACF represent a form of outreach to the community. ACF is therefore making TB diagnosis more approachable by actively looking for potential patients who have not yet been in contact with TB health services. Next to having a larger “case-finding-yield” than passive case finding (PCF) (30,31) ACF has the potential to almost eliminate indirect costs for TB-diagnosis, by actively approaching potential TB patients (chapter on Affordability) (13,23,30). In Nepal ACF has been implemented on numerous occasions for numerous target groups (13,23,32) as far back as 1982 (33). Today Nepalese ACF programs are implemented to identify cases among subgroups such as: people living with HIV, urban slum dwellers, people

living with diabetes, prisoners as well as in the form of contact tracing and through the FAST approach (Find cases actively, separate safely and treat effectively) (34). The FAST approach is used to identify presumptive TB cases in an outpatient and hospital-based setting to stop facility-based TB transmission (32). Unfortunately, Nepalese ACF programs are met by numerous challenges. Being heavily reliant on community health workers to approach potential patients and the availability of rapid diagnostic tools, ACF programs in Nepal have been negatively impacted by shortages of staff and diagnostic tools (23,32). Even though there are multiple different programs implemented in communities and healthcare facilities across the country, the aforementioned issues are leading to lower case finding yields than expected. With only a few districts reporting more than 5% of TB cases detected via contact tracing and many districts reporting a 0% contact tracing yield (Figure 4) in 2016/17 (latest available data), ACF projects such as contact tracing are currently not operating under their full potential (34). In order to unlock the full capacity of ACF programs increased funding and resource allocation will be necessary in the future.

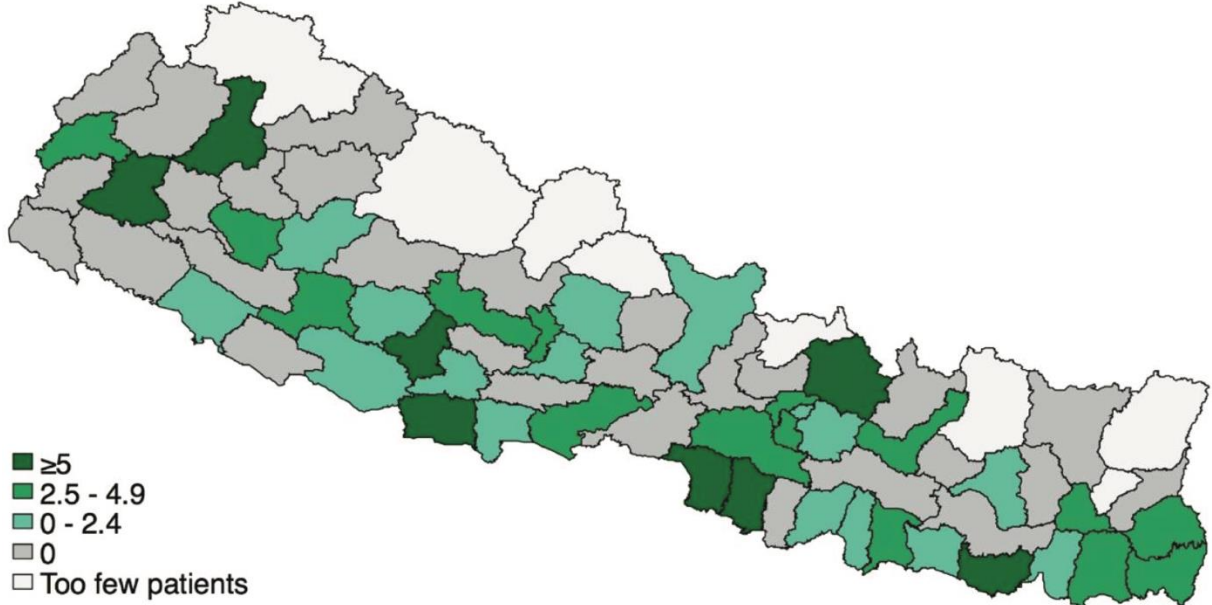


Figure 4 Proportion of all patients diagnosed via contact tracing, 2016-2017 (34)

### *Ability to perceive*

The ability to perceive personal healthcare needs as well as the ability to identify the appropriate healthcare services is based on preconceived knowledge about health and healthcare, which requires a certain amount of literacy/ health literacy (35–40). The ability to identify signs and symptoms of TB correctly is one of the first topics that is often discussed when assessing patients' capabilities to correctly identify their healthcare needs, appropriate services, or the importance of treatment completion. Indeed, multiple studies over the last decades have shown that a higher level of knowledge about the duration of their treatment, the diagnosis process, or TB symptoms had a positive effect on compliance and treatment completion of DOTS (35–38). A study conducted in the district of Lalitpur trying to investigate a possible connection between patients' knowledge on TB and the utilization of DOTS services not only found a direct connection of TB related knowledge and healthcare utilization, it was also able to show an increase in TB related knowledge with age, whereas people in the age group of 50 to 60 years had significantly more knowledge than any other age group. Furthermore, the study was able to draw a connection between the general education status and TB knowledge. Those who completed twelve years of school were significantly more knowledgeable (35). A finding which was confirmed by other authors who in addition have identified low educational status or even illiteracy as a reason for low compliance with DOTS (36), major delays in treatment (40), and even as a detrimental issue to efforts trying to curb transmission of TB (37). A recent qualitative study from 2021 investigating barriers to TB care in four districts of Nepal (chosen for their high prevalence of TB and poverty) identified low TB knowledge and overall low educational status as key barriers to access, and thereby as a major contributor to the development of DR-TB (due to a delay in diagnosis, low compliance, and reinfection) (9). While investigating gender-based barriers to TB treatment in Nepal, the authors of a 2013 qualitative study were able to show a higher prevalence of TB related knowledge among men than women (41). Among other issues this gender-related difference in TB related knowledge was identified as a reason for longer treatment delays and overall worse access to TB services for women. Furthermore, the study suggests that a high pervasiveness of traditional beliefs among women further aggravated the lack of access to healthcare. Regarding gender related issues the study mainly discusses the traditional family roles of men and women, with men being the breadwinner of the family and thereby having

a more privileged position in terms of healthcare access and a certain reluctance of women to come forward with any health concerns (41).

Furthermore, social norms and traditions like the menstrual taboo or “Chaupadi” as it is called in the Hindu community of western Nepal, prohibit young women from attending school and participating in social life as they are seen as “impure” during menstruation (42,43). This social isolation and absence from school during menstruation leads to an overall lower educational status of women, which is (as already established) also linked to higher TB prevalence and lower TB knowledge (9,10,35,37,38) The role of gender specific issues will be further discussed in the section on acceptability and ability to seek.

### Acceptability and ability to seek

#### *Acceptability*

In 2008 a study conducted in the rural district of Nawalparasi in southern Nepal was trying to trace back the path to TB treatment of 26 patients enrolled in DOTS centres around the district (44). Even though the study is from 2008, limited to one district and subject to potential bias due to the sole inclusion of patients that were already undergoing TB treatment in DOTS facilities (thereby missing patients who did not find their way to national treatment facilities), it still offers some interesting insights due to its approach of assessing access to treatment as a journey from first symptoms via multiple consultations and referrals to a national DOTS centre. When asked about their decision-making process in choosing an appropriate facility, patients reported their perceived severity of illness as the initially determining factor. Most patients who initially had mild symptoms such as mild cough or fever chose a shop or pharmacy to get over the counter medicine as an initial healthcare intervention. In case symptoms persisted or worsened after the initial consultation patients reported economic factors, perceived quality, and reputation of healthcare providers as a reason for further consultations of additional healthcare services. 21 out of 26 patients consulted private healthcare providers after their initial consultation, before they ended up visiting a national DOTS centre. This study shows that the further along one gets on the road towards proper healthcare the more the requirements to be deemed appropriate as a healthcare provider

change. It is therefore important to include every level of healthcare provider along the way into the discussion about access to TB healthcare.

Once patients enter the healthcare system to seek diagnosis of, or treatment for a TB infection, perceived quality of services and financial concerns are not the only factors that determine whether a provider is deemed acceptable. Social stigma and exclusion in connection with TB are not just perpetuated by the patients' immediate surroundings (i.e. neighbours, friends and family etc.) (9,10,24), they are also perpetuated by healthcare workers themselves. A qualitative study conducted among 34 TB patients in Kathmandu found that institutional stigma and fear thereof was experienced by TB patients who sought care in higher level healthcare institutions (24). Interestingly the patients' experiences specifically mentioned in the study all seemed related to healthcare workers being afraid of the patients, mainly due to a fear of transmitting TB themselves. This connection between stigma and insufficient knowledge about TB has long been established (45), and unfortunately this issue does not stop at the doors of healthcare facilities. In 2020 researchers assessed the level of knowledge as well as attitudes towards TB and TB patients of 270 medical interns from three medical universities. Although the overall TB knowledge was deemed adequate there were some important gaps, for instance only half of the interns were aware that most patients are non-infectious after two weeks of treatment. Furthermore, the study was able to show a positive connection between the level of knowledge and a more positive attitude towards TB patients (25). Although not representative for every type of healthcare worker in the country this study does show a need for further training and educational programs for healthcare workers to reduce institutional stigma and make health care facilities more acceptable for every TB patient.

### *Ability to seek*

In the past few decades several studies have been conducted that concerned themselves with gender specific differences in Nepalese TB-patients and how these might affect access to healthcare. Unfortunately, the applicability of those studies to modern day Nepal is somewhat limited, as they have either been done more than 20 years ago (46,47), with survey data from 2002 (48) or were (although also concerned with Nepal) generally concerned with larger regions like south-east Asia rather than focused on the country of Nepal (46,49). Nonetheless,

some of these studies shall be discussed in this section of the thesis, as they discuss problems and barriers that might still be relevant today and might also hint at areas of concern that should be revisited by researchers today.

In 2016 a large review/ meta-analysis examining TB prevalence surveys from 28 LMICs conducted between 1993 and 2016, with over 3.1 million participants was aiming to determine whether there existed any gender specific differences in the TB burden and notification among TB patients (48). The authors argued that notification data alone were not sufficient to determine whether excess male cases were due to barriers in access for women or due to a higher prevalence in men. As a more reliable measure of disease burden, and to eliminate care-seeking biases, data from prevalence surveys were analysed by sex. The authors were able to show that there was a significantly higher TB prevalence among men (over twice as high) as well as a 1.5 times higher rate of prevalent to notified cases among men (suggesting a delay in diagnosis for men). The included 2002 Nepalese survey made the top of the list displaying the male

lopsided M:F ratio of TB prevalence (Figure 5). It was suggested that a reason for this discrepancy might in fact be barriers for men to access healthcare. Furthermore, the authors saw their results as supportive of research showing that male TB-patients often delay care seeking longer than women (49). However, a cross sectional study published in 2001

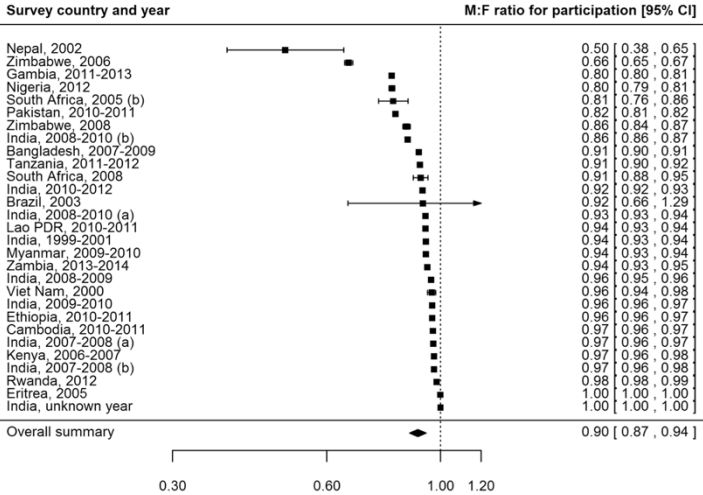


Figure 5 Horton et al. Male to Female ratios among participants of TB prevalence surveys in LMICs (48)

analysing interviews from newly diagnosed TB-patients attending DOTS centres in Nepal found a significantly higher delay before diagnosis for women compared to men whereas the time till diagnosis for men was 2.3 months on average while it was 3.3 months for women. This longer delay for women was found to be linked to a higher proportion of women believing in and visiting traditional healers before seeking care from a proper healthcare facility (47). Although these two studies are very different in type, scope, and outcome they both manage to touch upon the same subject and allow us to start comprehending the complexity of the subject of gender specific ability to seek TB-healthcare. The larger meta-analysis with a focus

on prevalence data and disease burden found clear evidence of a higher prevalence in the male population in almost every LMIC they included. Furthermore, the authors concluded that due to a higher rate of prevalent to notified cases there had to be a lack of access to healthcare for male TB-patients (48). The much smaller, largely qualitative study on the other hand could not support this suggestion as they mainly found evidence of barriers for women (47).

The cultural norm of Chaupadi or menstrual taboo has already been discussed in the section on “ability to perceive”, since social isolation and exclusion from school and other social gatherings is leading to a loss in education for young women in the Hindu community in parts of Nepal. However, since women are barred from participating in any form of social life during menstruation the negative implications for women are far more numerous than “just” missing time in school. This social shunning also strips them from their self-determination and thereby their ability to access healthcare during menstruation (42,43,50). Although there have not been any studies on the impact of Chaupadi on the access to healthcare with a specific focus on TB patients, it can be assumed that a monthly loss of self-determination and exclusion from any form of social contact might also be detrimental to access to TB services. Even though the practice has been officially outlawed since 2005 (51) it has not been stopped (42,43). Further studies on how to prevent this harmful practice and how it impacts women’s access to TB healthcare as well as actions by local and central governments to help put an end to Chaupadi are certainly needed.

#### [Availability and accommodation, ability to reach](#)

##### *Availability and accommodation*

Geographical barriers, the physical location of healthcare services and scarcity of resources and accommodation especially in rural areas are topics that affect TB patients in most LMICs (20,52). In Nepal the situation is no different. Long distances to the sparsely distributed healthcare centres together with stock outs of medicines/other needed resources and staff shortages (a common issue that affects multiple sections of the framework) are commonly found to be barriers to access to TB healthcare in the rural areas of Nepal (9–12). Thus, the unavailability of professional staff like doctors is more pronounced in rural areas (53). A study conducted among medical students in Nepal found that even though medical students

were not opposed to the possibility of working in rural areas they felt not properly prepared to work in a setting they perceived as being low in resources (54).

A 2020 qualitative study conducted among patients, community members and healthcare workers in central and western Nepal, investigating barriers to TB healthcare found that the decision of where to build new healthcare facilities was often subject to politicization and lobbying. According to the community members and local healthcare workers healthcare facilities were often built in areas near to the homes and constituencies of political leaders, rather than in areas with low availability of healthcare infrastructure, thereby serving as a political tool to increase voter satisfaction (10).

Although Nepal's number of healthcare centres and diagnostic modalities has been increased in recent years the utilization of said resources has not been without trouble (15,55). The GeneXpert machine is a currently recommended testing system by the WHO, as it is currently the only self-contained cartridge-based DNA testing system to reliably detect TB as well rifampicin resistant TB (56). In Nepal the utilization of these GeneXpert facilities has been met with numerous challenges. A lack of properly trained technicians, frequent power outages (the GeneXpert machines need a constant supply of electricity to run properly), difficulties in maintaining the correct temperature to store the cartridges, difficulties in replacing cartridges (57,58) as well as issues with the official procurement channels and the proper maintenance of the machines (55) has caused serious disruptions to the scale-up of testing centres. This resulting lack of availability of testing opportunities is one reason why TB patients in Nepal, especially in the rural areas where the density of healthcare centres is low (59), are continuing to face long delays in diagnosis and treatment (39,40,60).

A recent study investigating the use of Loop mediated isothermal amplification tests (LAMP) as a point of care device for TB diagnosis in Nepal delivered promising results (61,62). LAMP are nucleic acid amplification tests designed to allow a visual detection of TB DNA in the sample (62). By using methyl green dye, the authors of the study were able to further simplify and improve the visualization process by eliminating the need for more complex visualization methods like UV illuminators. With this method the authors were able to achieve a sensitivity in culture positive samples of 92.8% and a specificity in culture negative samples of 96.3% (61). Although LAMP are unable to deliver any form DST (in contrast to



GeneXpert testing or cultures) they are easy to use and quick to perform (62), thereby representing an ideal candidate for point of care testing in rural parts of the country with a limited availability of diagnosis modalities.

### *Ability to reach*

The connection between investments in transportation infrastructure and the resulting reduction of socioeconomic gaps between rural and urban areas has long been known (63). To give an example from neighbouring India, one of the reasons why the north-eastern region remains underdeveloped in comparison to the rest of the country is that more than 70% of roads are unpaved (64). The ability to reach healthcare is inherently connected to the availability of modes of transport and the state of existing transport infrastructure, which in Nepal is in need of improvement. An overall lack of transport infrastructure connecting rural communities to urban hubs and high costs for transportation of people and goods and long travel times (8) have only been aggravated by the 2015 earthquake which has devastated parts of the country, causing an estimated 8790 deaths and over 600 million USD in damages (65). This discrepancy between healthcare needs and the patient's ability to reach healthcare facilities is associated with major delays in diagnosis and treatment of TB in rural areas of Nepal, where transport infrastructure is scarce. In fact, researchers were able to show that patients who lived more than 5 kilometres away from their nearest DOTS centre experienced significant delay between the onset of symptoms and reaching an appropriate healthcare facility (40,60). A study investigating reasons for TB-patient delay conducted in the district of Banke (a district with relatively good transportation infrastructure and easy access to diagnostic centres via existing road networks and public transport) found a comparatively low amount of patient delay, which was in part attributed to the patient ability to reach one of the diagnostic centres in the area (39). Although there are areas of the country with proper roads and means of transportation, a great proportion of the population still relies on insufficient transportation infrastructure to reach healthcare facilities (8), which leaves room for much improvement. Visits to the nearest healthcare facility cost time, especially for TB or MDR TB patients who must undergo lengthy treatments often with daily check-up for months on end (7). This intense and time-consuming treatment schedule requires a certain amount of occupational flexibility in order to still be able to generate income and be able to reach healthcare facilities at the same time. A task that remains challenging at best and impossible

at worst for many (66). When paired with a lack of social support (as experienced by many migrant workers in Nepal (67)) to compensate for lost income or the cost of travel, proper healthcare moves both physically and figuratively into the far distance. This topic will be further discussed in the section on “ability to pay”.

Next to patients having trouble reaching healthcare facilities, the transportation of sample material from mountainous areas to diagnosis centres in urban hubs poses as a major challenge for TB programs in the rural areas of Nepal. A 2016 study investigating the feasibility of the novel transport reagent *OMNIgene Sputum* in rural areas of Nepal was able to show that remote sputum collection sites were as far away from diagnostic centres as 400 kilometres, which delayed transport times up to 6 days (68). These delays in transport time were connected to inadequate sample preservations (sputum samples need to be refrigerated when transported for longer than 24 hours (62), which was often not possible), which lead to several issues such as, contamination of cultures, invalid results and ultimately the need to repeat sampling and testing, resulting in additional costs for the NTP and delays in diagnosis for the patients. The *OMIgene Sputum* reagent eliminates the need for refrigeration by stabilizing the sample. It was thereby able to significantly reduce sample contamination and increase TB detection with unrefrigerated sputum samples from remote areas of the country (68).

## Affordability and ability to pay

### *Affordability*

Nepal’s government has made great achievements towards making TB treatment and diagnosis more affordable to its citizens. With the inclusion of free treatment for drug susceptible-TB and TB preventive treatment for children under the age of 5 (who have come into close contact with an active TB case) into their basic health service package as well as by having patients with DR-TB covered by the national health insurance scheme, Nepal’s national tuberculosis control centre is reaching many Nepalese citizens who would otherwise not be able to afford treatment (15). The introduction of the National Health Insurance scheme (NHI) in 2014 (69) and the National Health Insurance Act in 2017 (70) were seen as milestones in Nepal’s path towards achieving universal health coverage and reducing out of pocket payments (OOP) and catastrophic health expenditure (CHE) (healthcare related spendings that exceed the household’s ability to pay (71)). The implementation of the NHI, which heavily

relies on the collection of premiums as well the contribution of funds from all levels of government (federal, provincial, and local) together with additional support from national and international organizations, has been met with numerous challenges right from the beginning (70). Although mandatory for every citizen, enrolment into this centralized single fund system was slow right from the start. Due to several issues beginning right at the input level (lack of human resources, lack of proper national documentation) together with low satisfaction rates due to delayed payments to providers and overall low awareness of the program within the population, dropout rates soon began to rise (70,72–74). To this day the roll-out of the NHI is still in progress and remains in the “expansion phase”. It remains to be seen whether these projects will be successful in terms of providing overall healthcare coverage and reducing OOP and CHE.

Measuring CHE for healthcare is an inherently difficult task due to the complexity of the subject. Whether a health-related cost bares the potential to push a household into poverty depends on numerous factors which determine its vulnerability to CHE. Such factors include combined income and total purchasing power of a household, its social and financial security nets to fall back on to, indirect costs associated with healthcare, and more (75). It is therefore not surprising that the currently available studies on CHE in Nepal can only deliver an incomplete picture, especially when trying to determine the financial situation of subgroups such as TB patients. Recent studies that tried to provide a more complete picture of CHE in Nepal had to focus on nation/region wide survey data that was collected several years ago and predated the introduction of NHI (76–78). Results from these studies are therefore only partially applicable when trying to determine the financial burden of TB to Nepal’s population. Other studies that managed to collect more recent data or data on specific subgroups such as TB patients were able to deliver a more up to date picture but were somewhat constrained by their smaller sample size and limited to only a single or small number of provinces at most (23,79,80). A 2018 study conducted among 1048 households in the district of Kailali (the first district to undergo implementation of the new health insurance program) was still able to show CHE (defined as more than 10% OOP for healthcare related costs to total household expenditure) for 17.8% of households included in the survey (79). At roughly the same time (between 2018 and 2019) a study with 221 participants across 4 districts found an overall rate of CHE of 32% among households affected by TB (80). Although these studies are certainly

different in terms of study population and geographical distribution, they both show that there are still many who risk slipping into poverty because of costs associated with healthcare, especially for those diagnosed with TB.

After direct costs of TB treatment, the often overlooked indirect cost associated with the utilization of healthcare are an important additional source of financial hardship. These indirect costs can present themselves in the form of travel costs needed to reach health-care facilities (9,81), additional food expenditure during time spent in health centres (9), or in extreme cases the costs of relocation and rent for patients to stay near a DOTS centre to undergo the intensive and lengthy treatment of MDR-TB (66). The accumulation of indirect cost is sometimes even further aggravated by the necessity to consult multiple service providers during the duration of treatment, either due to a lack of resources in health centres (81) or due to a lengthy referral system leading to multiple consultations and a delay in diagnosis and treatment (39,40).

### *Ability to pay*

A recurring finding throughout the literature is the connection between socioeconomic disadvantage, the inability to pay for TB healthcare and the resulting economic distress that households face because of their medical expenses (9,10,66,76–82). Although Nepal has managed to lift many of its people out of poverty over the last five years, its multi-dimensional poverty index (MPI) (as published in the Government's latest report in 2021) still places Nepal within the group of the poorest Asian countries. Especially rural areas are afflicted by poverty with the province of Karnali being the poorest area of Nepal with an estimated 39.5% of people living below the MPI poverty line (compared to 17.4% nationally) (83). Unsurprisingly the financial status, or rather a lack of appropriate finances was found to be associated with the occurrence of CHE in studies concerned with overall personal health expenditure (76–79) as well as in studies specifically concerned with the financial burden of TB infections (80–82). A higher family income and thereby a higher ability to pay for health-related expenses was also found to have a positive effect on compliance with DOTS programs (36). Furthermore, a loss of income because of an TB infection (due to physical inability to perform labour or due to the lengthy and time-consuming nature of TB treatment regimens) further aggravated the financial strain that TB infections had on afflicted households (9,66,80). Although monthly

cash incentives in the amount of NPR 3000 (roughly US\$27) to pay for transportation and nutritional support are offered to MDR TB patients by the NTP, the financial needs created by indirect costs often exceed the provided financial support. There are currently no cash incentives for patients with drug susceptible TB (DS TB)(9).

### Appropriateness and ability to engage

#### *Appropriateness*

As with most dimensions of access to healthcare the provision of appropriate services for TB patients is inherently linked to the existence of sufficient resources, both in terms of goods and services like medication and diagnostic modalities as well as human resources (9–11). In the context of appropriateness, resource shortages might lead to the provision of services that are outdated or suboptimal. An area where this mismatch between the needs of patients and the provision of services becomes evident is the provision of medication for MDR-TB patients. While the 6 months long oral antibiotic treatment regimen with Rifampicin, Isoniazid, Pyrazinamide and Ethambutol (or 2HRZE/4HR as it is commonly abbreviated) for DS-TB has been established for decades (84), the treatment regimen for MDR-TB is complex, plagued by side effects and subject to frequent change (7,84). For decades now second line injectable drugs such as Kanamycin and Amikacin have been part of many MDR-TB treatment regimens and even though TB programs in countries such as Nepal had achieved some success in the treatment of MDR-TB with those agents (85), they did not come without reservations. Due to severe side effects such as hearing loss due to ototoxicity or severe gastrointestinal symptoms adherence to these regimens is difficult and regular check-ups are necessary (86,87). The introduction of regimens that were able to treat MDR-TB without these injectable agents and focused on the much better tolerated oral drugs Bedaquiline and Delamanid was thereby seen as step forward. Today these drugs are officially recommended by the WHO as the regimen of choice (88). A 2020 study retrospectively examining treatment outcomes of MDR-TB patients in Nepal (including injectables) showed that even though standard MDR-TB treatments were tolerated by patients there was still a need to include the new all oral drug regimen (which was not readily available in Nepal at the time) to further improve treatment results (89). It is therefore good to see that Nepal's national TB program has included the new oral regimen into their latest treatment guideline (90). How the roll out of this new regimen will pass off and how it will affect treatment adherence is yet to be determined.

Due to Nepal's diverse geography, there are large local differences in terms of TB burden (91) and access to healthcare (8,39,40). In the more accessible and often economically better developed lowlands of the country, services like DOTS centres are more easily reachable than in mountainous and more rural areas (39,40). These structural differences change what is deemed appropriate in terms of TB healthcare for mountainous and more rural areas. While a TB patient with access to transportation infrastructure might be able to make frequent trips to a facility-based DOTS centre, this facility-based system might not be appropriate for someone living in a hard-to-reach mountain valley in the far north of the country. Several studies have explored the advantages of community based (CB DOTS) and family-based DOTS (FB DOTS) in Nepal (92–94). Training and using family members or community members to directly observe TB treatment where a facility-based system is not feasible due to great distances to healthcare facilities is by no means a new idea and has been utilized in Nepal to some extent for over 20 years (94). Throughout the years it has been shown time and again that CB/FB DOTS managed to match or even outperform facility-based DOTS programs in terms of treatment adherence, completion, and cost effectiveness. These programs are therefore particularly suitable for TB patients in the rugged and isolated mountain areas of the country (92–94). Although over 80% of TB treatments are currently taken under observation (95) a 2020 study found that only 40% of DOTS treatments were community based, even though CB DOTS had significantly better outcomes in treatment completion and cost effectiveness (89). This shows that a stronger focus on CB/FB DOTS strategies especially for rural areas has the potential to increase access to TB healthcare by making services more appropriate for and therefore easier to attain by TB patients.

### *Ability to engage*

By empowering the voices of patients and including them in the diagnosis and treatment planning process, shared decision-making between TB patients and healthcare professionals has been shown to greatly improve treatment adherence and outcomes (96,97). The ability to engage with the healthcare system and participate in shared decision making however requires a certain level of health literacy (27). The ability to identify healthcare needs, comprehend treatment options and schedules as well as consequences of treatment failure or non-adherence is essential for the inclusion of TB patients into the decision-making process (98,99). Unfortunately, there is still a great need for more health literacy in Nepal (100) and the issue affects access to healthcare on more than one level. A more detailed analysis of the

status of TB related health literacy in Nepal has been given in the section on “ability to perceive”.

A patient’s ability to engage is also influenced by characteristics of healthcare providers who influence patients on a very personal level. A study investigating possible associations between treatment adherence of TB patients and the quality of professional-patient interaction in a western district of Nepal showed how the quality of communication between patients and healthcare professionals affected treatment adherence. The authors were able to show that not only a lack of communication (e.g. lack of information about side effects) but also a low quality of communication between examiners and patients was significantly associated with treatment non-adherence (101). These findings were further substantiated in later studies discussing connections between poor communication between patients and healthcare workers and non-adherence to DOT regimens in Nepal (9,10).

## Discussion

Even though Nepal has made great efforts over the last decades to help mitigate the effects of TB on its healthcare system and curb the spread of the disease, TB still poses a major threat to Nepal's public health (6,15). While actions like the implementation of the NHI in 2014 (69), the expansion of ACF programs (23,32), or the expansion of GeneXpert facilities across the country (14,58) have been designed to make TB healthcare more accessible, they have been met with numerous challenges. From low enrolment numbers into the NHI due to implementation issues right from the get-go (70) to low utilization of GeneXpert machines (58) and difficulties to keep ACF programs going due to technical problems and staff / resource shortages (23,32) these actions by the Nepalese government and the national TB program are plagued by implementation issues. To gain further insight into the topic of access to healthcare for TB patients in Nepal I used Levesque et al.'s framework (27). The framework's systematic approach of viewing access to health care in 5 categories from a demand as well as a supply side perspective has allowed me to look beyond TB healthcare implementation and explore systematic issues that affect access on both sides (demand/supply) and throughout the different categories of the framework.

*Geography:* Nepal's diverse topography with large and rural areas of the country being covered in hills and mountains poses a significant challenge to access to healthcare for TB patients (9,11,44,59). Low availability of TB diagnostic and treatment centres as well as staff shortages in the centres that do exist (9–13) create the need for people living in these rural areas to travel to urban centres situated mostly in the lowlands of Nepal. Unfortunately, a lack of transport infrastructure like well-maintained roads or affordable transportation services like buses in these mountainous areas is impeding patients' ability to reach TB healthcare (8). Long travel times are leading to a delay in diagnosis and the additional costs for transportation representing an economic barrier for TB patients (39,40,60) thereby impeding their ability to pay for TB healthcare. Since TB treatment entails lengthy treatment schedules and often requires regular check-ups by health care professionals (especially for MDR TB patients who often experience severe side effects due to their treatment regimens (7)) regular visits to healthcare centres for rural dwellers are sometimes not possible. For some patients this only leaves relocating to a more urban area with better access to TB healthcare as their only option



to access TB treatment. This necessity to relocate brings with it further rental costs for accommodation near a treatment facility and is often paired with a loss of income (66). Ideally the improvement of transportation infrastructure like roads and public transportation services would have a great effect on making TB healthcare more accessible to the rural population. However, the extension of road networks and other forms of transportation infrastructure requires considerable political commitment and the cooperation of multiple branches of government and can thereby at most be seen as long-term goals. More achievable interventions include the utilization of LAMPs as quick and easy to use point of care diagnostic tools in rural areas and the application of OMNIgene Sputum reagent to ensure proper delivery of uncontaminated samples to DST testing facilities. Furthermore, actions to increase the density of TB healthcare facilities in rural areas are needed to further cut down on delays in diagnosis and treatment. By building on and expanding already existing projects like the expansion of ACF programs, CB/FB DOTS programs or the extension of GeneXpert facilities across the country TB healthcare could be brought closer to people living in hard-to-reach areas. Lastly, incentives for healthcare professionals to work in rural areas should be implemented to combat staff shortages. As many graduates from Nepalese medical schools feel underprepared to work in resource low settings (53,54) a reorientation of education as well as improvements of rural healthcare centres could therefore be seen as encouragements for young doctors and nurses to help facilitate the improvement of access to healthcare for TB patients in rural areas of Nepal.

*Health literacy/education:* Adequate knowledge about TB is connected to access to TB healthcare in several ways. It affects both the demand as well the supply side of access to healthcare across different categories of the framework (27). The ability to perceive healthcare needs and identify appropriate healthcare services is linked to a certain level of knowledge about signs and symptoms of TB as well as the diagnostic and treatment process (35,38,45). Multiple studies conducted in different regions of Nepal were able to find a connection between low levels of knowledge on TB among patients and low treatment completion / adherence rates (9–11,35,38). An overall low educational status was hereby linked to low TB knowledge (35–38). Furthermore, researchers have called for actions from stakeholders to increase the approachability of TB healthcare services by increasing access to information on testing and treatment facilities, as studies have identified insufficient

awareness of TB testing and treatment options as barriers to TB healthcare (35,38). Based on these findings the Ministry of Health has devoted several sections of their 2021 TB-Free Nepal Implementation Guideline to health promotion (via print and electronic media) as well as community mobilization (recruitment of local volunteers and community health workers to help disseminate information) (14). Of course, to what extent this will be implemented in the future and how big the effect will be in terms of making the healthcare system more approachable for TB patients remains to be seen.

However, insufficient knowledge about TB is not purely a problem among the general population. Studies have shown that institutional stigma towards TB patients is perpetuated by a lack of knowledge about TB among health care workers. Mainly a fear of infection is leading to negative attitudes and stigma towards TB patients, rendering health care options nonacceptable for patients (24). Educational programs addressing these fears could help reduce stigma and make TB healthcare more acceptable for TB patients.

*Gender related barriers:* Nepalese TB prevalence surveys have consistently shown a higher TB prevalence among men over the years (5,95). The authors of a 2016 meta-analysis analysing TB prevalence data from 28 LMICs (including 2002 data from Nepal) argued that this excess in male TB cases might be due to barriers for men to access TB healthcare. They argued that by analysing prevalence data they were getting a more accurate picture of disease burden than by analysing notification data alone and that using prevalence data would eliminate care seeking biases in their results when analysed by sex. Furthermore, they found a 1.5 times higher rate of prevalent to notified cases for men, suggesting a delay in diagnosis for men (48). These findings stand in contrast with findings from other studies, specifically concerned with gender related barriers to TB health care in Nepal. Multiple studies found higher delay before diagnosis for women linked to barriers such as a higher proportion of women visiting traditional healers before seeking care in official TB healthcare centres (47), higher pervasiveness of traditional beliefs amongst women (41) or social norms such as “Chaupadi” or menstrual taboo, shunning women from any form of social contact during menstruation (50). Being somewhat contradictory and either based on outdated data sets (48) or rather small in scale (41,47) these findings are not enough to fully grasp the complex topic of gender related barriers to TB health care. There is certainly an urgent need for current research to

guide the implementation of healthcare services tailored to the specific needs of male and female TB patients in Nepal to break down gender specific barriers to TB healthcare.

*Economic barriers:* TB disease still poses a threat to the financial security of many Nepalese citizens even though Nepal has introduced the NHI in 2014, the National Health Insurance Act in 2017 (69) and programs offering monthly cash incentives to alleviate the financial strain of indirect costs associated with MDR TB treatment (9). With 39.5% of people living below the poverty line in the poorest regions of the country (17.4% national average) the ability to pay for TB related costs is limited for many TB patients (83). For many TB patients the currently available financial support structures are either not accessible or not enough to offset the often indirect costs (transportation, food, accommodation, loss of income etc.) associated with TB treatment (9,11,23,66,77,80,81). This brings with it the risk of facing catastrophic health expenditure as a consequence of their TB disease (23). Although financial hardship is listed in several studies as a barrier to access TB healthcare the availability of data and studies on CHE related to TB healthcare in Nepal is low. Currently available data from large scale surveys trying to determine the financial impact of health-related expenditure on patients is outdated and predates the implementation of most currently available financial support structures (77). More recent studies specifically concerned with TB related expenditure are restricted by their small sample size and small regional focus (66,76). This knowledge gap needs to be addressed. Recent large-scale surveys and analyses of the collected data to determine the impact of healthcare related payments on TB patients are necessary to guide future financial support systems.

*Strengths and limitations of the thesis:* The collection and analysis of available literature allowed me to combine findings on a meta level and show links between different topics affecting access to TB healthcare. Furthermore, an extensive literature search revealed knowledge gaps and possible areas of interest for future research, such as a lack of information on CHE linked to TB healthcare related expenditures. However, the dependency on already existing information also constitutes a limitation, as only a limited informative value can be attributed to sections of the review where only insufficient or contradicting literature was found.

## Conclusion and recommendations

TB represents an immense challenge to the Nepalese healthcare system. With high prevalence rates and disease burden (6,95) TB remains high on the Ministry of Health's agenda. Assuring unimpeded access to TB healthcare is thereby a crucial element of Nepal's line of action to help guide the country towards a TB free future. With this literature review guided by Levesque et al.'s framework on patient centred access to healthcare I aimed to depict the current state of knowledge around the topic of access to healthcare for TB patients in Nepal, describe specific barriers for patients and identify knowledge gaps that need to be addressed. Today TB patients in Nepal seeking TB healthcare are still facing numerous obstacles along the way. A lack of transportation infrastructure paired with low availability of TB healthcare facilities in rural areas (8,44,59) is severely impeding patients' ability to reach proper TB healthcare and increasing the risk of financial hardship for those that must deal with the indirect costs associated with travel or relocation (66). While a lack of TB related knowledge among patients is impeding their ability to correctly identify and perceive health care needs is causing delays in diagnosis and treatment (35,38), insufficient knowledge among healthcare workers is perpetuating negative attitudes and stigmas towards TB patients, rendering healthcare option nonacceptable (24,25). For other elements of the framework the currently available literature unfortunately paints a picture that is less clear. While smaller qualitative studies are showing that to this day many TB patients especially in poorer areas of the country are facing CHE due to their TB disease (either due to TB healthcare being non affordable or patients being unable to pay) (66,76) a lack of current large-scale surveys is leaving the true scale of the problem in the dark. Furthermore, somewhat contradictory studies concerned with the topic of gender related barriers (impeding patients' ability to seek TB healthcare) are leaving questions unanswered. While higher prevalence rates among men than women as well as high rates of prevalent to notified cases among men are interpreted as indicators of gender related barriers to TB healthcare by some authors (48) other largely qualitative studies have found evidence of gender related barriers mainly for women (41,47).

In order to facilitate progress towards a TB free Nepal, barriers to access to TB healthcare must be addressed by government stakeholder and researchers alike. Knowledge gaps must be closed to inform targeted interventions and diagnosis and treatment options must be made

available to populations underserved by the current system. Based on the findings of this thesis the following recommendations are made:

*Active case finding:* ACF programs have the potential to increase the approachability of TB healthcare services by actively reaching out to the community and systematically identifying potential TB patients (30,31). Although this WHO endorsed intervention (17) has been implemented across the country and across several different subgroups (34) case finding yields of ACF programs remain low (32,34). ACF programs have been severely impacted by shortages in rapid diagnostic tools and healthcare workers and are in need of additional funding (23,32). Furthermore, a better integration of FAST programs into the daily operations of healthcare facilities by providing appropriate space, time, and diagnosis options such as GeneXpert testing for trained personnel are necessary to improve outcomes (32). For other programs such as contact tracing projects investigations and research to determine the root causes of low case finding yields (34) are necessary before any changes to the programs can be made. Improving existing ACF programs would not only make TB diagnosis more approachable it would also make it more affordable for patients in rural areas by eliminating the need to pay for travel expenses.

*Family/Community based DOTS:* Even though studies have shown that CB/FB DOTS programs have significantly better outcomes in terms of treatment adherence and completion (89) only 40% of DOTS treatments in Nepal are currently family or community based (95). Next to good outcomes CB/FB DOTS programs have the additional advantage of eliminating the necessity to travel to or relocate near DOTS centres for treatment, making CB/FB DOTS programs thereby more appropriate and easier to access for TB patients in rural areas (92–94). The Ministry of health together with the NTP should therefore place a stronger focus on CB/FB DOTS programs to make TB treatment more acceptable and affordable.

*LAMP and OMNIgene Sputum reagent:* To ensure that people in often understaffed and undersupplied rural areas have access to appropriate diagnosis methods, the utilization of technologies such as the Loop mediated isothermal amplification test (LAMP) (a nucleic acid amplification test detecting DNA or RNA (102)) have the potential to increase availability of TB diagnosis for patients. Although unable to perform drug susceptibility testing, LAMP tests

have the advantage of being simple and relatively quick to perform (102) and therefore functioning as a point of care test in rural areas of the country. A recent study investigating the utilization of simple to use visual methyl green (a dye used to simplify the visualization process) based LAMP tests in Nepal has identified this method as a candidate for future TB testing (61). Furthermore, the use of technologies such as the OMNIgene Sputum reagent have the potential to increase the NTPs ability to transport sputum samples from rural areas to diagnostic centres safely. By stabilizing the samples this transport reagent eliminates the need to refrigerate them and therefore decreases the risk for contamination, effectively increasing the number of samples that can be used for diagnosis. This method of sample stabilization is especially useful for samples from rural areas which often must be transported for days without refrigeration (68).

*Health literacy programs:* Even though recommendations to expand health literacy programs have already found their way into the guidelines for a TB free Nepal (14) a lack of TB related knowledge and a resulting low ability to perceive healthcare needs, as well as a perpetuation of stigmas are still barriers on both the demand as well as the supply side of access to TB healthcare (35,38). A stronger focus on educational campaigns through social media outlets and more traditional forms of media like television could help to facilitate knowledge about TB among the public. Already existing formats like educational campaigns about HIV (HIV ka swala) and maternal care (Ama ko maya) (9) could serve as templates for future TB campaigns. Furthermore, institutional stigma about TB patients needs to be addressed to make healthcare more acceptable to TB patients. Healthcare workers across all fields need to be trained and educated about TB to prevent stigma and negative attitudes towards TB patients.

*Research and surveys:* To close an important knowledge gap a collection of recent data on the pervasiveness of CHE and OOP because of TB infection is needed to inform future economic support projects. Additionally, research regarding gender specific barriers to TB healthcare should be encouraged to be able to offer solutions tailored to the specific needs of men and women living with TB.

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