

**Determinants of Tuberculosis Treatment Success and Death  
in Nepal: Evidence from e-TB Surveillance Data**

**Research Brief Prepared by  
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## Research Brief

### Determinants of tuberculosis treatment success and death in Nepal: Evidence from e-TB surveillance data

To achieve Sustainable Development Goal (SDG), government of Nepal is committed to reduce tuberculosis incidence to 20 per 100,000 population by 2030. Yet, by 2019 incidence of tuberculosis is 245 per 100 population in Nepal. Using data on tuberculosis case finding and treatment outcome reported in electronic tuberculosis surveillance data, we examined socio-demographic, geographic, and clinical determinants of tuberculosis treatment success and death, and recommended potential interventions to accelerate progress by 2030.

#### Key findings:

1. Older people have lower level of TB treatment success and higher level of death due to TB
2. Male are less likely to have successful TB treatment and more likely to die due to TB than female
3. Dalit and Muslim have lower odds of TB treatment success and higher odds of death due to TB
4. TB treatment success and death due to TB varied across provinces. Karnai province and province2 have higher level of treatment success than province1 and Gandaki and Sudurpaschim provinces have higher level of death due to TB than province1
5. HIV positive status among TB patients reduce the level of treatment success and increase the likelihood of death

#### Background

Tuberculosis (TB) is a major cause of ill health and is one of the top ten cause of global death. TB remain a public health problem in Nepal. Every year around 69,000 people develop TB and about 17,000 people die due to TB in Nepal. But, only 32,043 TB patients were notified in NTP in 2020 and about 54% of the new TB patients are missed. Current level of tuberculosis incidence in Nepal is 245 per 100,000 population. To achieve the SDG target of reducing TB incidence to 20 per 100,000 population, all the missing TB patients should be traced and successfully treated. For this, the factors contributing to the TB case finding and successful treatment should be identified and appropriate interventions should be implemented to mitigate the problems. Which is not well explored in Nepal. As policy makers and program managers consider best ways to improve TB treatment outcome, following key questions remain:

- What are the key determinants of TB treatment success and death due to TB?
- Is there any ethnic and geographical variation in TB treatment success and death?
- What can be done to improve TB treatment outcome?

#### Methodology

Using TB patient case finding and treatment outcome data reported in electronic TB register, we examined association of patient’s sociodemographic, geographic and clinical characteristics with TB treatment success and death. Cross-tabulation and logistic regression analysis were used to examine the association. Some 66625 TB patients identified during 2013 to 2018 were entered in eTB data, but TB treatment outcome was complete only for 28960 TB patients. Therefore, 28960 TB patients were included in the analysis. More detail methodology is provided in the separate paper.

**Sustainable development goal target and challenges for tuberculosis**

In line with global SDG, government of Nepal is committed to achieve various targets related to goal3 of ensuring healthy lives and promote wellbeing for all at all ages. One of the targets is to end epidemic of TB by reducing tuberculosis incidence to 20 per 100,000 population by 2030. Level of TB incidence in 2019 is 245 per 100,000 population, which is much higher than the expectation. With this incidence, every year about 69,000 people are expected to develop Tb but only about 33,000 TB patient were notified and started TB treatment in 2019. More than a half of the expected TB patients are missed and continue transmitting disease in community. This has become a challenge for government of Nepal.

**Key finding1. Older people have lower level of TB treatment success and higher level of death due to TB**

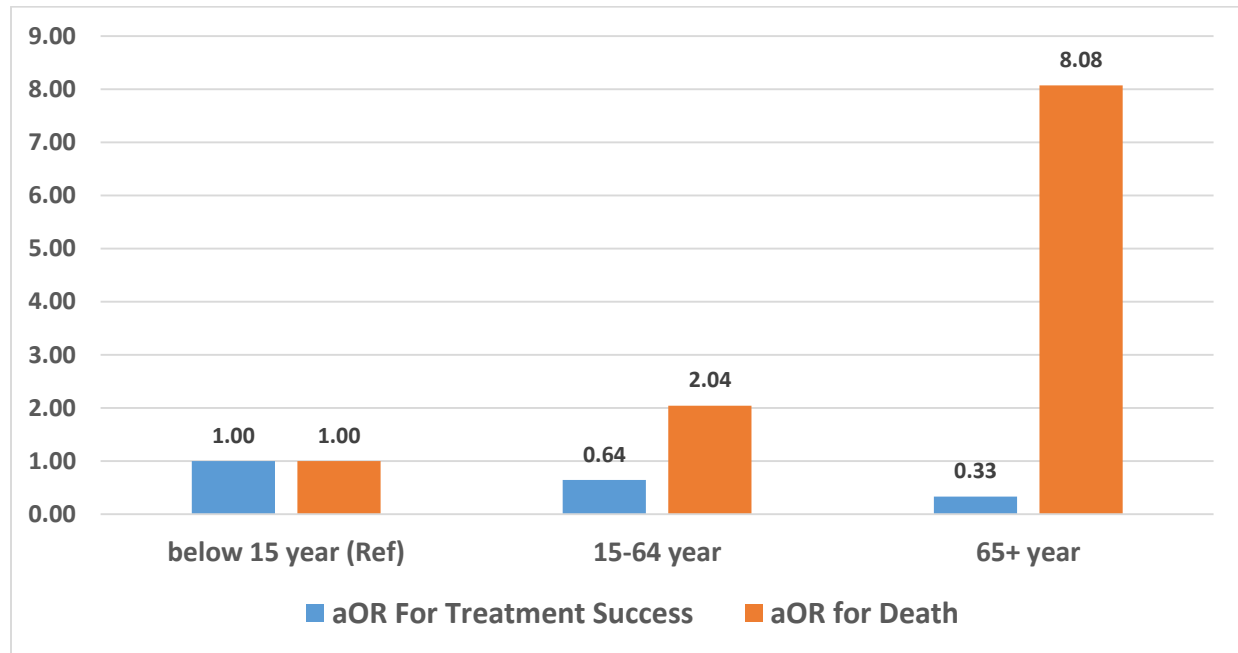


Figure1. Relationship of age group with Tuberculosis treatment success and death (aOR- Adjusted Odds Ratio)

Age has been well recognized as a key social determinant of TB incidence and treatment outcome. Older people are vulnerable to TB because of their higher mobility and exposure of TB bacilli, comorbidity, nutritional status and other behavioural and genetic factors. Our analysis indicated that:

- TB treatment success rate declined and death due to TB increased with age
- Compared to TB patients of age less than 15 years, patients with age 15-64 year were 0.6 times and patients with age 65 years or older were 0.3 times less likely to have successful TB treatment

- Similarly, compared to TB patients of age under 15 years, patient with age 15-64 years were 2 times and patients with age 65 or older were 8 times more likely to die

Published literatures suggest that Higher loss to follow-up, worsened TB morbidity along with other co-morbidities, higher family responsibility, limited family support leading to non-compliance to TB medication are potential reasons behind the lower treatment success and higher death among older TB patients in resource poor countries like Nepal.

**Key finding2. Male are less likely to have successful TB treatment and more likely to die due to TB than female**

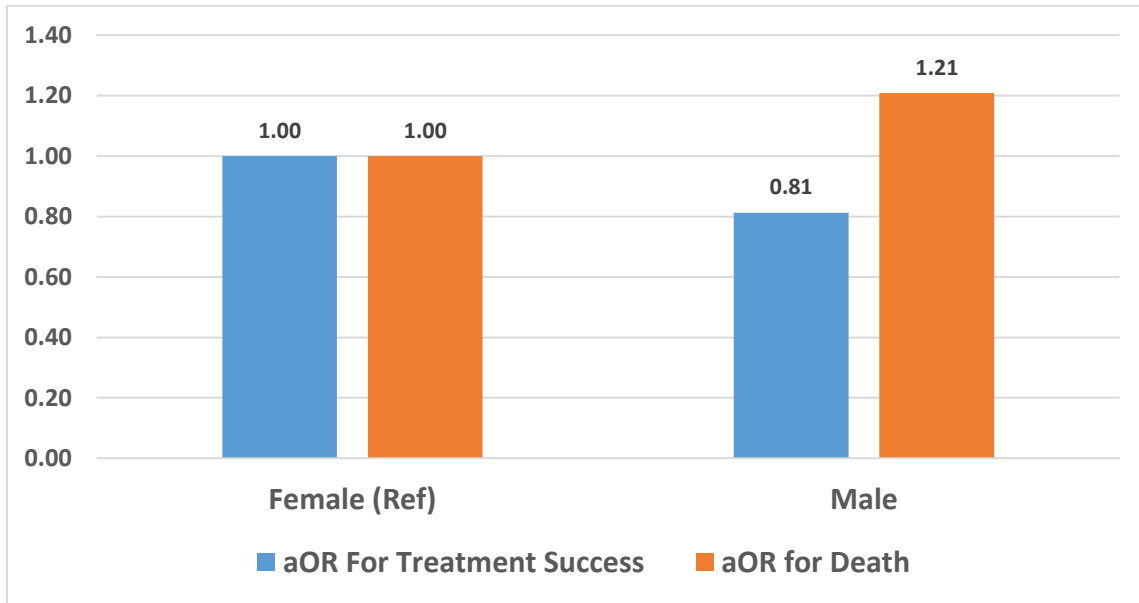


Figure 2. Relationship of sex with tuberculosis treatment success and death (aOR- Adjusted Odds Ratio)

Globally, it is evident that TB disease affects male more than female and similar result is evident in Nepalese context:

Compared to female, male had 0.8 times lower odds of TB treatment success and 1.2 times higher odds of death

Reason for this lower rate of treatment success and higher death rate due to TB among male is not clear. However, literatures suggest that this is because male are more likely than female to be exposed to disease and female may have under-reported their disease because of their lower access to health service due to socio-economic constraints.

**Key finding3. Dalit and Muslim have lower odds of TB treatment success and higher odds of death due to TB**

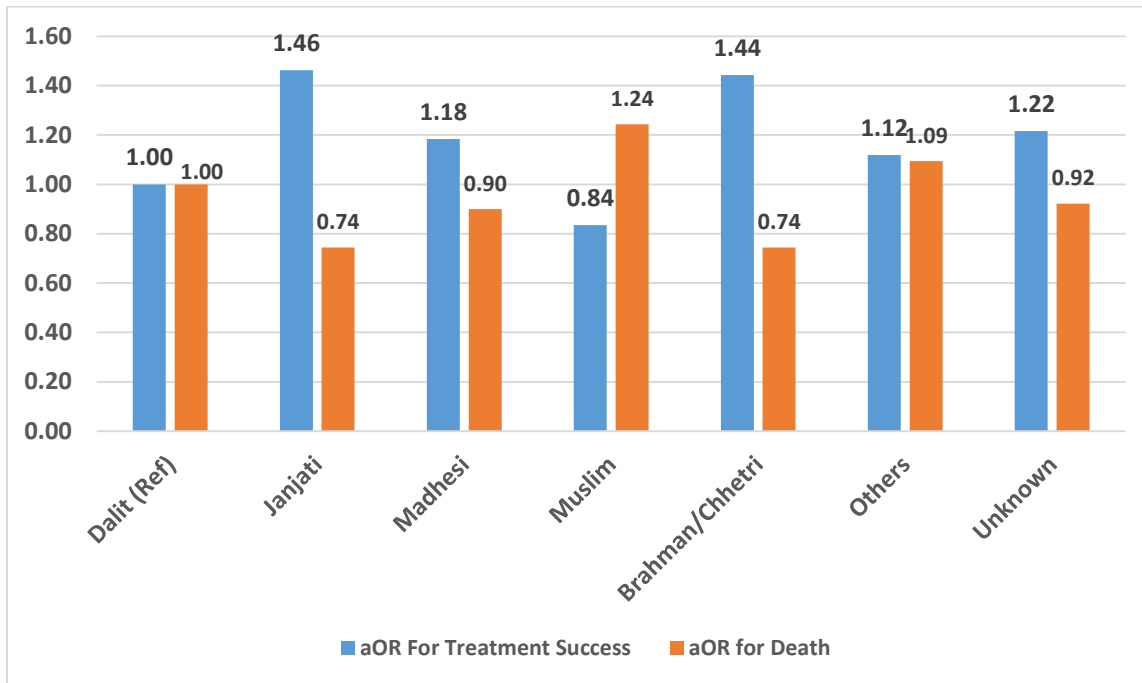


Figure 3. Relationship of ethnicity with Tuberculosis treatment success and death (aOR- Adjusted Odds Ratio)

Ethnicity has been well discussed as an important social determinant of TB and TB treatment outcome in global literature; however, ethnic disparity on TB treatment outcome and death is not adequately examined in Nepal. Our analysis indicated that:

- Both the TB treatment success and death due to TB varied across ethnicity. Janjati have 1.5 times higher odds of TB treatment success than Dalit. Similarly, Madhesi have 1.2 times higher, Brahmin/Kshetri have 1.4 times higher and Muslim have 0.8 times lower odds of TB treatment success than Dalit
- Similarly, Janjati and Brahmin/Kshetri have 0.7 times lower odds of death due to TB than Dalit. Lack of knowledge on health care service as well as low decision making power due to traditional belief could be some reasons for preventing Muslim and Dalits from utilization of modern health care service leading to poor health outcome

Racial disparity in TB incidence and treatment has also been reported in other countries, where TB burden is shown to be higher among indigenous and black people compared to other groups. The ethnic variation of TB indicator was explained by poor living condition, lower income and limited access to health service among black and indigenous population. Small and crowded homes, inadequate natural light and ventilation are potential contributors for enabling environment and preservation and spread of TB bacilli.

**Key finding4.** TB treatment success and death due to TB varied across provinces. Karnai province and province2 have higher level of treatment success than province1 and Gandaki and Sudurpaschim provinces have higher level of death due to TB than province1.

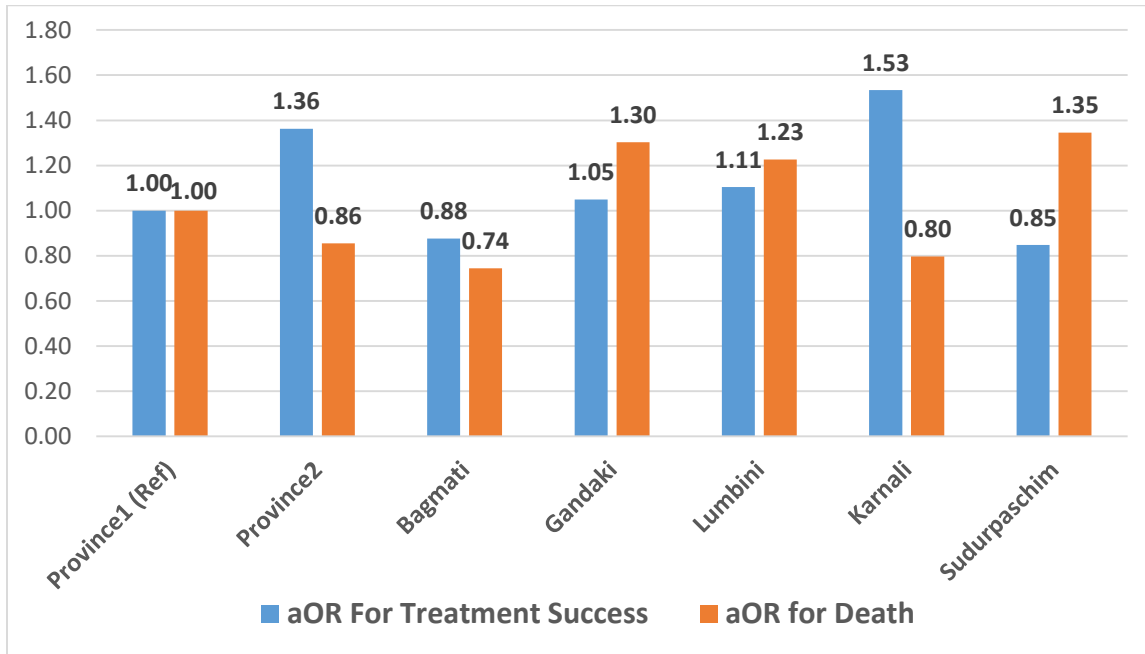


Figure 4. Relationship of geography with Tuberculosis treatment success and death (aOR- Adjusted Odds Ratio)

Barriers to accessing TB related diagnosis and treatment service are known to be associated with higher TB treatment adherence and death. Frequency of visit, transportation cost and cost of seeking care, availability of health personnel, drug and diagnostics, surrounded by complex geographical situation are some barriers faced by Nepalese people while seeking care for TB. We examined relationship of geographical location with TB treatment success and death in Nepal. Our analysis suggested that:

- Both TB treatment success and death due to TB varied across geographical regions.
- Province2 has 1.4 times higher odds and Karnali province has 1.5 times higher odds of TB treatment success compared to Province1.
- Similarly, Gandaki and Sudurpaschim provinces have 1.3 times higher odds of death due to TB

This variation of treatment success and death across provinces could be due to differences in ability of clinical diagnosis, access to TB care and effectiveness of surveillance system, but the true reason is not clear. This highlights need for further exploration of reasons for this provincial variation in TB treatment success and death.

**Key finding5. HIV positive status among TB patients reduce the level of treatment success and increase the likelihood of death.**

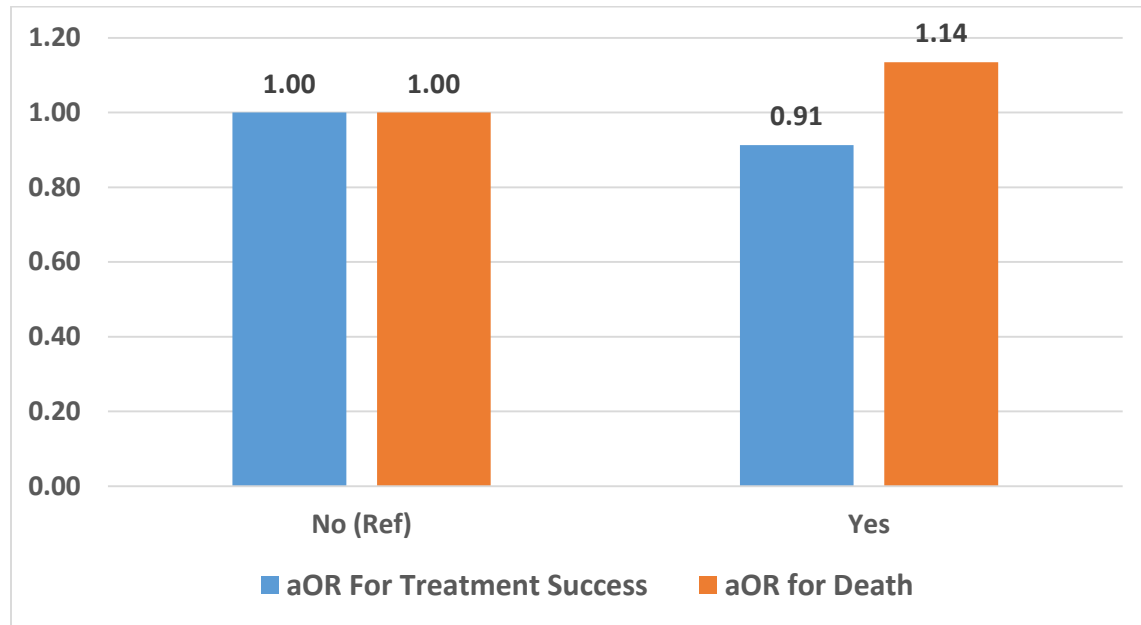


Figure 5. Relationship of HIV positive status with Tuberculosis treatment success and death (aOR- Adjusted Odds Ratio)

In our analysis, HIV status was significantly associated with both the TB treatment success and death due to TB. TB patient who were HIV positive were 0.9 times less likely to have successful TB treatment and 1.14 times more likely to experience death due to TB. Compromised immune system and drug burden among HIV infected people taking ART could be the main reason for this difference.

**Conclusions:**

Various individual, social, geographical and clinical variables were associated with TB treatment success and death. The factors increasing the odds of TB treatment success include younger age, female, non-Dalit and Muslim ethnicity, Karnali Province and Province1 occupant, being an extra-pulmonary and pulmonary clinically diagnosed TB case, getting category1 TB drug and HIV status negative case. Similarly, the factors increasing the odds of death include, older age, male, Dalit ethnicity, occupant of Gandaki and Sudurpaschim Province, being pulmonary bacteriologically confirmed case, getting category2 drug and being HIV positive. Such TB cases should be considered as high-risk group and pay more attention during management and treatment and targeted interventions should be carried out.

**Limitations:**

This study has several limitations. First, the data used in analysis of this study does not include complete list of TB patient in the district. This include only the TB patient, which are entered in the eTB register and treatment outcome result are available. This is a retrospective study based on data extracted from clinical record and exclude non-clinical cases such as the death of TB patient occurred in the community. The data also lack the information of TB patient and provider perspectives, as they were not interviewed. Second limitation of this study is that it include only the variables available in eTB data. Therefore, certain important social and clinical determinants of TB treatment success and death are

missing. For example, socio-economic status of TB patient (education, employment, income etc.), existing co-morbidity (diabetes, malnutrition), TB patient risk behavior (smoking, alcohol and drug use) were not available in the data set. Further studies should look at these important variables for comprehensive analysis to examine determinants of TB treatment success and death. Inclusion of these variables in NTP surveillance will enhance the documentation and identification of risk factors for TB and implementing interventions to prevent TB transmission in community in the future. Third limitation of this study is that treatment outcome of 57% of the patient entered in eTB register were unknown and we could not use these cases in the analysis, this may have contributed to over or under estimation of our result.

### **Policy Recommendations**

- To improve treatment success and reduce death among older population, implement community based DoTS approach effectively with focused monitoring and management of TB among older population. In addition, in consultation with geriatric specialists, develop comorbidity management policy and implement interventions for effective management of TB among old age population among older population.
- Develop guideline on TB-HIV collaborative activities to effectively deliver integrated TB-HIV service and effectively implement mandatory provision of HIV testing among TB patients to improve treatment success and reduce death among HIV infected TB patients.
- As TB treatment success and death varies across provinces, deeper knowledge about need and condition of people in different places should be gained before designing implementing program interventions for management and care for TB patients. Effective counseling on TB medication and treatment adherence should be provided through trained service providers in local language.
- Designing messages in local languages, mobilization of TB service providers who are from local community, speak local language and know local cultural norms can be some strategies to improve TB treatment outcome among people living in hard to reach areas.
- Dalit, Muslim, and other minority groups face some physical, financial, and information related barriers to access TB related information and care. Therefore, government should implement targeted interventions to empower them socially and economically. This will improve access to health information and service to these minority groups. Local level providers should be trained to communicate effectively and respectful manner among ethnic minority groups.
- Regular monitoring and supportive supervision of TB diagnosis and treatment center, wide spread health education through various media, contact tracing of bacteriologically positive TB patient and targeted TB screening among high risk groups are other cost effective interventions recommended to improve case notification and treatment outcome in Nepal.
- Additional study should be conducted by using comprehensive framework to include all social determinant of TB to identify root cause of low treatment success and high death due to TB.



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