



Alcohol and Tuberculosis: A Comprehensive Public Health Perspective and Case Series Study at a Tertiary Care Hospital

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Abstract

This study focuses on the intersection of alcoholism and pulmonary tuberculosis (PTB) and its implications for public health. Conducted at a tertiary care hospital in Mumbai, the research aimed to identify the impact of alcohol consumption on PTB incidence, severity, and treatment outcomes among adult male patients. A descriptive case series approach was employed to study patients attending the outpatient department (OPD) and inpatient department (IPD) in May and June 2023.

The findings revealed a significant association between alcoholism and PTB, with chronic alcoholic patients being more susceptible to TB infection and developing severe complications. Comorbidities such as HIV, uncontrolled diabetes, and hemoptysis were commonly observed in these patients, necessitating comprehensive and integrated healthcare services.

Moreover, the study highlighted the psychiatric impact of alcoholism on PTB patients, with many presenting with depression and suicidal ideation. The challenges of early detection and management of PTB were also noted, indicating the need for stronger primary healthcare and community-based interventions.

In conclusion, this study underscores the need for a multidimensional approach to address the complex issues arising from the intersection of alcoholism and PTB. Comprehensive public health strategies encompassing early detection, treatment adherence, mental health support, and targeted preventive measures are crucial to mitigate the impact of alcohol on PTB risk and improve overall health outcomes.

Keywords: Tuberculosis, Alcohol, Alcohol and TB, Alcohol TB and Hepatic comorbidity.

Introduction

Alcohol is a risk factor for Tuberculosis (TB)⁽¹⁾ Tuberculosis (TB) is the world's top infectious killer. TB is caused by bacteria (*Mycobacterium tuberculosis*, that most often affect the lungs. TB is spread from person to person through the air. When people with lung TB cough, sneeze or spit, they propel TB germs into the air. A person needs to inhale only a few of these germs to become infected. People with active TB can infect 10–15 other people through close contact over the course of a year. Without proper treatment, 45% of HIV-negative people with TB on average and nearly all HIV-positive people with TB will die. The good news is that TB is curable and preventable.⁽²⁾ A total of 1.6 million people died from TB in 2021 (including 187 000 people with HIV). Worldwide. About one-quarter of the world's population has latent TB, which means people have been infected by TB bacteria but are not (yet) ill with the disease and cannot transmit the disease. People infected with TB bacteria have a 5–10% lifetime risk of falling ill with TB. However, persons with compromised immune systems, such as people living with HIV, malnutrition or diabetes, or people who use tobacco, consume alcohol have a much higher risk of falling ill.⁽²⁾ Alcohol consumption can lead to malnutrition, due less food intake and because of malabsorption, which heightens the risk of contracting tuberculosis (TB). Malnutrition weakens the immune system, making individuals more susceptible to TB infection. Stopping the alcohol intake can help improve nutrition and potentially lower the likelihood of TB occurrence.

Symptoms

People with latent TB infection don't feel sick and aren't contagious. Only a small proportion of people who get infected with TB will get TB disease and symptoms. Babies and children are at higher risk. Certain conditions can increase a person's risk for tuberculosis disease: diabetes (high blood sugar) weakened immune system (for example, HIV or AIDS), being malnourished, tobacco use and alcoholics. Unlike TB infection,

when a person gets TB disease, they will have symptoms. These may be mild for many months, so it is easy to spread TB to others without knowing it. Common symptoms of TB: prolonged cough (sometimes with blood), chest pain, weakness, fatigue, weight loss, fever, night sweats.

Alcohol use

No level of alcohol consumption is safe for our health (W.H.O.04/01/2023) The harmful use of alcohol is a causal factor in more than 200 disease and injury conditions. Worldwide, 3 million deaths every year result from harmful use of alcohol. This represents 5.3% of all deaths.(WHO 5/9/2022). Alcohol use has been identified as a major risk factor for both developing TB disease and having worse outcomes; (1–4) Heavy alcohol use or Alcohol use disorder (AUD) prevalence among TB patients worldwide ranges from 15% to 70%.^{7–11} AUD is a chronic, relapsing brain disease characterized by an impaired ability to stop or control alcohol use despite adverse social, occupational, or health consequences. The presentation of AUD can range from mild to severe, and recovery is possible regardless of the level of severity.⁽¹⁶⁾

Alcohol and Tuberculosis

The relationship between alcohol consumption and tuberculosis can be explained by two causal pathways^[3,4]. First, alcohol consumption impairs the immune system, which increases susceptibility to tuberculosis infection, as well as to reactivation of latent tuberculosis^[3, 4]. The ability of alveolar macrophages to respond to newly introduced pathogens is compromised by alcohol consumption^[5,6]; under normal circumstances these macrophages eliminate most mycobacteria^[5, 6]. Specifically, mobilisation and adherence of macrophages is suppressed and phagocytosis of mycobacteria and superoxide production are impacted^[6–9]. In addition, monocytes' production of cytokines that regulate inflammation is limited by alcohol consumption^[7,8,1]. The macrophages' ability to respond to these cytokines and present mycobacterial antigens to lymphocytes is also

reduced, and antigen-specific T-cell activation is impaired^[8]. As a result of these changes, the immune system's ability to respond to new and dormant mycobacteria is severely diminished^[9]. Apart from direct influences on the immune system, alcohol consumption is associated with malnutrition, liver disease and social drift, all of which impact the maintenance of innate and acquired immune systems^[9]. Second, alcohol consumption leads to presence in social environments that facilitate the spread of tuberculosis infection^[3,4]. Examples of such environments include bars, shelters, prisons and social institutions, which have been implicated in molecular-epidemiological studies ^[11,12].

Those who use alcohol may have worse TB treatment outcomes due to behavioral mechanisms, including worse medication adherence and greater loss to follow-up (LTFU),^(12–14) or biologic mechanisms, including the impact of alcohol on innate and adaptive immune responses,⁽¹⁵⁾ lung function and barrier protection,⁽¹⁶⁾ hepatotoxicity,⁽¹⁷⁾ and TB and human immunodeficiency virus (HIV) drug absorption and metabolism.⁽¹⁸⁾

Alcohol use disorder (AUD) is a chronic, relapsing brain disease characterized by an impaired ability to stop or control alcohol use despite adverse social, occupational, or health consequences. The presentation of AUD can range from mild to severe, and recovery is possible regardless of the level of severity.^(16,38) Alcohol use has been identified as a major risk factor for both developing TB disease and having worse outcomes;^(1–4)

Alcohol and TB Epidemiology

Alcohol misuse has significant implications for tuberculosis (TB) epidemiology, including the risk of infection, transmission, severity, treatment outcomes, and efficacy of treatment.⁽¹⁷⁾

Risk of Infection

Alcohol misuse is associated with an increased risk of TB infection. Chronic alcohol consumption weakens the immune system, making individuals

more susceptible to contracting TB when exposed to the *Mycobacterium tuberculosis* bacteria. Alcohol impairs the function of immune cells, such as macrophages and neutrophils, which are crucial for fighting off TB infection.⁽¹⁸⁾

Risk of Transmission and Severity

Individuals with alcohol use disorder (AUD) who develop active TB can also pose a higher risk of transmitting the infection to others. Alcohol misuse may lead to behaviors that increase the likelihood of TB transmission, such as living in overcrowded conditions or having poor adherence to infection control measures. Moreover, AUD can worsen the clinical outcomes of TB, including increased severity of disease, higher rates of extra-pulmonary TB, and increased mortality.⁽¹⁹⁾

Treatment Outcomes

Alcohol misuse negatively impacts TB treatment outcomes. Studies have shown that individuals with AUD have lower treatment adherence rates, longer treatment durations, and higher rates of treatment failure, relapse, and mortality compared to those without AUD. Alcohol can interfere with medication adherence, increase the risk of drug interactions, and hinder the body's ability to eliminate TB bacteria.⁽¹⁷⁾

Efficacy of Treatment

Alcohol misuse can also affect the efficacy of TB treatment. Alcohol can impair liver function and compromise the metabolism of anti-TB medications, leading to suboptimal drug levels in the body. This can reduce the effectiveness of treatment and contribute to the development of drug resistance.⁽¹⁷⁾

Addressing alcohol misuse within the context of TB is crucial for improving TB control efforts. Implementing interventions that target both alcohol misuse and TB, such as integrated screening and treatment programs, can help improve treatment outcomes and reduce transmission rates. It is essential to provide comprehensive care that addresses both the alcohol-related challenges and TB management to effectively combat the dual burden of alcohol and TB.

Prevention

Alcohol consumption has been identified as a risk factor for tuberculosis (TB) in some studies. Preventive measures can be implemented at various stages to reduce the impact of alcohol on TB risk. Let's explore each level of prevention in the context of alcohol as a risk factor for TB:

Pre-morbid Prevention

This level of prevention focuses on preventing the development of risk factors before they can lead to the disease. In the case of alcohol and TB, pre-morbid prevention would involve measures aimed at discouraging excessive alcohol consumption in the general population. Public health campaigns, educational programs, and policy interventions that promote responsible drinking habits and raise awareness about the association between alcohol and TB can fall under this category.

Primary Prevention

Primary prevention aims to prevent the initial occurrence of a disease. For TB and alcohol-related TB risk, primary prevention would involve targeting individuals who consume alcohol and educating them about the risks associated with excessive drinking. Programs that promote moderation, provide resources for seeking help with alcohol dependence, and encourage healthier lifestyle choices can be part of primary prevention efforts.

Secondary Prevention

Secondary prevention focuses on detecting and treating risk factors and diseases in their early stages to prevent further progression. In the context of alcohol as a risk factor for TB, secondary prevention efforts would involve screening individuals who consume alcohol regularly for TB infection. Early detection of TB can lead to timely treatment, reducing the risk of transmission to others and preventing the development of more severe TB cases.

Tertiary Prevention

Tertiary prevention aims to reduce the impact of an existing disease and prevent complications and relapses. In the context of alcohol and TB, tertiary

prevention measures would involve providing appropriate treatment and support for individuals who are already diagnosed with TB and are also affected by alcohol consumption. Ensuring compliance with TB treatment and offering interventions for alcohol cessation can be part of tertiary prevention strategies.

It is essential to note that the effectiveness of these preventive measures may vary depending on the individual's circumstances, the severity of alcohol use, and the level of TB risk. Combining preventive measures at different levels can enhance the overall effort to mitigate the impact of alcohol as a risk factor for TB and improve public health outcomes.

Methods and Materials

The study was carried out in unit 4 OPD of Group of TB Hospitals Sewri Mumbai in May 2023 and June 2023. GTB Hospitals is a largest hospital in Asia exclusively for Pulmonary tuberculosis with bed strength of 1000 beds for sensitive patients and 200 beds for drug resistance patients, as it is tertiary care hospital, maximum patients are in last stage with lots of complications. Study is a descriptive type and Total Patients in OPD in May and June 2023 was 120 and 121 in unit 4 respectively. Out of which IPD was 52 and 38 for May and June respectively. Case selection was Alcoholic patient who comes to OPD with sign and symptoms of pulmonary TB" microbiologically diagnosed as Pulmonary Tuberculosis (PTB). Study population are adult male only not less than 18 yrs as we have not found female in both OPD and IPD patients except one, who was adherent to treatment and completed standard treatment course of Anti TB. Treatment (ATT). Inclusion Criteria Patient is chronic alcoholic and his liver function test is not normal or deranged, microbiologically (Sputum microscopy, MGIT Liquid culture, Molecular test recommended by W.HO. like GenXpert, Line Probe Away LPA) Patients attending in OPD are more than 80% requires hospitalization having bilateral destroyed lungs on x-ray chest with

comorbidity like HIV with low CD count, uncontrolled Diabetes, Hemoptysis moderate to severe. Pneumothorax or Hydro pneumothorax. As the patient is chronic alcoholic, patient develops psychiatric problem also like depression, suicidal ideation which are treated by hospitalization.

Case Series

Case study 1. 66 yr. old male patient, chronic alcoholic, Newly diagnosed with sputum positive PTB, ATT started on 15/06/ 2023, CBC 11.2/17200/2.7 lakhs, LFT -SGOT/PT 74/56. Bilirubin T/D/I 21.0/9.5/11.5, KFT BUN 07, CREAT 0.8.

Case study 2- 45 year old male patient recently diagnosed PTB, on sputum GenXpert done on 10/07/2023- MTB detected medium, Rifampicin sensitive was started on cat 1 ATT came with complaints of cough with expectoration, loss of appetite and generalised weakness for past one month, patient has history of chronic alcohol abuse, and splenectomy done 4 months back, recently diagnosed with DM on Diabetic diet, Liver function test shows SGOT and SGPT raised 108 and 83 respectively, Bilirubin WNL(total-0.8, direct-0.5) Renal function test show reports within normal limit, Sr creat-1.0 Hb-8.6, TLC-13100, plt-5.2lakh.

Case study 3 48 yr. old male patient, H/o repeated TB, with HIV+, on ART. CXR shows bilateral lower zone irregular opacity. Comes with symptoms of fever, cough, blood streak sputum, generalized weakness, started on ATT

Case study 4 - 42 yr. old male patient, chronic alcoholic, clinically and radio logically diagnosed with PTB, taken on ATT since 13th july 2023, CBC -5.7/3500/1.2lakhs. C/o weakness, fever, loss of appetite, cough, pedal edema..

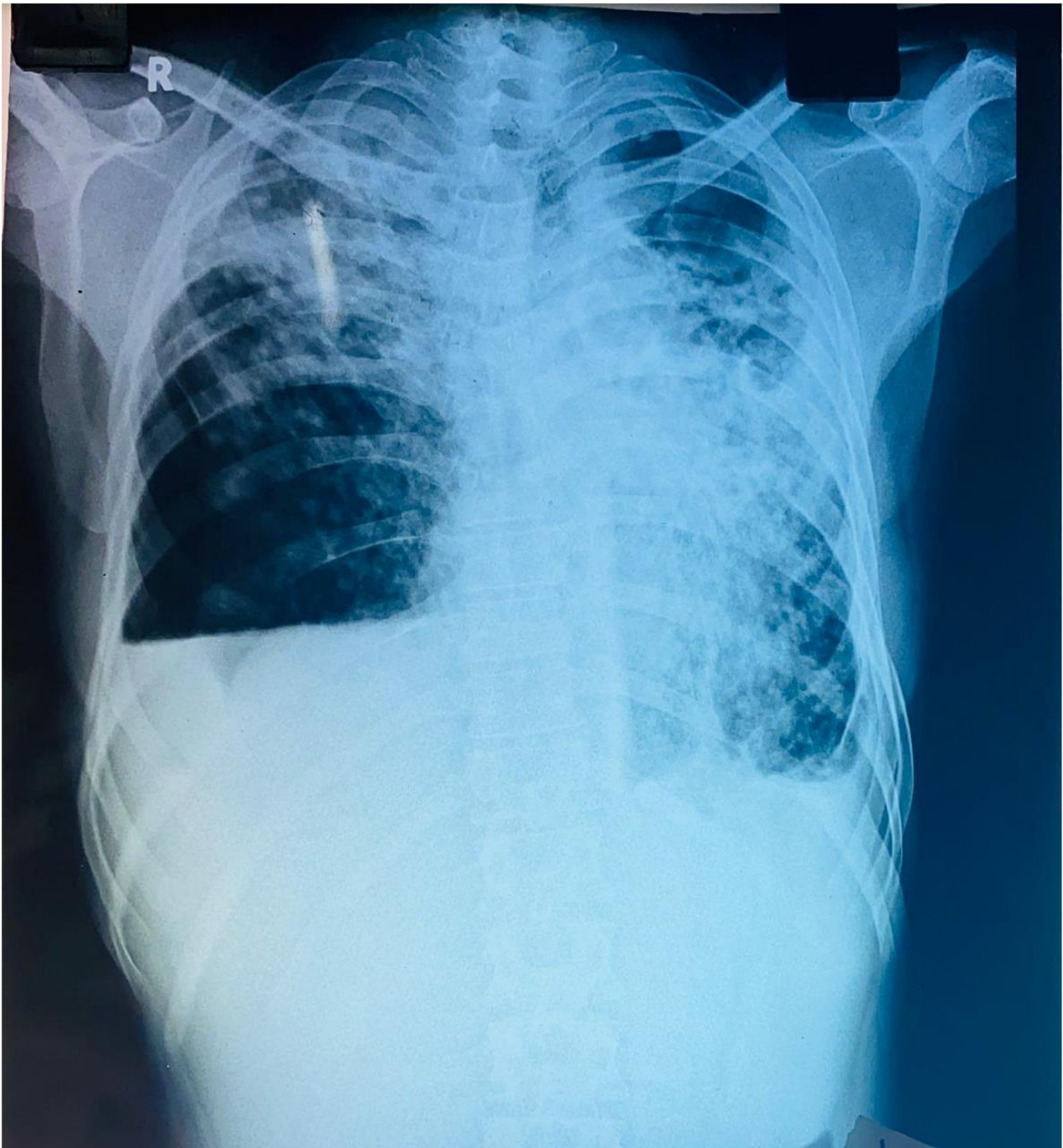
Case study 5, 60 yr. old male patient h/o of Diabetes with PTB 7yr back, taken complete ATT, comes with Breathlessness, Cough, Generalized weakness. Chronic alcoholic Liver Function test deranged, patient refuse getting admitted in hospital. CXR shows bilateral old fibrotic lesion. GenXpert shows MTB detected with Rifampicin resistance, ECG taken shows QtcF 470msec. Patient was advised to consult cardiologist and all pre- treatment investigation to be done. Ref to health post for starting ATT.

Case study 6, 54yr. male patient h/o Haemoptysis 2 days now stopped, Cough, generalized weakness. Chronic alcoholic LFT raised, GenXpert MTB detected no RR, ATT hepatosafe started. Patient refused admission in hospital and was referred to health post for ATT with follow up general hospital in Gastro Dept.

Case study 7, 37 year old patient diagnosed with PTB started on DS ATT since March 2023, history of chronic Alcohol abuse, was admitted for breathlessness on exertion, cough and fever for 15 days, liver function test shows SGOT 13, SGPT 16, WNL, RFT WNL, Hb is 9.0

Case study 8, 45 year old male patient came with complaints of chest pain, breathlessness, fever, cough since 8 days, was advised CXR, which was suggestive of Hydro Pneumothorax HPT, ICD insertion done and lung expansion was seen, history of chronic alcohol abuse, Liver function reports awaited, ATT started.

Case study 9, 26 year old male patient, came with complaints of breathlessness on exertion, cough with expectoration and generalised weakness since 1 month, P/H/O PTB 2 yr. back, ATT – 2months only, now sputum for GenXpert report and blood reports awaited



Discussion

The study conducted at Unit IV OPD and IPD of GTB Hospitals in Mumbai focused on adult male chronic alcoholic patients presenting with signs and symptoms of pulmonary tuberculosis (PTB). The study was descriptive in nature and took place in May and June 2023. The hospital is the largest in Asia dedicated exclusively to treating pulmonary tuberculosis, with a significant bed capacity for both sensitive and drug-resistant patients.

From a public health perspective, this study provides valuable insights into the challenges posed by the intersection of alcoholism and pulmonary tuberculosis. Several key points can be discussed:

Alcoholism and PTB

The study targeted alcoholic patients with PTB, indicating that alcoholism may be a significant risk factor for developing tuberculosis. This finding highlights the importance of addressing

alcohol abuse as a potential public health measure to reduce TB incidence and burden.

Gender Disparity

The study population predominantly consisted of adult male patients, with only one female patient identified. This gender disparity raises questions about the underlying reasons for the underrepresentation of females in the study and whether there are potential barriers to healthcare access for women with PTB.

Comorbidities and Complications

The majority of patients attending the OPD required hospitalization due to the severity of their condition, with many having bilateral destroyed lungs on chest X-ray and comorbidities such as HIV, uncontrolled diabetes, and moderate to severe hemoptysis. This highlights the need for comprehensive and integrated healthcare services that address both tuberculosis and its associated comorbidities.

Mental Health Impact

Chronic alcoholic patients with PTB were found to be susceptible to developing psychiatric issues like depression and suicidal ideation. Addressing the mental health aspect of TB patients, particularly those with comorbid alcoholism, is crucial for effective management and overall patient well-being.

Tertiary Care Challenges

As GTB Hospitals is a tertiary care hospital, it tends to receive patients in advanced stages of PTB with complex complications. This indicates that there might be challenges in the early detection and management of tuberculosis cases at the primary and secondary healthcare levels, emphasizing the need for stronger primary healthcare and community-based interventions.

Microbiological Diagnosis

The study utilized various recommended tests for microbiological diagnosis, such as sputum microscopy, MGIT Liquid culture, and molecular tests like GenXpert and Line Probe Assay (LPA). Ensuring the availability and accessibility of these diagnostic tools at various healthcare facilities

would aid in early detection and prompt treatment of PTB cases.

Overall, the study underscores the importance of a multidimensional approach to tackle pulmonary tuberculosis in the context of alcoholism. Addressing public health concerns related to tuberculosis requires a comprehensive strategy that includes targeted interventions for alcohol abuse, improved access to healthcare services, early diagnosis, and robust mental health support for patients. Additionally, efforts should be made to understand and address gender-specific healthcare needs to ensure equitable access to care for all individuals affected by Pulmonary tuberculosis (PTB).

Conclusion

The study conducted at Unit IV OPD and IPD of Group of TB Hospitals Sewri, Mumbai, in May and June 2023 focused on alcoholic patients presenting with signs and symptoms of pulmonary tuberculosis (PTB). The hospital, GTB Hospitals, is the largest in Asia exclusively dedicated to treating pulmonary tuberculosis, with a significant bed capacity for both sensitive and drug-resistant patients.

Overall, the study emphasizes the need for a comprehensive and multidisciplinary approach to managing alcoholic patients with PTB in a tertiary care setting like GTB Hospitals. Addressing their physical, mental, and social needs would be crucial in improving their overall outcomes and quality of life.

Alcohol use is a significant risk factor for tuberculosis (TB) morbidity and mortality, with far-reaching social and economic consequences. Studies have shown that alcohol weakens the immune system, making individuals more susceptible to TB infection. Moreover, alcohol use can hinder treatment adherence and response to TB medications, leading to prolonged illness, increased transmission, and higher mortality rates. Alcohol-related TB cases can result in various social and economic challenges. Individuals with TB may face stigmatization and discrimination,

leading to delayed diagnosis and treatment. This, in turn, can further exacerbate the spread of TB in communities. Additionally, alcohol use can contribute to poverty, as individuals may experience reduced productivity and income loss due to illness.

In underprivileged areas, where alcohol use is prevalent, the burden of TB may be higher due to the intersection of risk factors and limited access to healthcare. Addressing alcohol-related TB requires comprehensive strategies that include TB awareness campaigns, improved access to TB diagnostics and treatment, and targeted interventions to address alcohol use disorders. By integrating these approaches, we can reduce TB morbidity and mortality, alleviate social and economic consequences, and promote better public health outcomes in India.

Summary

The issue of alcohol use and its impact on public health in Indian culture is a major concern. According to the National Drug Survey 2019, 27.3 percent of individuals aged 10 to 75 years reported alcohol consumption, with 43 percent engaging in high-risk drinking patterns.

Alcohol consumption in India leads to various health problems, including liver cirrhosis, heart disease, and diabetes. It also contributes to absenteeism, road accidents, and mental health and social issues, affecting individuals, families, and society as a whole.

To tackle this problem, a comprehensive public health-driven alcohol policy is essential. Strategies should include awareness campaigns, stronger regulation and enforcement, pricing and taxation measures, and access restrictions. Expanding treatment and support services, implementing education and prevention programs, involving communities, and conducting regular research are also crucial.

Cultural sensitivity is vital, recognizing that alcohol is deeply ingrained in Indian culture. Collaboration among government, healthcare,

NGOs, and community organizations is necessary for effective implementation.

As India experiences changes from globalization, urbanization, and migration, addressing alcohol-related issues becomes even more critical. Tailored strategies, considering regional and societal disparities, can help mitigate the harmful consequences of alcohol use and promote overall public health and well-being.

In summary, the study highlights the association between alcoholism and pulmonary tuberculosis among adult male patients. It underscores the need for comprehensive public health interventions that address both alcohol abuse and TB to reduce disease burden and improve overall health outcomes. Early diagnosis, effective treatment, mental health support, and targeted preventive measures can play a pivotal role in controlling TB in this vulnerable population.

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