International Journal of
Health Systems and Medical Sciences

ISSN: 2833-7433
Volume 2 | No 8 | Aug -2023

Prevalence of Tuberculosis Infection among Patients Attending Consultant Clinic for TB and Chest Diseases at AL Najaf Governorate

Zahraa Sabah Ibrahim, Khadija Shaban Hassan, Abbas Fadhal Humadi

Middle Technical University/ College of Health & Medical Technology /Technical Medical Institute/Baghdad, Iraq

Abstract: Mycobacterium tuberculosis causes TB, a contagious illness. Although the lungs are the main target, the kidneys, spine, and brain are all affected. TB patients cough, sneeze, and talk, releasing droplets carrying tuberculin bacteria. This makes the illness airborne. Research motivation Comorbidities were examined in tuberculosis patients visiting a consultant clinic for chest diseases. Moderating strategy: A cross-sectional study at an Al-Najaf consultant clinic examined TB and other chest illnesses. 118 cases were studied. The study was conducted from January to April 2023. Positive cases averaged 46.5 18.28 years, whereas healthy controls averaged 47.8 16.60 years. Number of windows, exercise, and TB were correlated with p-values of 0.04, 0.02, and 0.01, respectively. This research indicated that four factors occupation, body mass index (being underweight), alcohol consumption, and consuming hot milk predict TB the most.

Keywords: Patients, Comorbidity, Tuberculosis, BMI, Prevalence.

Introduction

Tuberculosis (TB) remains a critical concern in global public health, with an alarming toll of 10 million cases and 1.4 million fatalities reported in 2019 alone[1]. Caused by Mycobacterium tuberculosis, TB primarily afflicts the lungs, yet its impact extends to vital organs such as the brain, kidneys, and spine [2]. The airborne transmission through coughing or sneezing contributes to its high contagion rate. Despite antibiotic treatments, factors like poverty, malnutrition, and fragile healthcare systems perpetuate its diffusion. [1]

In the face of available treatments, TB continues to be a formidable threat. The World Health Organization (WHO) ranks TB among the top 10 global causes of death, reigning as the leading fatal infectious agent, Low- and middle-income countries bear the brunt, accounting for approximately 95% of TB-related deaths.[1]

Vulnerable populations like those with HIV/AIDS, prisoners, and those in overcrowded or homeless conditions face elevated TB risks [3]. This extends even to high-income nations, particularly impacting immigrant communities. [4]

Extensive research has unveiled a spectrum of factors amplifying TB susceptibility and progression, encompassing age, gender, socioeconomic status, HIV status, diabetes, smoking, alcohol use, and indoor air pollution [4]

The substantial global impact of TB mandates a comprehensive comprehension of its transmission and advancement risk factors. This understanding guides the precise targeting of interventions and resources, fostering a reduction in the worldwide TB burden. Thoroughly assessing TB risk elements is pivotal for designing efficacious prevention and control strategies.[5]

Subject and methods

Study Design: A cross-sectional approach was employed, conducted within a consultant clinic specializing in TB and chest disease in Najaf city.

Study Duration: Data collection spanned a 4-month period, commencing on December 25, 2022, and concluding on April 25, 2023.

Sampling: The study's sample comprised 118 adults aged between 15 and 80 years.

Study Setting: The investigation took place in Najaf city at the aforementioned consultant clinic for TB. Clinic visits occurred from 8 am to 2 pm throughout the week. Case data were amassed from patients showing respiratory symptoms and positive tuberculin test results. Control data were obtained from individuals with respiratory conditions but negative tuberculin test outcomes.

Inclusion Criteria: Study participants were required to be above 15 years of age, representing both genders and residents of Najaf city.

Exclusion Criteria: Individuals under 15 years of age, those from outside Najaf city, and those with drug-resistant TB were excluded.

Ethical Consideration: Due to the sensitive nature of the study, participants were informed of the voluntary nature of their participation. It was clarified that their provided information would be used exclusively for the research.

Data Collection Technique: Data collection involved direct interviews with participants. The questionnaire, translated into Arabic, employed closed-ended questions. Participants were briefed on the study's objectives, and the confidentiality of their information was ensured.

Statistical Examination: Collected data underwent analysis using the SPSS-26 statistical package. The presentation included metrics such as frequency, percentage, mean, and standard deviation. Chi-square analysis was employed to determine independently related risk factors for tuberculosis.

Results

The p-value of 0.006 indicates a significant difference in BMI between male and female patients. The significant difference suggests that, on average, female patients have a higher BMI compared to male patients as shown in table (1).

Table (1): BMI between male and female among cases with TB (N=118).

	Gender	N	Mean	Std. Deviation	P-value
BMI	Male	61	23.122	4.8445	0.006*
	Female	57	25.874	5.8248	
*Significant difference between two independent means using Students-t-test at 0.05 level.					

Those who reported having recently infected with TB germs were substantially more likely to be cases than controls (88.1% of cases vs 1.3% of controls, with a p-value of 0.001 for the comparison between the two groups). This can be seen in Table (2).

Those who reported working with persons who are at a high risk for tuberculosis were considerably more likely to be cases than controls (20.3% of cases vs 5.9% of controls, with a p-value of 0.001 for the comparison). Those who reported a previous stay in a hospital were more likely to be cases than controls (35.6% of cases vs 14.8% of controls, with a p-value of 0.001 for the comparison). On the other hand, the existence or absence of a BCG scar and whether or not the person had been in close contact with someone who had infectious TB illness were two of the factors that did not indicate significant differences between the cases and the controls. The variable "History of visiting health facility in the past 12 months" revealed a difference that was on the verge of being statistically significant, with 48.3% of cases reporting this history compared to 37.7% of controls (p-value of 0.05).

Table (2): Association between Medical history and Resident among Patients with TB (N=118).

Variables		Resident				P-value
		Rural		urban		
		No.	%	No.	%	
Have you been recently infected with TB bacteria?	**Yes**	**37**	**84.1%**	**67**	**90.5%**	**0.29**
	No	**7**	**15.9%**	**7**	**9.5%**	
Are you work with people who are at high risk for TB?	**Yes**	**9**	**20.5%**	**15**	**20.3%**	**0.98**
	No	**35**	**79.5%**	**59**	**79.7%**	
Are you close contacts of a person with infectious TB disease?	**Yes**	**12**	**27.3%**	**28**	**37.8%**	**0.24**
	No	**32**	**72.7%**	**46**	**62.2%**	
BCG scar	**Present**	**29**	**65.9%**	**63**	**85.1%**	**0.01***
	Absent	**15**	**34.1%**	**11**	**14.9%**	
History of visiting health facility in past 12month	**Yes**	**23**	**52.3%**	**34**	**45.9%**	**0.5**
	No	**21**	**47.7%**	**40**	**54.1%**	
Frequency of visit	**once**	**10**	**43.5%**	**14**	**41.2%**	**0.86**
	2-5 time	**8**	**34.8%**	**14**	**41.2%**	
	>5 time	**5**	**21.7%**	**6**	**17.6%**	
History of hospital admission	**Yes**	**16**	**36.4%**	**26**	**35.1%**	**0.89**
	No	**28**	**63.6%**	**48**	**64.9%**	
***Significant difference between percentages using Pearson Chi-square test (χ^2-test) at 0.05 level.**						

These findings in Table (3) provide insights into the factors associated with underweight status among TB cases, there was a statistically significant difference (P=0.02) in underweight prevalence based on the size of the family, with larger families showing a higher prevalence of underweight individuals. There was a significant difference in (P= 0.05) underweight prevalence based on exercise habits, with non-exercisers showing a higher prevalence of underweight individuals. There is a statistically significant difference in underweight prevalence between individuals who take vitamin supplements and those who do not. This the presence of severe kidney disease, statistically significant at a p-value of 0.05, suggests that severe kidney disease may be associated with a higher likelihood of being underweight among TB cases.

Table (3): Association between some studied variables and underweight among patients with TB (N=118).

Variables	Class	Underweight				P- value
		No		Yes		
		No.	%	No.	%	
Gender	**Male**	**51**	**49.5%**	**10**	**66.7%**	**0.21**
	Female	**52**	**50.5%**	**5**	**33.3%**	
Age	**Mean ± SD**	**46.42±17.39**		**47.07±24.26**		**0.12**
Marital status	**Single**	**22**	**21.4%**	**4**	**26.7%**	**0.40**
	Married	**62**	**60.2%**	**7**	**46.7%**	
	Divorced	**8**	**7.8%**	**3**	**20.0%**	
	Widow	**11**	**10.7%**	**1**	**6.7%**	

SES	**Mean ± SD**	**6.1 ± 2.09**		**5.2 ± 1.41**		**0.8**
Size of the family	**less than 4**	**29**	**28.2%**	**0**	**0.0%**	**0.02***
	4-6	**31**	**30.1%**	**4**	**26.7%**	
	more than 6	**43**	**41.7%**	**11**	**73.3%**	
Do exercise?	**Yes**	**20**	**19.4%**	**0**	**0.0%**	**0.05***
	No	**83**	**80.6%**	**15**	**100.0%**	
Primary disease site	**PTB**	**72**	**69.9%**	**12**	**80.0%**	**0.42**
	EPTB	**31**	**30.1%**	**3**	**20.0%**	
Cigarette smoking	**Yes**	**45**	**43.7%**	**6**	**40.0%**	**0.78**
	No	**58**	**56.3%**	**9**	**60.0%**	
Alcohol consumption	**Yes**	**4**	**3.9%**	**1**	**6.7%**	**0.61**
	No	**99**	**96.1%**	**14**	**93.3%**	
Vitamins supplement	**Yes**	**33**	**32.0%**	**1**	**6.7%**	**0.04***
	No	**70**	**68.0%**	**14**	**93.3%**	
Diabetes	**Yes**	**39**	**37.9%**	**4**	**26.7%**	**0.40**
	No	**64**	**62.1%**	**11**	**73.3%**	
HIV infection	**Yes**	**1**	**1.0%**	**0**	**0.0%**	**0.70**
	No	**102**	**99.0%**	**15**	**100.0%**	
Sever kidney disease	**Yes**	**7**	**6.8%**	**3**	**20.0%**	**0.05***
	No	**96**	**93.2%**	**12**	**80.0%**	

***Significant difference between percentages using Pearson Chi-square test (χ^2-test) at 0.05 level.**
***significant difference between the two independent means using Students-t-test at 0.05 level.**

These findings in Table (4), highlight the potential influence of socioeconomic status on certain behaviors and practices related to nutrition and hygiene among TB patients. There was a statistically significant difference in the use of boiled water for drinking, in the type of water used, in the consumption of meat or fish weekly, in the consumption of salads or vegetables weekly, and in the regular intake of vitamin supplements among different socioeconomic statuses in TB at P- value (0.05, 0.004, 0.03, 0.02, and 0.003, respectively).

Table (4): Association between nutritional status and socioeconomic status among cases with TB (N=118).

Variables	**Class**	**Socioeconomic status**						**P-value**
		Low		**Moderate**		**High**		
		No.	**%**	**No.**	**%**	**No.**	**%**	
use boiled milk	Yes	18	48.6%	41	56.9%	8	88.9%	0.092
	No	19	51.4%	31	43.1%	1	11.1%	
use boiled water for drink	Yes	34	91.9%	53	73.6%	6	66.7%	**0.05***
	No	3	8.1%	19	26.4%	3	33.3%	
Type of water used?	Piped water	22	64.7%	19	35.2%	1	16.7%	**0.004***
	tank water	8	23.5%	8	14.8%	2	33.3%	
	purified water	4	11.8%	27	50.0%	3	50.0%	
frequency of eating dairy products per week	Yes	34	91.9%	69	95.8%	9	100.0%	0.52
	No	3	8.1%	3	4.2%	0	0.0%	
eat meat or fish weekly	Yes	24	64.9%	59	81.9%	9	100.0%	**0.03***
	No	13	35.1%	13	18.1%	0	0.0%	
eat salads or	Yes	19	51.4%	56	77.8%	9	100.0%	**0.02***

vegetable weekly	No	18	48.6%	16	22.2%	0	0.0%	
vitamins supplement taken regularly	Yes	3	8.1%	27	37.5%	4	44.4%	**0.003***
	No	34	91.9%	45	62.5%	5	55.6%	
*Significant difference between percentages using Pearson Chi-square test (χ^2-test) at 0.05 level. *Fisher's exact test at 0.05level used for cell have expected count less than 5.								

Among the patients with Tb, the majority of cases (71.2%) had pulmonary tuberculosis (PTB), and (28.8%) had extra-pulmonary tuberculosis (ETTB) as present in Figure 1.

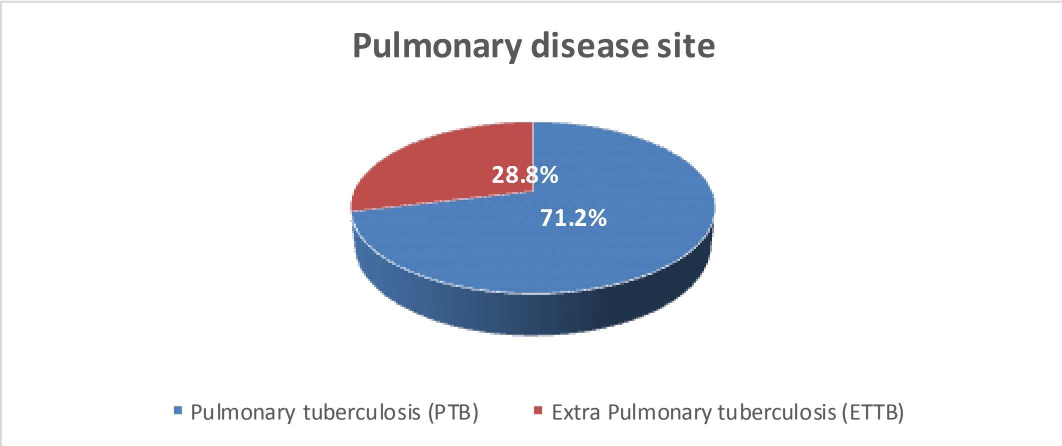

Figure 2: pulmonary disease sites among patients with TB (N= 118).

Discussion

BMI between male and female among cases group. The results of this study indicate a significant difference (p-value = 0.006) in BMI between male and female patients with tuberculosis TB, with females having a higher average BMI (25.874). These findings align with previous research. A study by *[6]* in Kenya reported higher BMI values in females than males, with significant association (p-value < 0.001), possibly influenced by hormonal factors and different nutritional needs. In contrast, a study by *[7]* in Korea found no significant gender-related differences in BMI among TB patients. possibly due to a small sample size, demographic similarities, and similar nutritional habits.

The result of this study showed no statistical association between residence and contact with people with infectious TB at work or with whom they have close contact.

A previous study done in South Africa by *[8]*, report most of the contacts were from home. (73%) from urban and (51%) from rural. Contacts were reported from outside the home but from non-workplaces (5.9% and 12%) respectively. (15%) contact from work buildings in urban areas

This is because the city's environment is more crowded and more polluted air than in the countryside. As for the workplaces, people are more frequent, which causes the spread of infection among them. *[9]*

The result of this study indicates that there is a statistically significant difference in the presence of BCG scars between rural and urban residents. In a cross-sectional study in China, all of the participants had BCG scars, where participants were divided into two groups, a group conducted an EST6-CF P10 skin test (ECST), (this test is a tuberculosis-specific antigen that has been reported accurate and safe in identifying tuberculosis infection field *[10]*, The other group had a tuberculin skin test (TST). In Group ECST, there is no association between residency and BCG scar at a (p-value is 0.6). this is not matched with our result. In the TST Group, there is an association between residency and BCG scar at (p_ value 0.006.) This group agrees with our result. *[11]*

Our results showed no association between residency, visits to health institutions, and hospitalization while a cross-sectional study conducted in Madurai and Chennai in India in patients with TB found that 73% contacted a health facility while they had health problems (like cough, upper respiratory infection). (61%) from urban and (38%) from rural areas. *[12]*

This difference in results between urban and rural areas is due to the extent of knowledge about the disease, follow-up treatment, financial constraints, differences in symptoms, work pressure, lack of access to health facilities, home treatment, self-medication, and transportation problems.

Regarding the association between underweight and some study variables, the results showed that the presence of severe kidney disease, which is statistically significant at a (p-value < 0.05), raises the possibility that underweight status may be more frequently related to severe renal disease in TB cases. This result is consistent with a cohort study conducted in Singapore by [13] which suggested that the incidence of End Stage Renal Disease (ESRD) was higher in underweight patients compared to normal-weight patients. It is widely known that infection, which manifests as one of the acute diseases, is the main risk factor for acute kidney injury (AKI) in hospitalized patients.

The result of this study revealed that non-exercisers showed a higher prevalence of underweight individuals. These findings did not differ from a study done in Korea by [14], that investigated the effect of being underweight on pulmonary function in which The underweight group performed less intense activity on average per week than the other groups. This suggests that poor pulmonary function may be linked to underweight individuals' low muscle mass and physical inactivity.

regarding vitamin supplementation, the current study found there is a statistically significant (p-value <0.05), difference in underweight prevalence between individuals who take vitamin supplements and those who do not. This explained the association between some studied variables and underweight among patients with TB. They suggested that multivitamin supplementation, together with regular vitamin and/or dietary supplement use, appears to have an impact on appetite. *[15]* However, male versus female vitamin and/or dietary supplement consumers were more likely to have lower body weight and fat percentages. Also, the result of this study found there is a statistically significant difference in underweight based on the size of the family at (p-value <0.02)

Larger families had a higher prevalence of underweight patients this result is similar to another study done in Burkina Faso by *[16]*, Which reported that 56.3% of the sample of a large family size had more than 4 members with underweight BMI. This may be explained by the demanding nature of larger families who are less likely to afford daily expenses. A study conducted in Africa revealed that in underdeveloped nations, it is often believed that having a large household increases the risk of malnutrition. [17]

The result of the current study found the potential influence of socioeconomic status on certain behaviors and practices related to nutrition and hygiene among TB patients. There was a statistically significant association (P-value <0.05) between the consumption of food and water for patients with TB and their socioeconomic status. In a previous study in Latvia, done by *[18]* it was found that a significant association (p-value <0.001) between the patients with TB who had a low socioeconomic status and lower quality and quantity of food and water that can be provided which cause malnutrition

Also In a previous study in Sri Lanka, done by *[19]* it was found that 95% of pulmonary tuberculosis patients had an acceptable level of food consumption. But the highest percentage of them were thin (51%). This indicates that they have a pronounced nutritional deficiency. These results match the results of this study where participants had a moderate risk of malnutrition.

The current study showed that there is an adequate association between drinking water, eating vegetables, meat, and not taking vitamins and the socio-economic level of tuberculosis patients.

As we explained earlier, these are the usual nutritional habits of the inhabitants of the Middle Euphrates region. Since the study participants are mostly moderately income. This explains these findings. In a previous study in Sri Lanka, by [20] it was found that the proportion of patients with tuberculosis is higher in the lower socio-economic classes, where the study identified the fight against poverty as important in the fight against tuberculosis. This is because patients with low socioeconomic incomes are unable to afford nutritious food.

Regarding the pulmonary disease site among the patients with TB, the present study found that the majority of cases had pulmonary tuberculosis (71.2%) and Extrapulmonary tuberculosis (28.8%). This result was supported by another study in Morocco done by *[21]* that indicated pulmonary tuberculosis was found to be (63.50%), and Extrapulmonary tuberculosis was (36.50%). This is consistent with our study as pulmonary tuberculosis is more prevalent than extrapulmonary tuberculosis.

Pulmonary tuberculosis is more common due to making an early diagnosis, which makes it more likely to be more prevalent. Although pulmonary tuberculosis and extrapulmonary tuberculosis share most of the risk factors, each type has the most risk factors that affect it the most. Such as age, gender, chronic diseases, and HIV. A study in Turkey done by *[22]* found that women, smokers, and children are more likely to spread extrapulmonary tuberculosis. but extrapulmonary tuberculosis is accompanied by symptoms that depend on the affected organ. This gives the most diagnostic differences from pulmonary tuberculosis, in addition to the way extrapulmonary tuberculosis is transmitted in the form of hematogenous spread and sometimes comes from neighboring organs.

In conclusion

The study revealed significant gender-related differences in BMI among TB patients, underscored the influence of socioeconomic factors on dietary habits, and highlighted the prevalence of pulmonary and extrapulmonary TB. These findings offer valuable insights for designing targeted interventions to address TB's impact. Understanding gender-specific health disparities and the relationship between socioeconomics, nutrition, and TB manifestation can aid in developing effective strategies for prevention and control. This comprehensive analysis contributes to the broader efforts to combat TB and improve global public health outcomes.

Recommendations include gender-specific nutritional interventions for TB patients, health education programs targeting urban and rural populations, workplace awareness campaigns, community-based initiatives promoting healthy habits, improved early diagnosis measures, a multidisciplinary approach involving healthcare and nutrition professionals, advocacy for comprehensive public health policies, continued research, and global collaboration to effectively address TB's complex challenges.

Acknowledgment

I extend my gratitude to my supervisor, participants, clinic staff, colleagues, and funding support for their essential contributions.

References

1. R. Fukunaga, P. Glaziou, J. B. Harris, A. Date, K. Floyd, and T. Kasaeva, "Epidemiology of tuberculosis and progress toward meeting global targets—worldwide, 2019," *Morbidity and Mortality Weekly Report*, vol. 70, no. 12, p. 427, 2021.
2. L. E. Sosa *et al.*, "Tuberculosis screening, testing, and treatment of US health care personnel: recommendations from the National Tuberculosis Controllers Association and CDC, 2019," vol. 19, ed: Elsevier, 2019, pp. 2383-2387.
3. L. A. Lambert, L. R. Armstrong, M. N. Lobato, C. Ho, A. M. France, and M. B. Haddad, "Tuberculosis in jails and prisons: United States, 2002− 2013," *American journal of public health*, vol. 106, no. 12, pp. 2231-2237, 2016.
4. G. G. Alvarez *et al.*, "Molecular epidemiology of Mycobacterium tuberculosis to describe the transmission dynamics among Inuit residing in Iqaluit Nunavut using whole-genome sequencing," *Clinical Infectious Diseases*, vol. 72, no. 12, pp. 2187-2195, 2021.
5. B. Cole, D. M. Nilsen, L. Will, S. C. Etkind, M. Burgos, and T. Chorba, "Essential components of a public health tuberculosis prevention, control, and elimination program: recommendations of the advisory council for the elimination of tuberculosis and the national tuberculosis controllers association," *MMWR Recommendations and Reports*, vol. 69, no. 7, p. 1, 2020.

6. R. J. Kosgei *et al.*, "Gender difference in mortality among pulmonary tuberculosis HIV co-infected adults aged 15-49 years in Kenya," *Plos one*, vol. 15, no. 12, p. e0243977, 2020.
7. H. Choi *et al.*, "Body mass index, diabetes, and risk of tuberculosis: a retrospective cohort study," *Frontiers in Nutrition*, vol. 8, p. 739766, 2021.
8. P. J. Dodd *et al.*, "Age-and sex-specific social contact patterns and incidence of Mycobacterium tuberculosis infection," *American journal of epidemiology*, vol. 183, no. 2, pp. 156-166, 2016.
9. N. A. Rajab, N. Hashim, and A. R. A. Rasam, "Spatial mapping and analysis of tuberculosis cases in Kuala lumpur, Malaysia," in *2020 IEEE 10th International Conference on System Engineering and Technology (ICSET)*, 2020: IEEE, pp. 38-43.
10. F. Yang, W. Xu, W. Lyu, F. Tan, C. Yu, and B. Dong, "High Fidelity MZI-BCG Sensor With Homodyne Demodulation for Unobtrusive HR and BP Monitoring," *IEEE Sensors Journal*, vol. 22, no. 8, pp. 7798-7807, 2022.
11. T. K. Hung, D. Leung, J. S. R. Duque, and Y. L. Lau, "Bacillus Calmette-Guérin Scar erythema in a 14-year-old girl post-BNT162b2 vaccination," *Pediatrics International*, vol. 64, no. 1, 2022.
12. J. Samal, "Health seeking behaviour among tuberculosis patients in India: a systematic review," *Journal of clinical and diagnostic research: JCDR*, vol. 10, no. 10, p. LE01, 2016.
13. A. Y. L. Liu, J. Wang, M. Nikam, B. C. Lai, and L. Y. Yeoh, "Low, rather than high, body mass index is a risk factor for acute kidney injury in multiethnic Asian patients: a retrospective observational study," *International Journal of Nephrology*, vol. 2018, 2018.
14. J. G. Do, C.-H. Park, Y.-T. Lee, and K. J. Yoon, "Association between underweight and pulmonary function in 282,135 healthy adults: A cross-sectional study in Korean population," *Scientific reports*, vol. 9, no. 1, p. 14308, 2019.
15. D. Ongan and A. Yuksel, "What to eat for a better sleep in haemodialysis patients: Potential role of B vitamins intake and appetite," *Pakistan Journal of Medical Sciences*, vol. 33, no. 2, p. 417, 2017.
16. B. B. Musuenge, G. G. Poda, and P.-C. Chen, "Nutritional status of patients with tuberculosis and associated factors in the health centre region of Burkina Faso," *Nutrients*, vol. 12, no. 9, p. 2540, 2020.
17. S. A. O. Adeyeye, T. J. Ashaolu, O. T. Bolaji, T. A. Abegunde, and A. O. Omoyajowo, "Africa and the Nexus of poverty, malnutrition and diseases," *Critical Reviews in Food Science and Nutrition*, vol. 63, no. 5, pp. 641-656, 2023.
18. A. Ivanovs, I. Salmane-Kulikovska, and L. Viksna, "The impact of socioeconomic factors on tuberculosis prevalence in Latvia," *Age*, vol. 13, p. 39, 2016.
19. N. A. Jayasuriya, I. N. NL, and K. Derore, "Food security and nutrition among the tuberculosis infected patients," *A case study among patients at the chest clinic in Sri Lanka*, 2015.
20. M. G. Buddhika Senanake, S. I. Wickramasinghe, S. Samaraweera, P. De Silva, and S. Edirippulige, "Examining the social status, risk factors and lifestyle changes of tuberculosis patients in Sri Lanka during the treatment period: a cross-sectional study," *Multidisciplinary Respiratory Medicine*, vol. 13, no. 1, 2019.
21. R. Eddabra and M. Neffa, "Epidemiological profile among pulmonary and extrapulmonary tuberculosis patients in Laayoune, Morocco," *Pan African Medical Journal*, vol. 37, no. 1, 2020.
22. L. N. ALTUNAL, B. E. SENGEL, A. S. OZEL, M. AYDIN, and A. KADANALI, "Demographic and microbiological characteristics of tuberculous lymphadenitis and other extrapulmonary tuberculosis cases," *Marmara Medical Journal*, vol. 35, no. 3, pp. 275-280, 2022.