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Health related quality of life and associated factors with medication adherence among tuberculosis patients in selected districts of Gandaki Province of Nepal

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ABSTRACT

Background: Tuberculosis is one of the significant public health problems of Nepal. Adherence to medication is very important for improving quality of life and preventing complication. Adherence to tuberculosis medications has significant economic and therapeutic consequences as non-adherence patients are at greater risk of developing complications which affect their health status and overall quality of life. The study aims to determine the factors associated with medication adherence and its effect on health related quality of life among tuberculosis patients in selected districts of Gandaki Province.

Methods: A health facility based cross-sectional study was carried out among 180 tuberculosis patients registered under DOTS and receiving treatment more than or equal to 60 days. WHOQOL-BREF tools to assess quality of life and Morisky medication adherence scale (MMAS-8) was adopt to assess medication adherence. Data was entered in Epi-data and analysis was performed with the help of the Statistical Package for Social Science (SPSS). The odds ratio with a 95% CI was calculated and p-value of <0.05 was considered as cutoff for statistical significance.

Results: A total 180 TB patients were participated in this study. Overall quality of life ranges from 10.75 to 89.25 with Mean $\pm$ SD as 55.96 $\pm$ 14.65. More than three-fourth (79.4%) respondents were adhere to medication. Medication adherence and health related quality of life was found statistically significant with relationship with health workers, favourable time at DOTS centre, absence of co-infection. Participants who were highly adhered to medication had good quality of life.

Conclusion: Majority of tuberculosis patients adhering to medication had good quality of life. Especial emphasis should be given to tuberculosis patients with co-infection, health workers should behave friendly and provide appropriate counselling in order to maintain the medication adherence and quality of life.

1. Background

Tuberculosis is a significant public health problem around the globe most prevalent in developing country including Nepal [1]. This disease continues to pose a serious threat to the population health accounting 80 percent of cases among the age groups 15 to 49 years which is productive age of life [2]. It become the seventh leading cause of death among this age group which can be preventable and curable [1].

World Health Organization (WHO) defines quality of life (QOL) as an "individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns". It is a broad-ranging concept affected by an individual's physical health, psychological state, level of independence, social relationships, and their relationship to salient features of their environment [3,4]. (HLQOL) is patients reported outcome (PRO) parameters which refer to the multi-dimensional

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Table 1
Categories of Quality of life based on Scores.

HRQOL Domains	Medication Adherence		Non-Medication Adherence	
	Poor Scores (<50)	Good Scores (≥50)	Poor Scores (<50)	Good Scores (≥50)
Physical HRQOL Score	45 (31.5%)	98 (68.5%)	30 (81.1%)	7 (18.9%)
Psychological HRQOL Score	30 (21.0%)	113 (79.0%)	24 (64.9%)	13 (35.1%)
Social HRQOL Score	49 (34.3%)	94 (65.7%)	31 (83.8%)	6 (16.2%)
Environment HRQOL Score	45 (31.5%)	98 (68.5%)	29 (78.4%)	8 (21.6%)
Overall HRQOL Score	29 (20.3%)	114 (79.7%)	31 (83.8%)	6 (16.2%)

nature of health directly from the patient's perspective [5,6].

Adherence to drug treatment and health-related quality of life are two distinct concepts. These two distinct concepts have in common that they are both related to the patient and important to consider when assessing the impact of any type of intervention in health care at the patient level. The association between medication adherence and HRQOL may be dual. The effect of medication adherence on HRQOL might be a consequence of the effectiveness of the therapy and the negative effects (i.e, side effects, daily life limitation of therapy, social stigma) that it can generate [7].

Adherence and HRQOL are two outcomes representing different points in time following processes of care. Adherence to tuberculosis medication is very important for improving the quality of life and preventing complications of the disease [8]. Measure of health outcome as judged by the individual respondents [9]. Adherence is an intermediate outcome or process variable while HRQOL is an ultimate outcome [10].

Adherence to TB treatment is the most important requirement for efficient TB control. TB treatment presents particular challenges for adherence because a standard treatment lasts 6 or 8 months and involves taking a number of medications, and side effects are common during the treatment [11]. Alternatively, Non-adherence to prescribed medications has been global problems as many studies have shown that they have affected the most patient with chronic illness. Poor medication

Table 2
Association between Socio-demographic characteristics and domains of Quality of Life among TB patients.

Variables	Physical Domain		Psychological Domain		Social Relationship		Environment Domain		Overall QOL	
	P-value	UOR (C.I.)	P-value	UOR (C.I.)	P-value	UOR (C.I.)	P- value	UOR (C.I.)	p-value	UOR (C.I.)
Ecological Region										
Terai Region	0.044*	1	<0.001**	1	0.238	1	0.034*	1	0.007**	1
Hilly Region		1.926 (1.019–3.639)		3.602 (1.832–7.082)		1.462 (0.778–2.749)		1.995 (1.055–3.773)		2.455 (1.275–4.727)
Treatment Facilities										
District Hospital	<0.001*	1	0.003**	1	0.003**	1	<0.001**	1	<0.001**	1
PHC		0.100 (0.026–0.381)		0.505 (0.183–1.395)		0.086 (0.022–0.327)		0.073 (0.019–0.280)		0.146 (0.048–0.447)
HP		0.600 (0.274–1.313)		0.848 (0.383–1.879)		0.514 (0.233–1.133)		0.401 (0.180–0.895)		0.432 (0.190–0.982)
UHC		1.933 (0.768–4.866)		10.000 (2.176–45.960)		1.113 (0.462–2.682)		1.221 (0.487–3.062)		2.415 (0.795–7.335)
Private Health Institution		2.800 (0.719–10.901)		4.167 (0.864–20.096)		0.734 (0.241–2.233)		1.417 (0.403–4.980)		1.707 (0.429–6.787)
Age										
≥65 Years	0.058	1	0.017*	1	0.053	1	<0.001**	1	0.026*	1
40–65 Years		3.045 (1.077–8.607)		4.345 (1.522–12.402)		2.773 (0.983–7.821)		8.685 (2.622–28.768)		3.087 (1.095–8.705)
15–40 Years		1.768 (0.612–5.105)		2.446 (0.850–7.036)		1.482 (0.513–4.278)		3.712 (1.108–12.432)		1.429 (0.504–4.052)
Sex										
Male	0.937	1	0.517	1	0.346	1	0.358	1	0.740	1
Female		1.025 (0.551–1.909)		1.251 (0.635–2.468)		1.348 (0.724–2.511)		1.344 (0.716–2.523)		1.117 (0.581–2.147)
Religion										
Non-Hindu	0.006**	1	0.247	1	0.016*	1	0.194	1	0.054	1
Hindu		3.107 (1.386–6.968)		1.609 (0.719–3.603)		2.697 (1.205–6.034)		1.674 (0.769–3.642)		2.167 (0.987–4.757)
Marital Status										
Married	0.057	1	0.289	1	0.903	1	0.012*	1	0.025*	1
Unmarried		2.116 (0.977–4.580)		1.562 (0.685–3.565)		1.045 (0.511–2.136)		2.851 (1.262–6.442)		2.753 (1.135–6.678)
Residence										
Rural	0.332	1	0.858	1	0.520	1	0.534	1	0.114	1
Urban		1.492 (0.665–3.349)		0.922 (0.379–2.244)		1.303 (0.581–2.921)		1.293 (0.575–2.908)		1.936 (0.854–4.389)
Family Type										
Joint	0.010*	1	0.075	1	0.205	1	0.003**	1	<0.001**	1
Nuclear		2.216 (1.211–4.054)		1.797 (0.943–3.424)		1.465 (0.811–2.646)		2.560 (1.391–4.712)		3.333 (1.737–6.396)

*statistically significant, ** statistically highly significant.

Table 3
Association between Socio-economic characteristics and domains of Quality of Life among TB patients.

Variables	Physical Domain		Psychological Domain		Social Relationship		Environment Domain		Overall QOL	
	P-value	UOR (C.I.)	P-value	UOR (C.I.)	P-value	UOR (C.I.)	P-value	UOR (C.I.)	p-value	UOR (C.I.)
Educational Status										
Illiterate	0.050*	1	0.051	1	0.013*	1	0.005**	1	<0.001**	1
Literate		2.448 (0.999–6.002)		2.430 (0.998–5.919)		3.321 (1.293–8.533)		3.901 (1.516–10.042)		4.667 (1.850–11.771)
Occupation										
Unemployment/ Students	0.649	1	0.628	1	0.084	1	0.182	1	0.131	1
Agriculture		1.600 (0.634–4.038)		1.286 (0.486–3.399)		2.311 (0.912–5.858)		0.650 (0.260–1.623)		0.886 (0.353–2.227)
Daily wages/Labor		1.700 (0.679–4.258)		2.000 (0.709–5.640)		2.456 (0.976–6.177)		1.506 (0.601–3.773)		1.857 (0.688–5.009)
Business		2.143 (0.774–5.935)		1.224 (0.438–3.422)		2.528 (0.932–6.855)		2.362 (0.822–6.786)		2.210 (0.726–6.724)
Service (Private/ Government)		1.429 (0.485–4.205)		1.371 (0.431–4.364)		2.063 (0.698–6.097)		1.624 (0.537–4.907)		0.731 (0.250–2.138)
House Keeper		1.750 (0.648–4.727)		2.571 (0.779–8.485)		3.852 (1.336–11.105)		2.362 (0.822–6.786)		4.117 (1.106–15.317)
Enrolment Health Insurance Scheme										
No	0.111	1	0.037*	1	0.236	1	0.127	1	0.182	1
Yes		1.926 (0.860–4.315)		2.930 (1.068–8.039)		1.598 (0.736–3.469)		1.873 (0.836–4.198)		1.798 (0.759–4.256)

adherence of TB patients threatens the well being of an individual and society, defaulting from treatment may increase the risk of drug resistance, relapse, and death, and may prolong infectiousness [12,13]. Non medication adherence almost triples the risk of developing multidrug resistance and drug resistance tuberculosis [5,14,15]. Adherence to therapies is a primary determinant of treatment success. Failure to adherence is a serious problem that affects both the patient and the health care system in aspects it substantially worsens disease and increased health care cost [16,17].

Quality of life in tuberculosis patients affected with age, gender, income, level of adherence, treatment regimen, adverse drug reaction, quantity of pills, treatment duration, co-infection of diseases, change in family life, belief about illness, social and health workers behavior [18,5,14,18,19,20].

Nepal Government has set the goal to eliminate TB as a public health problem (<1 case per million population) by 2050 [2]. Multidrug resistance and drug resistance TB, a chronic disease that is increasing globally, is associated with higher risks of Drug resistance TB and adverse TB treatment outcomes. The low medication adherence directly affects the health related quality of life among TB patients which may bring complications in care and control of TB, especially in areas with a high burden of tropical diseases. Furthermore, it will control in transmission of disease especially pulmonary tuberculosis and prevent from drug resistance. Medication adherence is associated with the health-related quality of life of tuberculosis patients [5,14,15]. The study aims to determine the factors associated with medication adherence and its effect on health related quality of life among tuberculosis patients in selected districts of Gandaki Province.

2. Methods and materials

2.1. Study Design

The study design was health facility based cross-sectional study done among the tuberculosis patients.

2.2. Study Methods

Study method was quantitative. Semi structured questionnaire was used for collecting primary data through face to face interview with dropout and continuous users.

2.3. Study Population, Sampling Frame and Sample

The study population were all the TB Patients who are under medication from DOTS centers of selected Districts of Gandaki Province of Nepal. Study sample was determined by Cochran formula

$$n = \frac{z^2 * \sigma^2}{E^2}$$

Where,

n = required sample size

Z = z statistical at 5% level of significance (1.96)

From the previous study Mean ± SD of HRQOL of tuberculosis patients 61.125 ± 12.94 [21].

σ = standard deviation (σ)

E = margin error

Considering the marginal error for estimating the mean 61.125≈61 as ± 2, the sample size was

Now,

$n = \frac{1.96^2 * 13^2}{2^2} = 162.25 \approx 163$

Non response (10%) = 17

Therefore, n = 180

So the investigator aims to focus study by 180 samples following the calculation above. **Sampling Procedures** The following steps were followed for the selection of DOTS centres and TB patients in selected districts. The sample was selected by multistage sampling method. **First stage:** Among the eleven districts in Gandaki province, Kaski, Nawalparasi East and Tanahun district which has highest tuberculosis patients load were selected for the study. **Second stage**: Among 160 DOTS Centres in three selected districts, 22 DOTS centres was selected from the Kaski (8), Nawalparasi (5) and Tanahun (9) district based on the TB cases load. **Third stage:** Required sample size was determined based on Probability Proportional to Size (PPS) of total TB cases from selected

Table 4
Association between diseases related characteristics and domains of Quality of Life among TB patients.

Variables	Physical Domain		Psychological Domain		Social Relationship		Environment Domain		Overall QOL	
	P-value	UOR (C.I.)	P-value	UOR (C.I.)	P-value	UOR (C.I.)	P-value	UOR (C.I.)	p-value	UOR (C.I.)
Type of TB										
Pulmonary	0.340	1	0.013*	1	0.159	1	0.599	1	0.348	1
Extra Pulmonary		1.388 (0.708–2.722)		2.875 (1.245–6.641)		1.621 (0.828–3.175)		1.196 (0.613–2.335)		1.408 (0.689–2.877)
Duration of Confirm TB Diagnosis										
<1 Months, Delay Diagnosis	0.009**	1	0.053	1	0.004**	1	0.045*	1	<0.001**	1
≥1Months, Early Diagnosis		2.618 (1.274–5.379)		2.058 (0.991–4.273)		2.958 (1.420–6.159)		2.068 (1.016–4.211)		3.281 (1.588–6.779)
Phase of Treatment										
Intensive Phase	0.626	1	0.056	1	0.747	1	0.603	1	0.091	1
Continuous Phase		1.423 (0.344–5.878)		4.184 (0.963–18.180)		1.263 (0.306–5.216)		1.457 (0.353–6.022)		3.545 (0.818–15.371)
Experience of Side Effects										
Yes	0.002**	1	<0.001**	1	0.106	1	0.009**	1	<0.001**	1
No		2.692 (1.444–5.018)		3.007 (1.555–5.815)		1.653 (0.898–3.041)		2.292 (1.234–4.256)		3.448 (1.801–6.598)
Know about the Symptoms of TB										
No	0.286	1	0.277	1	0.025*	1	0.134	1	0.011*	1
Yes		1.430 (0.741–2.758)		1.469 (0.734–2.939)		2.139 (1.102–4.150)		1.653 (0.856–3.192)		2.410 (1.227–4.733)
Taking drugs other than TB medication										
Yes	0.069	1	0.191	1	0.085	1	0.056	1	0.004**	1
No		1.882 (0.952–3.720)		1.608 (0.789–3.276)		1.818 (0.920–3.592)		1.943 (0.982–3.842)		2.769 (1.380–5.555)
Contact with any TB patients										
TB Patients	0.035*	1	0.510	1	0.179	1	0.137	1	0.047*	1
No Contact		2.138 (1.055–4.331)		1.283 (0.611–2.697)		1.617 (0.803–3.257)		1.704 (0.845–3.436)		2.064 (1.011–4.215)
Ever Received TB Treatment										
Yes	1.000	1	0.074	1	0.883	1	0.700	1	1.000	1
No		1.000 (0.418–2.391)		0.450 (0.187–1.080)		0.973 (0.395–2.221)		0.840 (0.346–2.036)		1.000 (0.402–2.488)

DOTS Centres. **Fourth stage:** TB patients to be interviewed were selected randomly from the sampling frame.

Inclusion Criteria:

1. All the TB patients registered under DOTS therapy and who were completed 60 days under DOTS medication in the selected districts of Gandaki province.
2. TB medication patients who were above 15 years of age.

Exclusion Criteria: Those TB patients from selected DOTS centre who were disagree to participate in study and those with mentally severely ill and deafness were excluded from study.

2.4. Research tools

Data was collected from the TB patients using interview schedule in Nepali version at one point in time for each of the patients. A schedule was divided into four sections. The first section was included the socio-demographic characteristics and disease related information. The second section was focus on the medication adherence and its associated factors and lifestyle related behavior of participants. The third section was focus on the health related quality of life using the Nepali version of WHOQOL-BREF and quality of life questionnaire. WHOQOL-BREF tool which consists of four domains i.e. physical, psychological, social relationship and environment. The four scores denote an individual perception of quality of life in each particular domain. Each item measures in a 5 point likert scale, with higher denoting a higher HRQOL and lower indicating a lower HRQOL, where as Q3, Q4 and Q26 rates in reverse negatively approach that is score 1 = 5, 2 = 4, 3 = 3, 4 = 2 and 5 = 1 [22]. The fourth section was focus on medication adherence using Morisky Scale questionnaire. For bi-variate and multivariate analysis, medium adherence and higher adherence were merged and categorized as adherence and low as non– adherence.

Pre-testing: Pre– testing was done in Kaski HO DOTS centres, Kaski District of Gandaki province excluding study participants and changes was made accordingly. The interview schedule was made based on the

Table 5
Association between accessibility to health care facilities related characteristics and domains of Quality of Life among TB patients.

Variables	Physical Domain		Psychological Domain		Social Relationship		Environment Domain		Overall QOL	
	P-value	UOR (C.I.)	P-value	UOR (C.I.)	P-value	UOR (C.I.)	P- value	UOR (C.I.)	P-value	UOR (C.I.)
Traveling Time (Minute)										
≥30	0.850	1	0.961	1	0.920	1	0.252	1	0.272	1
<30		1.089(0.450–2.634)		1.024(0.395–2.652)		0.956(0.396–2.311)		1.672(0.694–4.024)		1.646(0.676–4.009)
Use of Transportation										
Yes	0.683	1	0.947	1	0.946	1	0.398	1	0.136	1
No		1.133(0.622–2.063)		1.022(0.536–1.948)		1.021(0.563–1.851)		1.295(0.711–2.361)		1.609(0.860–3.008)
Pay for Transportation										
Yes	0.464	1	0.536	1	0.570	1	0.568	1	0.291	1
No		0.801 (0.442–1.451)		1.225 (0.644–2.330)		1.187 (0.657–2.143)		0.841 (0.464–1.525)		0.715 (0.384–1.332)
Money Spend for Diagnosis of TB										
Yes	0.444	1	0.071	1	0.481	1	0.273	1	0.168	1
No		1.369(0.613–3.059)		2.548(0.922–7.040)		1.329(0.602–2.933)		1.581(0.696–3.590)		1.893(0.765–4.685)
Preferable time for DOTS Centre										
1:00–5:00 PM	0.057	1	0.257	1	0.021*	1	0.062	1	0.241	1
10:00–12:00 AM		0.921(0.377–2.246)		1.874(0.758–4.631)		0.643(0.261–1.586)		0.410(0.152–1.104)		0.956(0.378–2.417)
Time Favourable		3.654 (0.940–14.197)		2.769 (0.763–10.049)		3.054(0.780–11.959)		1.000(0.268–3.729)		2.533(0.639–10.049)
Is that time Favourable										
No	<0.001**	1	<0.001**	1	<0.001**	1	<0.001**	1	<0.001**	1
Yes		4.465(2.189–9.108)		3.583(1.776–7.227)		3.321(1.652–6.680)		3.151(1.582–6.276)		8.000(3.811–16.794)
Waiting time at health facility (Minute)										
≥10	0.045*	1	0.005**	1	0.379	1	0.091	1	0007**	1
<10		2.235(1.018–4.905)		3.116(1.407–6.899)		1.417(0.652–3.077)		1.960(0.898–4.279)		2.993(1.357–6.603)
Supervision during the time of medication										
Self										
Yes	0.003**	1	0.070	1	0.027*	1	0.020*	1	<0.001**	1
No		3.059(1.455–6.430)		1.990(0.946–4.186)		2.287(1.100–4.754)		2.380(1.148–4.933)		4.351(2.054–9.218)
Family Members										
Yes	0.735	1	0.298	1	0.581	1	0.156	1	0.446	1
No		0.900(0.488–1.659)		0.698 (0.355–1.373)		0.842 (0.457–1.551)		0.635 (0.340–1.188)		0.777 (0.405–1.488)
Health Worker										
No	0.232	1	0.718	1	0.501	1	0.612	1	0.456	1
Yes		1.441(0.791–2.623)		0.888(0.465–1.695)		0.815(0.449–1479)		0.856(0.469–1.562)		1.268(0.679–2.367)
FCHV										
Yes	0.626	1	0.753	1	0.747	1	0.603	1	0.798	1
No		1.423 (0.344–5.878)		0.769 (0.150–3.938)		1.263 (0.306–5.216)		1.457 (0.353–6.022)		1.211 (0.279–5.245)
Relationship with health workers										
Unfriendly	<0.001**	1	<0.001**	1	<0.001**	1	<0.001**	1	<0.001**	1
Friendly		4.362(2.312–8.230)		4.109(2.094–8.065)		4.742(2.505–8.976)		3.716(1.984–6.960)		8.250(4.073–16.710)
Knowledge about the length of the treatment										
Don't Know	0.014*	1	0.003**	1	0.014*	1	0.011*	1	0.002**	1
When Feeling Better		8.400 (1.258–56.068)		5.250 (0.988–27.895)		19.500 (2.690–141.346)		18.667 (2.554–136.409)		31.500 (3.738–265.428)
6 Months		12.250 (2.670–56.203)		9.375 (2.825–31.112)		5.529(1.504–20.319)		12.250 (2.670–56.203)		17.973 (3.894–82.961)
>6 Months		11.375 (2.030–63.753)		7.500 (1.715–32.796)		8.667(1.841–40.789)		9.333(1.679–51.875)		14.000 (2.464–79.550)
TB Status Disclosure										
No	<0.014*	1	<0.001**	1	<0.001**	1	<0.001**	1	<0.001**	1
Yes		2.250(1.176–4.305)		4.686(2.348–9.355)		2.957(1.527–5.72)		3.655(1.875–7.126)		5.762 (2.881–11.523)

Table 6
Association of medication Adherence of participants with Domains Score of HRQOL.

Characteristics	Domains Score of HRQOL		P-value	UOR	95%CI
	Poor QOL	Good QOL			
Physical Domain					
Nonadherent	30 (81.1%)	7 (18.9%)	<0.001**	1	Ref
Adherent	45 (31.5%)	98 (68.5%)		9.333	3.813–22.846
Psychological Domain					
Nonadherent	24 (64.9%)	13 (35.1%)	<0.001**	1	Ref
Adherent	30 (21.0%)	113 (79.0%)		6.954	3.169–15.259
Social Relationship Domain					
Nonadherent	31 (83.8%)	6 (16.2%)	<0.001**	1	Ref
Adherent	49 (34.3%)	94 (65.7%)		9.912	3.872–25.371
Environmental Domain					
Nonadherent	29 (78.4%)	8 (21.6%)	<0.001**	1	Ref
Adherent	45 (31.5%)	98 (68.5%)		7.894	3.345–18.630
Overall HRQOL					
Nonadherent	31 (83.8%)	6 (16.2%)	<0.001**	1	Ref
Adherent	29 (20.3%)	114 (79.7%)		20.310	7.742–53.285

*statistically significant, ** statistically highly significant.

reference to various research papers. Data collection tools were made in simple, clear and Nepali language. Patients were chosen only after confirming their treatment cards or health facility records

2.5. Data Collection Procedures

Data was collected by face to face interview methods with the help of the interview schedule. Data was gathered in the prescribed format on the socio-demographic characteristics, disease condition behavioral and other factors associated with medication adherence and Quality of Life.

2.6. Analysis of Data

Participants' response was closely recorded into the tool. Data was entered in Epi Data software and analysis was performed with the help of the Statistical Package for Social Science (SPSS). Univariate analysis was computed to describe socio-demographic profile of participants, pattern of TB medication adherence and level of Health-related quality of life, while mean and standard deviation was calculate for continuous variables. Bivariate Logistic regression, chi-square and fisher exact were performed for testing the existing significant association between TB medication (adherence and non adherence), fours domain of Health-related quality of life and selected independent variables. This was followed by multivariate analysis. Multivariate logistic regression model was carried out to identify the most independent and medication adherence factors related HRQOL. The odds ratio and 95% CI was reported while showing the association between outcome medication adherence, health-related quality of life and independent variables. This results were considered significant at 5% level i.e. p value (<0.05).

3. Results

A total 180 TB patients participated in this study. Two-fifth (39.4%) of the participants belongs to Kaski district. Majority (31.1%) of participants were taking treatment facility from district hospital DOTS centre. More than half (52.2%) of participants were between15 and 40 age group. Majority (65.0%) of participants were male. Four-fifth (82.8%) of the participants follow Hinduism and nearly three-fourth (71.7%) of the participants were married. Majority (84.4%) of participants were from urban area and more than half (52.8%) of the participants belong to nuclear family. One-fourth (26.7%) of the participants were currently unemployed whereas very few (1.7%) participants were engaged in government job. Fourth-fifth (81.1%) of the participants were not enrolment in health insurance scheme program.

Mean score (±SD) of physical domain was 53.04 ± 18.32 and of psychological domain was 58.46 ± 15.31, social relation was 57.12 ± 18.49 and environment was 55.22 ± 15.62. The mean and standard deviation of overall quality of life was 55.96 ± 14.65. Around half (46.1%) of tuberculosis patients had high adherence, 33.3% had medium and 20.6% had low adherence to medication.

Table 1 shows majority (79.7%) of respondents who were adhered to medication had good overall HRQOL where majority (83.8%) of participants who weren't adhered to medication had poor HRQOL.

Table 2 reveals that treatment facilities and age were found statistically significantly associated with psychological, environmental domains and overall HRQOL; ecological region of treatment was associated with all domains except social domain and overall HRQOL. Religion of participants was associated with physical domain, social domain and overall HRQOL similarly, ethnicity of participants was only associated with social domain and overall HRQOL. Marital status of participants was associated with environmental domain and overall HRQOL. Table 3 shows educational status was statistically associated with all domains and overall HRQOL where, enrolment in health insurance scheme was only associated with psychological domain and occupation was not found statistical significant with any domains and overall HRQOL. Table 4 reveals duration of confirming tuberculosis, experiences of drug side effects were statistically associated with all domains except psychological domain and overall HRQOL Aware about TB symptoms was statistically associated with social relation domain and overall HRQOL. Similarly, co-infection was statistically associated with all domains except of social relationship. Contact with any TB patients was associated with physical domain and overall HRQOL.

Table 5 reveals relationship with health workers, knowledge on treatment duration, TB status were associated with all domains of HRQOL. Preferable time for DOTS centre was only associated with social relation domain. Favourable time to receive medicine from DOTS

Table 7
Adjusted relationship of explanatory variables with health related quality of life.

Variables	Physical Domain		Psychological Domain		Social Relationship		Environment Domain	
	P-value	AOR (C.I.)	P-value	AOR (C.I.)	P-value	AOR (C.I.)	P- value	AOR (C.I.)
Treatment Facilities								
District Hospital	<0.001**	1	0.053	1	0.036*	1	<0.001**	1
PHC		0.21(0.004–0.121)		0.768(0.148–5.000)		0.065(0.012–0.365)		0.022 (0.004–0.128)
HP		0.269 (0.076–0.950)		2.622 (0.612–11.231)		0.350(0.096–1.280)		0.239 (0.061–0.936)
UHC		1.464 (0.408–5.251)		13.595 (1.607–115.044)		0.544(0.146–2.030)		0.810 (0.205–3.209)
Private Health Institution		1.240 (0.223–6.892)		4.208 (0.557–31.807)		0.438(0.078–2.453)		0.696 (0.120–4.043)
Age								
>65 Years			0.410	1			0.017*	1
41–64 Years				2.653 (0.481–14.614)				11.725 (2.150–63.937)
15–40 Years				1.568(0.286–8.605)				6.220 (1.254–30.843)
Religion								
Non-Hindu	0.007**	1			0.032*	1		
Hindu		4.530 (1.501–13.669)				3.801(1.120–12.902)		
History of Smokeless Tobacco								
Yes	0.008**	1						
No		3.605 (1.403–9.259)						
TB Registration Treatment Category								
Others (Previous Treatment Category)			0.003**	1				
New				7.527 (1.968–28.783)				
Treatment Compliance Days								
60–90 Days					0.005**	1		
91–150 Days						0.407 (0.142–1.162)		
≥150 Days						2.615 (0.796–8.588)		
Experience of Side Effects								
Yes	0.027*	1	0.099	1			0.148	1
No		2.850 (1.125–7.221)		2.405(0.847–6.827)				2.027 (0.779–5.275)
Taking drugs other than TB medication								
Yes	0.038*	1						
No		2.912 (1.058–8.009)						
Clinical time Favourable for Patients								
1:00–5:00 PM					0.020*	1		
10:00–12:00 AM						14.302 (1.775–115.233)		
Time Favourable						1.232 (0.352–4.337)		
Relationship with health workers								
Unfriendly	0.271	1	0.528	1	0.020*	1	0.084	1
Friendly		1.843 (0.621–5.473)		0.680(0.205–2.252)		3.433 (1.214–9.705)		2.586 (0.879–7.607)
Medication Adherence								
Non-Adherence	0.116	1	0.513	1	0.059	1	0.056	1
Adherence		3.266 (0.747–14.270)		1.609(0.387–6.692)		4.550(0.954–21.896)		3.844 (0.965–15.308)

*statistically significant, ** statistically highly significant.

center, was statistically associated with all domains and overall HRQOL.

Table 6 shows participants who had adhere to medication were more than nine times ($p < 0.001$, UOR-9.333, CI = 3.813–22.846); more than six and half times ($p < 0.001$, UOR-6.954, CI = 3.169–15.259); more than nine and half times ($p < 0.001$, UOR-9.912, CI = 3.872–25.371) likely to had good quality of life of physical domain, psychological domain and social domain respectively. Participants who had adhere to medication were more than seventh and half times ($p < 0.001$, UOR-7.894, OR-3.345–18.630) more likely to had good quality of life of environmental domain. Participants who had adhere to medication were more than twenty times ($p < 0.001$, UOR-20.310, CI = 7.742–53.285) likely to had overall good quality of life.

Table 7 shows association of variables with quality of life. Age was associated with environmental domain, religion with physical and psychological domain, TB registration treatment category of participants was associated with psychological domain. Table 8 reveals variables like co-infection status, time favourable for DOTS centre and relationship with health workers were found statistically significant with medication

Table 8
Adjusted relationship of explanatory variables with Medication Adherence.

Characteristics	Medication Adherence		P-value	AOR	95%CI
	No n (%)	Yes n (%)			
Co-Infection (Taking drugs other than TB)					
Yes	18 (40.0%)	27 (60.0%)	0.024*	1	Ref
No	19 (14.1%)	116 (85.9%)		38.176	2.077–308.571
Time Favourable for DOTS					
No	26 (55.3%)	21 (44.7%)	0.023*	1	Ref
Yes	11 (8.3%)	122 (91.7%)		54.454	2.483–2477.147
Relationship with health workers					
Unfriendly	35 (47.3%)	39 (52.7%)	0.030*	1	Ref
Friendly	1 (1.9%)	104 (98.1%)		61.873	1.479–2588.423

*statistically significant

adherence. Participants who perceived favorable time of DOTS centers were more than fifty-four and half times (p0.023, AOR-54.454, CI = 2.483–2477.147) more likely to adhere with medicine compared to participants who don't perceived favourable time of DOTS center. Participants who had friendly relationship with health workers were nearly sixty-two times (p0.030, AOR-61.873, CI = 1.479–2588.423) times likely to adhere to medicine with compared to participants who were not friendly with health workers.

4. Discussion

Majority of tuberculosis patients adhere to medication had good quality of life while participants with non adherence to TB medication had poor quality of life. In this study, domain wise quality of life highest score was recorded with psychological domain 58.46 ± 15.31 while the lowest was in physical domain 53.04 ± 18.32. The mean transformed quality of life score of social relationship was 57.12 ± 18.49 and 55.22 ± 15.62 of environmental domain which is similar to the study conducted in western region of Nepal [22].

In the present study, the factors like ecological region, treatment facility, favourable timeof DOTS centre, relationship with health service provider, knowledge on treatment duration and TB status discloser was found to be significantly associated with all domain of health-related quality of life. Our study shows no statistical association between gender and quality of life which contrast with the study done in Nigeria which shows female had better quality of life in psychological and social relationship. It might be due to the level of knowledge. The study shows that younger age group (<64 years) respondent had good health related quality of life in environment domain whereas a study conducted in Nigeria and Nepal showed<50 years of respondent had good health related quality of life in physical, psychological and social domain [18,22]. The present study shows that illiterate and people who were engaged in job had better quality of life which is in line with the findings of the study done in Pakistan [23].

The present study shows that age, educational status, marital status, family type, family monthly income status and prior of tobacco habit influenced the health-related quality of life score in different domains which is similar to the findings of study done in Kathmandu valley, western region of Nepal and Tehran, Iran [22,24,25]. Women and patients who live in urban areas of Iran had a significant higher mean of quality of life among tuberculosis patients [21] which contrasts with our findings. It might be due to community's perception towards shyness and politeness.

Hospital based study done in Ankara shows participants having low level of education, non-enrolment in social insurance and lack of family support had lower quality of life [20] which resembled with our findings. In the study, continuous stage of treatment TB patients had higher quality of life than intensive stage of TB patients which is in line with study done in Indonesia [26].

In the present study, patients without co-morbidities had higher quality of life than patients with co-morbidity which is similar to the finding of the study done in Indonesia [26]. Several TB patients had other concurrent co-morbidities illnesses that can themselves influence health related quality of life. Another study from Nepal and North India reported that TB patients suffering from diabetes showed poorer quality of life compared with TB patients without diabetes [25,27]. Diabetes is the most common co-morbidity in TB patients and that effect on quality of life [26,28].

In the adjusted analysis, medication adherence and health related quality of life was found statistically significant with variables like co-infection, relationship with health workers and time favourable at DOTS centre. Participants who were highly adhered to medication had a good quality of life which corresponds with the findings of research done in South Africa which had reported that high adherers had greater change in HRQOL than low adherers [29]. Tuberculosis patients who had a friendly relationship with health workers had higher adherence to medication and had a good health related quality of life in compare to no friendly relationship which is similar to the findings of study done in Hubei Province, China [15].

Patients living in urban areas and those with higher socio-economic status had higher adherence to medication and good quality of life of different domains which is comparable with the study done in South Africa [30]. However cross-sectional study design is not perfect in order to assess the association between medication adherence and quality of life.

5. Conclusion and recommendations

Quality of life of TB patients was 55.96 ± 14.65 which defines poor quality of life. More than half (56.1%) of the respondents were adhered to medication. Majority of tuberculosis patients adhering to medication had good quality of life. Medication adherence and health related quality of life was found associated with co-infection, relationship with health workers and favourable time at DOTS centre. Medication adhered TB patients weren't statistically significant with domains of health related quality of life in multi-variate analysis.

Especial emphasis should be given to tuberculosis patients with co-infection, health workers should behave friendly and provide appropriate counselling in order to maintain the medication adherence and quality of life. In addition, this study suggests the favourable time for taking medicine by TB patients is morning time so, the concerned health institution and care providers should idealize about this factor in order to ensure the medication.

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Conceptualization, Formal analysis, Writing - original draft, Writing - review & editing. **Dipendra Kumar Yadav:** Conceptualization, Formal analysis. **Sujan Babu Marahatta:** Conceptualization, Formal analysis, Writing - original draft. **Naveen Prakash Shah:** Formal analysis. **Sushila Baral:** Writing - review & editing. **Elina Khatri:** Conceptualization, Writing - original draft, Writing - review & editing. **Renuka Ojha:** Formal analysis, Writing - original draft, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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