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FACTORS ASSOCIATED WITH TREATMENT ADHERENCE AMONG TUBERCULOSIS PATIENTS IN GANDAKI PROVINCE OF NEPAL

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ABSTRACT

Introduction: Poor adherence to the treatment regimen is a major cause of treatment failure and the emergence of drug resistance among TB patients. The emergence of resistance to anti-tuberculosis drugs and particularly of multi-drug resistance (MDR), Pre-extensively drug resistance tuberculosis (Pre-XDR) and extensively drug resistance (XDR) tuberculosis have become a major public health problem in several countries and an obstacle to effective global TB control.

Methodology: This research was health facility based cross-sectional study and carried out among TB patients registered under DOTS and receiving treatment more than or equal to 60 days from health facilities of Gandaki province of Nepal. Structured interview schedule and validated questionnaires were used for data collection. Treatment Adherence was assessed by using Nepali version of Morisky medication adherence scale (MMAS-8) questionnaires. Data were entered in Epi-data software 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 a P-value of <0.05 was considered as cut off for statistical significance.

Results: A total 180 TB patients were participated in this study. The overall prevalence of treatment adherence among tuberculosis participants was 79.4%. Participants who haven't living with co-morbidities were more than four times more likely to adhere with medicine compared to participants who had living with co-morbidities. Similarly, who had friendly relationship with health workers were more than forty six and half times likely to adhere to medicine with compared to participants who had unfriendly relationship with health workers.

Conclusion: The supportive factors for treatment adherence among Tuberculosis patients were socio-economic factors (Hilly region, hindu religion, nuclear family, literate), life style related factors (no prior alcohol consumption, not habit smokeless tobacco previously), diseases related factors (delay of confirming TB diagnosis, Not experienced side effects, aware about TB symptoms, no co-infection) and accessibility to health care facilities related factors (confirm TB diagnosis cost, favourable time for DOTS centre, health workers supervision during the medication, friendly relationship with health workers, know about the length of the treatment, TB status disclose).

Key words: Treatment Adherence, Tuberculosis, Nepal

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INTRODUCTION

Tuberculosis is one of the most prevalent infectious diseases and a significant public health problem in Nepal as well as global and continues to pose

a serious threat to the health of the population and development of the country. TB is the largest killer among communicable diseases in the 15 to 49 years age group when humans are the most economically active period of life[1]According to the World Health Organization treatment adherence is defined as "the degree to which the person's behavior corresponds with the agreed recommendations from a health care provider." Adherence to tuberculosis medication is very important for improving the quality of life and preventing complications of the disease [2].

Tuberculosis treatment involves taking medications daily for months to years, depending on the level of TB treatment, and failure to complete therapy as prescribed can lead to poor outcomes, including increased risk of failure, disease relapse, continued transmission, development of drug resistance, and death [3]. Several factors as competing causes of patients' non-adherence to TB treatment are socio-economic factors like poor socio-economic status, Sex, occupation and ethnicity, lack of social support[4–8]eastern People's Republic of China, in order to provide scientific evidence for improving the follow-up rate and treatment completion rate., Methods: A total of 262 PTB patients in six counties (districts. Poor treatment 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.[9,10]

Patient's adherence to their medications is a critical and important factor to prevent serious undesirable complications and to reduce the health care resource utilization. Poor adherence to medications is a major public health challenge. Improving adherence could be an important potential source of health and economic improvement, from the societal, institutional and employer's point of view.

TB patients have difficulty in following a long-term treatment regimen. Efforts to improve treatment outcomes require a better understanding of adherence as a complex behavioral issue and the particular barriers to and facilitators of patient adherence. Direct observation and a regular home visit by health workers appear to reduce the risk of non-adherence [8]

Non adherence to medication almost triples the risk of developing multidrug resistance and drug resistance tuberculosis. Nepal Government has set the goal to eliminate TB as a public health problem (<1 case per million population) by 2050. 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. This study was conducted with objective todetermine the factors associated with treatment adherence among tuberculosis patients in Gandaki Province of Nepal.

METHODOLOGY

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

Sample Size was calulated as Success rate of tuberculosis was 89% (National Tuberculosis Centre, 2019) [1] along with design effect (1.19). The sample size was determined by using the formula

$$n = \frac{z^2 pq}{d^2}$$

Where:

n = Desired sample size
z = Standard normal deviate, usually set at 1.96 which corresponds to 95% confidence level
p = 0.89
q= 1-p (1-0.89) = 0.11
d = Permitted error (5%, if the confidence level is 95%); 0.05

Therefore no = $\frac{1.96^2 0.89 * 0.11}{0.05^2}$= 150.44≈151

Design effect for cluster sampling ≈ 151*1.19 = 179.69 ≈180

A total required number of participants were 180, which was obtained from twenty two DOTS centre.

The following steps were followed for the selection of DOTS centres and TB patients in selected districts. The sample was selected by cluster sampling method. First stage: Three districts of Gandaki Province were selected for the study which included two districts from hilly region and the remaining districts from Terai region. Kaski and Tanahun were selected among the districts of hilly

region as they had the highest load of tuberculosis patients. Nawalparasi East was selected being the only district in the province representing Terai region. Second stage: Among 160 DOTS Centres in three selected districts, 22 DOTS centres were randomly selected as: 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 DOTS Centres. Fourth stage: TB patients to be interviewed were selected randomly from the sampling frame.

The study population were all the TB Patients who are under medication from DOTS centers of selected Districts of Gandaki Province of Nepal.

All the TB patients registered under DOTS therapy and completed 60 days under DOTS medication in the selected districts of Gandaki province and aged 15 years and above were considered as the study participants. Those TB patients from selected DOTS centre who were not present at the time of data collection, who were voluntarily disagree to participate in study and those with mentally severely ill and deafness were excluded from study.

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

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 three sections. The first section was included the socio-demographic characteristics and disease related information. The second section was focus on treatment adherence using Morisky Scale questionnaire. The third section was focus on the treatment adherence and its associated factors and lifestyle related behavior of participants.

Data was collected by face to face interview method 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 treatment adherence.

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 and pattern of TB treatment adherence, while mean, standard deviation, Median and Interquartile Range (IQR) 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) and selected independent variables. Multivariate logistic regression model was carried out to identify the most independent and treatment adherence factors related. The odds ratio and 95% CI was reported while showing the association between outcome treatment adherence and independent variables. This results were considered significant at 5% level i.e. p value (<0.05).

Approval was obtained from School of Health and Allied Sciences and ethical approval was obtained from the Nepal Research Council (NHRC). Administrative permission obtained from the Ministry of social development of Gandaki Province, Province health directorate office, Health office Kaski, Health office Tanahun and Health office Nawalparasi East of Gandaki Province. Participants were fully informed regarding study objectives and written consent was obtained prior to the initiation of the data collection. Informed consent was taken from participants whose age was equal and more than 18 years, but for those less than 18 years of age consent was also taken from their guardian.

RESULTS

A total 180 TB patients were participated in this study. Table 1 shows two -fifth (39.4%) of the participants were from kaski district. More than half of participants were 15-40 years of age. Majority (65.0%) of participants were male. Majority (84.4%) of participants were from urban area and more than half (52.8%) of the participants belong to nuclear family. Higher education was quite low (8.3%). One-fourth (26.7%) of the participants were currently unemployed while majority (73.3%) of them was employed whereas (14.4%) were engaged in agriculture and (1.7%) government job.

Table 1:Socio-demographic Characteristics of the Participants		
Characteristics	**Frequency**	**Percentage**
District		
Kaski	71	39.4
Tanahun	52	28.9
Nawalparasi East	57	31.7
Age		
15-40 Year	94	52.2
41-64 Years	68	37.8
>65 Years	18	10.0
Median= 38.50,Interquartile Range(IQR)=28 Min=16, Max=95		
Sex		
Male	117	65.0
Female	63	35.0
Religion		
Hinduism	149	82.8
Buddhism	25	13.9
Christianity	5	2.8
Islam	1	0.6
Ethnicity		
Dalit	40	22.2
Disadvantaged Non Dalit Terai Caste	3	1.7
Disadvantaged Janjati	48	26.7
Religious Minorities	3	1.7
Upper Caste Groups	45	25.0
Relatively Advantaged Janajati	41	22.8
Marital Status		
Single	39	21.7
Married	129	71.7
Divorced	1	0.6
Widowed	11	6.1
Permanent Residence		
Urban	152	84.4
Rural	28	15.6
Family Type		
Nuclear	95	52.8
Joint	85	47.2
Educational Status		
Illiterate	23	12.8
Non Formal Education	30	16.7
Basic Education (1-8class)	56	31.1
Secondary Education (9-12 class)	56	31.1
Higher Education (Completion of Bachelor or Above)	15	8.3
Occupation		
Unemployed	48	26.7
Agriculture	26	14.4
House Keeper	22	12.2

Business	22	12.2
Labor	21	11.7
Students	18	10.0
Private Employee	10	5.6
Others (Driver, Abroad & Retirement)	10	5.6
Government Job	3	1.7

Table 2 shows that More than three-fourth (86.7%) respondents didn't forget to take the medicine, almost all (94.4%) didn't stop taking the medicine even they feel the symptoms are under control, about third-fifth (59.4%) respondents don't ever hassle on sticking to treatment plan, majority of respondents (76.1%) don't have difficulty in remembering to take all medicines.

Table 2:Frequencies of item Responses to Treatment Adherence Questionnaire

Indicators	Yes, n (%)	No, n (%)
Do you sometimes forget to take your medicine?	24 (13.3)	156 (86.7)
People sometimes miss taking their medicines for reasons other than forgetting. Thinking over the past 2 weeks, were there any days when you did not take your medicine?	10 (5.6)	170 (94.4)
Have you ever cut back or stopped taking your medicine without telling your doctor because you felt worse when you took it?	9 (5.0)	171 (95.0)
When you travel or leave home, do you sometimes forget to bring along your medicine?	35 (19.4)	145 (80.6)
Did you take all your medicines yesterday? (Yes=0; No=1)	172 (95.6)	8 (4.4)
When you feel like your symptoms are under control, do you sometimes stop taking your medicine?	30 (16.7)	150 (83.3)
Taking medicine every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your treatment plan?	73 (40.6)	107 (59.4)
How often do you have difficulty remembering to take all your medicine?	43 (23.9)	137 (76.1)

Catagorization of Morisky Medication Adherence Scale (MMAS-8)

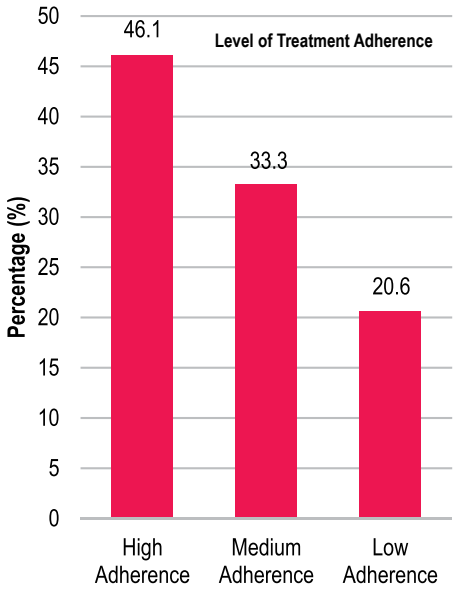

Figure 1 shows the eight item Morisky medication adherence scale (MMAS-8) was used to assess the prevalence of medication adherence among tuberculosis participants. The adherence rate among participants was high adherence 56.1%, Medium adherence 33.3% and 20.6% low adherence. For the bi-variate and mutli-variable analysis, the higher adherence and medium adherence were merged and categorized as adherence 79.4% and non-adherence 20.6%.

Table 3 shows that Hilly region participants were nearly three times (p= 0.005, UOR-2.917, CI=1.386-6.137) more likely to adhere to medicines when compared to Terai region participants. Participants belongs to Hindi religion were more than two and half times (p=0.027, UOR-2.602, CI=1.114-6.080) more likely to adhere with medication than belongs non-hindu religion (Buddhism, Christianity and Islam). Participants living in nuclear family were nearly four times (p<0.001, UOR-3.957, CI=1.780-8.794) likely to adhere with medication than joint family. Literate were more than four and half times (p<0.001, UOR-4.619, CI=1.841-11.589) more likely to adhere to medication with compare to illiterate participants.

Table 3: Association of Socio-demographic Characteristics of Participants with Treatment Adherence					
Characteristics	**Treatment Adherence**		**P-value**	**UOR**	**95%CI**
	No n (%)	**Yes n (%)**			
Ecological Region					
Terai	19 (33.3%)	38 (66.7%)	0.005**	1	Ref
Hilly	18 (14.6%)	105 (85.4%)		2.917	1.386-6.137
Level of Treatment Facilities					
District Hospital	14 (25.0%)	42 (75.0%)	0.089	1	Ref
PHC	7 (33.3%)	14 (66.7%)		0.667	0.224-1.984
HP	12 (25.0%)	36 (75.0%)		1.000	0.411-1.984
UHC	3 (7.9%)	35 (92.1%)		3.889	1.033-14.633
Private Health Institution	1 (5.9%)	16 (94.1%)		5.333	0.647-43.942
Age					
≥65 Years	7 (38.9%)	11 (61.1%)	0.061	1	Ref
15-40 Years	14 914.9%)	80 (85.1%)		3.636	1.205-10.976
40-65 Years	16 (23.5%)	52 (76.5%)		2.068	0.688-6.219
Sex					
Male	28 (23.9%)	89 (76.1%)	0.131	1	Ref
Female	9 (14.3%)	54 (85.7%)		1.888	0.828-4.301
Religion					
Non-Hindu	11 (35.5%)	20 (64.5%)	0.027*	1	Ref
Hindu	26 (17.4%)	123 (82.6%)		2.602	1.114-6.080
Ethnicity					
Others Caste	31 (20.6%)	104 (77.0%)	0.172	1	Ref
Upper Caste	6 (13.3%)	39 (86.7%)		1.937	0.750-5.002
Marital Status					
Married	32 (22.7%)	109 (77.3%)	0.183	1	Ref
Unmarried	5 (12.8%)	34 (87.2%)		1.996	0.721-5.526
Residence					
Rural	9 (32.1%)	19 (67.9%)	0.104	1	Ref
Urban	28 (18.4%)	124 (81.6%)		2.098	0.859-5.123
Family Type					
Joint	27 (31.8%)	58 (68.2%)	<0.001**	1	Ref
Nuclear	10 (10.5%)	85 (89.5%)		3.957	1.780-8.794
Educational Status					
Illiterate	11 (47.8%)	12 (52.2%)	<0.001**	1	Ref
Literate	26 (16.6%)	131 (83.4%)		4.619	1.841-11.589
Occupation					
Unemployment/Students	22 (33.3%)	44 (66.7%)	0.056	1	Ref
Agriculture	5 (19.2%)	21 (80.8%)		2.100	0.698-6.318
Daily wages/Labor	2 (11.1%)	24 (88.9%)		4.000	1.085-14.748
Business	4 (18.2%)	18 (81.8%)		2.250	0.679-7.457
Service (Private/Government)	2 (11.8%)	15 (88.2%)		3.750	0.787-17.875
House Keeper	1 (4.5%)	21 (95.5%)		10.500	1.325-83.239

Table 4 showed that participants who had not consumed alcohol prior were more than three and half times (p=0.003, UOR-3.529, CI=1.555-8.010) more likely to adhere to medicines with compared to participants who had consumed prior of alcohol. Participants who had not habit of smokeless tobacco previously were more than two and half times (p=0.007, UOR-2.833, CI=1.332-6.02) more likely to adhere to medicine with compared to participants who had consumed smokeless tobacco previously. Participants who had not currently consumed smokeless tobacco were more than four and half times (p=0.004, UOR-4.655, CI=1.615-13.422) more likely to adhere to medicine with compare to participants who had currently consumed smokeless tobacco. Participants who had not family history of TB were more than two times (p=0.0237, UOR-2.327, CI=1.052-5.150) more likely to adhere to medicine with compared to participants who had family history of TB.

Table 4: Association of Life Style Related Factors of Participants with Treatment Adherence

Characteristics	Treatment Adherence		P-value	UOR	95%CI
	No n (%)	Yes n (%)			
History of Alcohol Consumption					
Yes	28 (29.5%)	67 (70.5%)	0.003**	1	Ref
No	9 (10.6%)	76 (89.4%)		3.529	1.555-8.010
Current of Alcohol					
Yes	3 (37.5%)	5 (62.5%)	0.238	1	Ref
No	34 (19.8%)	138 (80.2%)		0.411	0.093-1.803
History of Smoking					
Yes	17 (21.8%)	61 (78.2%)	0.719	1	Ref
No	20 (19.6%)	82 (80.4%)		1.143	0.553-2.363
Current of Smoking					
Yes	2 (18.2%)	9 (81.8%)	0.841	1	Ref
No	35 (20.7%)	134 (79.3%)		0.851	0.176-4.117
History of Smokeless Tobacco					
Yes	17 (34.0%)	33 (66.0%)	0.007**	1	Ref
No	20 (15.4%)	110 (84.6%)		2.833	1.332-6.026
Current of Smokeless Tobacco					
Yes	8 (50.0%)	8 (50.0%)	0.004**	1	Ref
No	29 (17.7%)	135 (82.3%)		4.655	1.615-13.422
History of Alcohol and Smoking					
Yes	27 (27.6%)	71 (72.4%)	0.013*	1	Ref
No	10 (12.2%)	72 (87.8%)		2.738	1.235-6.070
Family History of TB					
Yes	13 (32.5%)	27 (67.5%)	0.037*	1	Ref
No	24 (17.1%)	116 (82.9%)		2.327	1.052-5.150

Table 5 showed that participants in whom time taken to confirm TB diagnosis was more than one month, were more than three times (p=0.004, UOR-3.218, CI=1.467-7.059) more likely to adhere with medicine compared to participants who had taken less than one month duration to confirm TB diagnosis. Participants who were in continuous phase of treatment were more than four times (p=U0.050, OR-4.212, CI=1.001-17.724) more likely to adhere with medicine compared to participants who had intensive phase of treatment. Participants who had not experience of side effects of the TB medicine were more than five times (p<0.001, UOR-5.010, CI=2.304-10.893)

Table 5: Association of Diseases Related Factors of Participants with Treatment Adherence					
Characteristics	**Treatment Adherence**		**P-value**	**UOR**	**95%CI**
	No n (%)	**Yes n (%)**			
Type of TB					
Pulmonary	30 (23.1%)	100 (76.9%)	0.182	1	Ref
Extra Pulmonary	7 (14.0%)	43 (86.0%)		1.843	0.752-4.519
Duration of Confirm TB Diagnosis					
<1Months, Early Diagnosis	15 (37.5%)	25 (62.5%)	0.004**	1	Ref
>1 Months, Delay Diagnosis	22 (15.7%)	118 (84.3%)		3.218	1.467-7.059
Phase of Treatment					
Intensive Phase	4 (50.0%)	4 (50.0%)	0.050*	1	Ref
Continuous Phase	33 (19.2%)	139 (80.8%)		4.212	1.001-17.724
Experience of Side Effects					
Yes	25 (37.3%)	42 (62.7%)	<0.001**	1	Ref
No	12 (20.6%)	101 (89.4%)		5.010	2.304-10.893
Know about the Symptoms of TB					
No	17 (34.0%)	33 (66.0%)	0.007**	1	Ref
Yes	20 (15.4%)	110 (84.6%)		2.833	1.332-6.026
Taking drugs other than TB medication					
Yes	18 (40.0%)	27 (60.0%)	<0.001**	1	Ref
No	19 (14.1%)	116 (85.9%)		4.070	1.887-8.780
Contact with any TB patients					
No Contact	28 (20.1%)	111 (79.9%)	0.801	1	Ref
TB Patients	9 (22.0%)	32 (78.0%)		1.115	0.478-2.603
Ever Received TB Treatment					
Yes	5 (20.8%)	19 (79.2%)	0.971	1	Ref
No	32 (20.6%)	124 (79.5%)		0.981	0.340-2.828

more likely to adhere with medicine compared to participants who had experienced of side effects of the TB medicine. Participants who had aware about symptoms of TB were more than two and half times (p=0.007, UOR-2.833, CI=1.332-6.026) more likely to adhere with medicine compared to participants who had not aware about the symptoms of TB. Participants who haven't living with co-morbidities were more than four times (p<0.001, UOR-4.070, CI=1.887-8.780) more likely to adhere with medicine compared to participants who had living with co-morbidities.

Table 6 showed that participants who had spend money for diagnosis of TB NRs 5001 and NRs 15000 where more than five times (p=0.017, UOR-2.630, CI=1.096-6.315) more likely to adhere to medicine with compared to participants who had spend money for diagnosis of TB less than NRs5000. Participants who had time favourable with the preferable time of medication were more than thirteen and half times (p<0.001, UOR-13.732, CI=5.908-31.917) more likely to adhere with medicine compared to participants who had not time favourable with the preferable time of medication. Participants who had waiting time at health facility less than 10 minutes were more than two and half times (p=0.027, UOR-2.602, CI=1.114-6.080) more likely to adhere to medicine when compared to participants who had waiting time at health facility more than 10 minutes. Participants who had supervised by health workers at time of medication were more than two and half times (p=0.009, UOR-2.708, CI=1.285-5.706)

more likely to adhere to medicine with compared to participants who had not supervised by health workers at time of medicine. Participants who had friendly relationship with health workers were more than forty six and half times (p<0.001, UOR-46.667, CI=10.712-203.311) times likely to adhere to medicine with compared to participants who had unfriendly relationship with health workers. Participants who had not fear of stigma and discrimination were more than eight times (p<0.001, UOR-8.190, CI=3.680-18.226) more likely to adhere to medicine with compared to participants who had fear stigma and discrimination.

Table 6: Association of Accessibility to Health Care Facilities of participants with Treatment Adherence

Characteristics	Treatment Adherence		P-value	UOR	95%CI
	No n (%)	Yes n (%)			
Traveling Time (Minute)					
≥30	33 (21.0%)	124 (79.0%)	0.688	1	Ref
<30	4 (17.4%)	19 (82.6%)		1.264	0.402-3.971
Use of Transportation					
No	16 (21.1%)	60 (78.9%)	0.888	1	Ref
Yes	21 (20.2%)	83 (79.8%)		1.054	0.508-2.188
Pay for Transportation					
Yes	20 (20.6%)	77 (79.4%)	0.982	1	Ref
No	17 (20.5%)	66 (79.5%)		1.008	0.480-2.048
Money Spend for Diagnosis of TB					
Yes	33 (22.1%)	116 (77.9%)	0.253	1	Ref
No	4 (12.9%)	27 (87.1%)		1.920	0.627-5.879
Confirm Diagnosis Cost (NRs)					
<5000	14 (38.9%)	22 (61.1%)	0.017*	1	Ref
5001-15000	4 (11.1%)	32 (88.9%)		5.091	1.487-17.534
≥15000	15 (19.5%)	62 (80.5%)		2.630	1.096-6.315
Preferable time for DOTS Centre					
1:00-5:00 PM	6 (26.1%)	17 (73.9%)	0.181	1	Ref
10:00-12:00 AM	30 (22.4%)	104 (77.6%)		1.224	0.852-3.378
Time Favourable	1 (4.3%)	22 (95.7%)		7.765	0.852-70.752
Is that time Favourable					
No	26 (55.3%)	21 (44.7%)	<0.001**	1	Ref
Yes	11 (8.3%)	122 (91.7%)		13.732	5.908-31.917
Waiting time at health facility (Minute)					
≥10	11 (35.5%)	20 (54.5%)	0.027*	1	Ref
<10	26 (17.4%)	123 (82.6%)		2.602	1.114-6.080
Supervision during the time of medication					
Self					
Yes	19 (50.0%)	19 (50.0%)	<0.001**	1	Ref
No	18 (12.7%)	124 (87.3%)		6.889	3.079-15.415
Family Members					

Yes	16 (23.9%)	51 (76.1%)	0.396	1	Ref
No	21 (18.6%)	92 (81.4%)		0.728	0.349-1.517
Health Worker					
No	23 (29.9%)	54 (70.1%)	0.009**	1	Ref
Yes	14 (13.6%)	89 (86.4%)		2.708	1.285-5.706
FCHV					
Yes	3 (37.5%)	5 (62.5%)	0.396	1	Ref
No	34 (19.8%)	138 (80.2%)		0.728	0.349-1.517
Relationship with health workers					
Unfriendly	35 (47.3%)	39 (52.7%)	<0.001**	1	Ref
Friendly	1 (1.9%)	104 (98.1%)		46.667	10.712-203.311
Knowledge about the length of the treatment					
Don't Know	10 (62.5%)	6 (37.5%)	0.002**	1	Ref
When Feeling Better	2 (18.2%)	9 (81.8%)		7.500	1.196-47.049
6 Months	21 (15.9%)	111 (84.1%)		8.810	2.890-26.850
>6 Months	4 (19.0%)	17 (81.0%)		7.083	1.601-31.331
TB Status Disclosure					
No	25 (46.3%)	29 (53.7%)	<0.001**	1	Ref
Yes	12 (9.5%)	114 (90.5%)		8.190	3.680-18.226

Table 7 shows adjusted odds of having medication adherence TB patients was showed that participants who haven't living with co-morbidities more than thirty eight times (p 0.024, AOR-38.176, CI=2.077-308.571) more likely to adhere with medicine compared to participants who had living with co-morbidities. Participants who had time fevorable with the preferable time of medication 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 had not time fevorable with the preferable time of medication. 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 had unfriendly relationship with health workers.

Table 7: Adjusted relationship of explanatory variables with Treatment Adherence

Characteristics	Treatment 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

DISCUSSION

The eight item Morisky medication adherence scale (MMAS-8) was used to assess the prevalence of treatment adherence among tuberculosis participants. More than third-fourth (79.4%) of participants adhered to medication whereas one-fifth (20.6%) of participants were not adhere to medication.

Effective treatment adherence is the main intervention to prevent the spread of drug-resistant tuberculosis, other co-infection and improved quality of life. The present study revealed that the overall prevalence of treatment adherence among tuberculosis patients was 79.4% which is similar to a national TB prevalence survey, Nepal, and others similar study conducted in Ethiopia Lady of apostle hospital from Ethiopia [11–14]. Some individual characteristics such as a good relationship with DOTS focal persons, favourable time for TB medicine taken at the DOTS centre and without any co-infection TB patients were factors influencing adherence to medication.

The present study revealed that participants who were literate, unmarried and living in urban population were more likely to adhere with medication which contrasts with the study conducted in china which shows that patients who had higher education, married and permanent residents were more likely to be adherence to medication[8]. The reason behind it may be that unmarried participants were free from family responsibility so they have easy access to medication and in context of resident, participants living in urban areas can easily reached to DOTS centre for their medication.

In this research age, sex, marital status and occupational weren't significantly associated with treatment adherence. Very similar results were highlighted in the study done in Nigeria, Zambia, Ehrabor and Metropolitan area of Buenos Aires, Argentina which shows age, sex, marital status and occupation weren't significantly associated with treatment adherence[14–16] .This study showed statistical significant relationship of religion with treatment adherence but not with ethnicity which is in contrast with the findings from study done in Zambia, Nigeria and Ehrabor which showed both ethnicity and religion as related factors. The possible reason that separate ethnic group has separate medical practices in Nepalese society. They do have different religious belief[14].

A cross sectional study done in Palpa district of Nepal indicated that age and family income were significantly associated with compliance with tuberculosis medicine[17]. However, finding of this research shows that both weren't statistically associated. The possible reason for this might be due to the differences in the tool used in the study.

Very low adherence was shown by study participants having alcohol habit, tobacco consumption with treatment adherence. This was similarly observed in other studies where lifestyles behaviour such as alcohol and tobacco consumption were well-known risk factors for non-adherence[14,18,19]. Those TB patients who don't consume alcohol have good communication with health services providers and also found to be effectively adhered to their treatment regimen.

Another important finding of this study suggests that experience of drug side effects, knowledge of TB symptoms and co-infection were factors affecting the adherence to treatment rate. The possible reason was experience of drugs side effect made some of them believe that the treatment was worsening their condition and so few TB patients stop taking their medication when they encounter adverse drugs side effects such as urine discolorations, vomiting and nausea, etc., which is dependable with several previous studies[4,6,20–22]. Systematic review research had also reported the relationship between treatment cost and adherence rate of medication of TB patients[23].

The present study found that TB patients had stopped the medication for the few days due to drug side effects which had decrease the adherence rate. The participants who didn't experience any drug side effects were five times highly adhere to medication than the participants who had experience drugs side effects.

This study revealed that those who had known about TB symptoms were nearly 3 times highly adhered to medication than those who were not aware of TB symptoms. Study done by Das et al. reported that participants who had correct knowledge of the TB symptoms were 13.31 times more likely to adhered to TB treatment[24]. In the

adjusted analysis, those TB patients who did not take additional drugs other than TB treatment were significantly associated with adherence to medication than those who had taken additional drugs other than TB treatment. However, a study conducted in Northwest, Ethiopia reported that those TB patients who had taken additional drugs other than anti-TB were 2.67 times more likely to non-adhere to TB treatment[25].

According to the research conducted in Kathmandu, Nepal; National tuberculosis program Nepal 2011 report and Ethiopia which shows that majority of respondents were male and suffered from Extra Pulmonary Tuberculosis whereas the present research also shows that majority of respondents were also male but the majority of respondents were suffered from pulmonary tuberculosis. It might be due to the correctional health facilities and present at a time of data collection[26,27].

Xu et al study reported that 16% of non-adherence patients interrupted treatment because of the high medical cost of the treatment[8] whereas the present study revealed that low TB investigation charge was one of the key factor to be associated with adherence to medication than patients having high TB investigation cost. Free TB service policy was formulated with the aim to decrease the financial burden on patients and promote to TB treatment adherence which isn't properly implemented[8,23].

In this study no statistical significance was observed between distance and mode of transportation. However, waiting time at DOTS centre was found statistically significant. The TB patients waiting for less than 10 minutes were 2.602 times more likely to adhere to medication than those who had waited greater or equal to 10 minutes. This finding is supported by the study done in southern Ethiopia, where the patients who waited in health facility less than or equal to 30 min before getting service were 2.53 times more likely to adhere to tuberculosis medicine [21,28].

In the adjusted analysis, patients relationship with health care provider is significantly associated with adherence. This indicates a good relationship with health provider had a positive outcome on adherence to medication. This is similar to the finding of the study done in different places of Ethiopia and eastern Nepal, where good patients service providers relationship was on important reasons for adherence to medication [12,27–30]. A good patient -provider relationship might help TB patients to share the adverse effect of medicine, course of medications etc to the DOTS services provider, but if health professionals do not express good behaviour, the patients might think that their health condition is getting worsen and feel hopeless and interrupt the TB medications[12].

Gebreweld FH et al, 2018, reported that stigma was an evident factor and main obstacle for adherence to TB medication[20]. This study shows that those TB patients who had shared the TB status to other members such as family members and friends had 8.190 times more adhered to medicine than those TB patients who had not disclosed to another person.

The present study revealed that TB patients who had good knowledge of the duration of TB medication were 8.810 times higher chances to adhere to medication than those who don't have proper knowledge about the duration of treatment. A similar study conducted in India shows correct knowledge on the duration of treatment was significantly associated with adherence to TB medication [22,31].

CONCLUSION

The adherence rate among participants was high adherence 56.1%, Medium adherence 33.3% and 20.6% low adherence. The associated factors with adherence was socio-economic factors (Hilly region, hindu religion, nuclear family, literate), life style related factors (not prior of alcohol consumption, not habit smokeless tobacco previously), diseases related factors (delay confirm TB diagnosis, Not experienced of side effects, aware about TB symptoms, haven't co-infection) and accessibility to health care facilities related factors (confirm TB diagnosis cost, favourable time for DOTS centre, health workers supervision during the medication, friendly relationship with health workers, know about the length of the treatment, TB status disclose). This concludes that socio-economic, diseases related factors and health service related factors play more influence rather than other factors that determine TB medication. This study shows that non adherence rate of the participants was three in ten in selected districts of Gandaki province.

Especial emphasis should be given to TB patients with co-infection. Adequate counselling should be provided in order to maintain the treatment adherence and quality of life. Health care provider should behave friendly with TB patients to ensure the treatment adherence. Also health care providers should provide complete information about duration of treatment and side effect of medicine to TB patients so that they can decide towards treatment adherence and ensure their quality of life.

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CONFLICT OF INTEREST

None

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