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Treatment adherence and associated factors among type 2 diabetes mellitus patients attending a tertiary hospital in Nepal: a cross- sectional study

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Abstract

Background

Diabetes mellitus is a chronic metabolic disorder characterised by persistent hyperglycaemia. Its prevalence is increasing in Nepal, posing a substantial public health challenge. Poor treatment adherence leads to uncontrolled blood glucose, diabetes-related complications, and an increased healthcare burden. This study aimed to assess the level of treatment adherence and to identify its associated factors among patients with type 2 diabetes mellitus attending a tertiary care hospital in Nepal.

Methods

A hospital-based cross-sectional study was conducted among 410 outpatients with type 2 diabetes mellitus attending Lumbini Provincial Hospital, Butwal, Nepal, between December 2022 and March 2023. Participants were recruited by non-probability consecutive sampling. Treatment adherence was measured using the validated Brief Medication Questionnaire. Sociodemographic, behavioural and clinical data were collected through structured interviews. Associations were examined using chi-square tests, and independent predictors of non-adherence were identified using binary logistic regression.

Results

Only 30.0% of participants were adherent to their prescribed treatment regimen; 70.0% were non-adherent. Age ($\chi^2 = 8.986$; $p = 0.029$) and presence of comorbidities ($\chi^2 = 6.646$; $p = 0.010$) were significantly associated with adherence on bivariate analysis. Glycated haemoglobin (HbA1c) level showed a borderline non-significant trend ($\chi^2 = 3.152$; $p = 0.076$). On multivariable logistic regression, age remained the only independent significant predictor of non-adherence. Lifestyle factors and clinical symptoms showed no statistically significant association with adherence.

Conclusions

Treatment non-adherence is highly prevalent among patients with type 2 diabetes mellitus attending a tertiary care hospital in Nepal. Age-targeted and glycaemia-informed patient education, structured counselling and family engagement are needed to improve adherence and optimise diabetes outcomes.

Background

Diabetes is a chronic metabolic disorder characterised by elevated blood glucose levels resulting from impaired insulin function [1]. Its global prevalence is rising, with 537 million adults affected in 2021, the majority residing in low- and middle-income countries [2]. South-East Asia carries one of the highest

regional burdens [2]. In Nepal, diabetes prevalence is estimated at approximately 10%, with an increasing trend [3]. Hyperglycaemia contributed to 6.7 million deaths in 2021, and global diabetes-related mortality has risen by 3% since 2000 [1, 2]. Effective long-term management of type 2 diabetes mellitus (DM) requires lifelong adherence to medication, dietary modification, physical activity, and regular monitoring [4].

Poor treatment adherence results in uncontrolled blood glucose, an increased risk of complications, higher healthcare costs, and excess mortality [5, 6]. Despite its critical importance, adherence remains suboptimal, particularly in low-resource settings [7]. Limited evidence exists on treatment adherence among patients attending tertiary care hospitals in Nepal [8]. A systematic review and meta-analysis of Nepali studies reported non-adherence rates ranging from 56.3% to 71% [10]. Understanding adherence patterns is therefore essential to inform targeted interventions that improve diabetes management outcomes. This study aimed to assess the level of treatment adherence and its associated factors among patients with type 2 DM attending Lumbini Provincial Hospital, Nepal.

Methods

Study design, setting and participants

A hospital-based descriptive cross-sectional study was conducted at Lumbini Provincial Hospital, Butwal, Nepal, a tertiary care facility serving urban and rural populations of Lumbini Province and neighbouring districts. Data collection took place between 1 December 2022 and 1 March 2023.

Adults aged 18 years or older with a confirmed diagnosis of type 2 DM for at least six months, and receiving oral hypoglycaemic agents (OHA) or insulin, were eligible for inclusion. Patients who were unwilling to participate or who had a diagnosed psychiatric condition were excluded. Using a prevalence estimate of 41.2% [9] and adjusting for 10% non-response, a total sample of 410 participants was recruited by non-probability consecutive sampling, with eligibility verified through patient interviews and medical records.

Ethics approval and consent

Ethical approval

for this study was obtained from the Ethical Review Committee of Lincoln University College, Malaysia; the Nepal Health Research Council; and the Institutional Review Committee of Lumbini Provincial Hospital, Butwal, Nepal (full statement and approval reference numbers are provided under Declarations). Written informed consent was obtained from all participants prior to data collection, and confidentiality and voluntary participation were maintained throughout.

Data collection instrument

Treatment adherence was measured using the validated Brief Medication Questionnaire (BMQ), comprising three screening components: a five-item regimen screen, a two-item belief screen, and a two-item recall screen [9]. For analytical purposes, BMQ categories were dichotomised into 'adherent' (no positive responses on any screen) and 'non-adherent' (one or more positive responses). This dichotomous approach has been applied in prior Nepali studies to facilitate clinical interpretation [10, 11].

Instrument validation was conducted in two phases. In Phase 1 (development of items covering sociodemographic, clinical and behavioural-pattern variables), content validity was established through review by a panel of ten subject-matter experts comprising nurses, endocrinologists and physicians, who evaluated each item for relevance, clarity and comprehensiveness. In Phase 2, the BMQ was administered as the primary adherence measurement tool. The instrument was piloted on 10% of the target sample (n = 41), and internal consistency was assessed using Cronbach's alpha.

Statistical analysis

Data were entered in Microsoft Excel 2010 and analysed using IBM SPSS version 21 (IBM Corp., Armonk, NY, USA). Descriptive statistics summarised sociodemographic, behavioural and clinical characteristics. Chi-square tests examined associations between adherence and categorical variables. Binary logistic regression was used to identify independent predictors of non-adherence, with variables showing $p < 0.20$ on bivariate analysis entered into the multivariable model. Statistical significance was set at $p < 0.05$.

Results

Sociodemographic characteristics

The mean age of participants was 55.28 years, with the largest proportion in the 51–60 year age group (37.6%, n = 154). The sample comprised 58.8% males (n = 241) and 41.2% females (n = 169). Most respondents were literate (68.0%, n = 279), married (92.4%, n = 379), and unemployed (54.6%, n = 224). A majority (78.3%, n = 321) reported insufficient financial resources to meet annual household needs.

Regarding social factors, 57.3% (n = 235) reported a family history of diabetes mellitus, and 90.5% (n = 371) received family support. Most participants followed a vegetarian diet (62.2%, n = 255), 65.4% (n = 268) reported alcohol consumption, and 61.0% (n = 250) undertook regular physical activity.

Clinical characteristics

The majority of participants (71.7%, n = 294) had been receiving treatment for more than one year. Most were on oral hypoglycaemic agents (67.3%, n = 276), followed by insulin monotherapy (26.8%, n = 110) and combination therapy (5.9%, n = 24). Over half (53.4%, n = 219) were prescribed a single antidiabetic

agent. Polydipsia was the most prevalent symptom (74.1%, n = 304), followed by dry mouth (62.7%, n = 257), polyphagia (60.5%, n = 248), and polyuria (54.6%, n = 224). A normal body mass index was recorded in 53.4% (n = 219) of participants, and 64.1% (n = 263) had HbA1c values between 6.5% and 7.0%.

Level of treatment adherence

Of the 410 participants, 30.0% (n = 123) were classified as adherent and 70.0% (n = 287) as non-adherent to their prescribed treatment regimen (Table 1).

Table 1
Level of treatment adherence (n = 410)

Level of adherence	Frequency (n)	Percentage (%)
Adherent	123	30.0
Non-adherent	287	70.0
Total	410	100.0

Frequency and percentage of participants classified as adherent or non-adherent using the Brief Medication Questionnaire.

Factors associated with treatment adherence

Statistically significant associations were identified between treatment adherence and age ($\chi^2 = 8.986$; $p = 0.029$) and presence of comorbidities ($\chi^2 = 6.646$; $p = 0.010$). The highest proportion of non-adherence was observed among individuals aged 51–60 years (75.3%). HbA1c level showed a borderline non-significant association with adherence ($\chi^2 = 3.152$; $p = 0.076$); respondents with HbA1c > 7% demonstrated higher adherence (35.4%) compared with those with HbA1c 6.5–7.0% (27.0%). Table 2 presents associations between adherence and sociodemographic variables, Table 3 details associations with physical symptoms and clinical indicators, Table 4 presents behavioural and treatment factors, and Table 5 presents associations with comorbidities.

Table 2
Association between adherence level and sociodemographic characteristics (n = 410)

Variable	Adherent n (%)	Non-adherent n (%)	χ^2	p value
Age (years)				
<40	12 (36.4)	21 (63.6)	8.986	0.029*
41–50	38 (41.3)	54 (58.7)		
51–60	38 (24.7)	116 (75.3)		
>61	35 (26.7)	96 (73.3)		
Sex				
Male	67 (27.8)	174 (72.2)	1.347	0.246
Female	56 (33.1)	113 (66.9)		
Education				
Literate	90 (32.3)	189 (67.7)	2.120	0.145
Illiterate	33 (25.2)	98 (74.8)		
Marital status				
Married	111 (29.3)	268 (70.7)	4.842	0.089
Unmarried	3 (21.4)	11 (78.6)		
Widow/widower	9 (52.9)	8 (47.1)		
Employment				
Employed	60 (32.3)	126 (67.7)	0.827	0.363
Unemployed	63 (28.1)	161 (71.9)		
Family support				
Yes	108 (29.1)	263 (70.9)	1.469	0.225
No	15 (38.5)	24 (61.5)		

**p < 0.05 considered statistically significant.*

Table 3
Association between adherence level and clinical/anthropometric parameters (n = 410)

Variable	Adherent n (%)	Non-adherent n (%)	χ^2	p value
Polyuria				
Yes	69 (30.8)	155 (69.2)	0.152	0.697
No	54 (29.0)	132 (71.0)		
Polydipsia				
Yes	94 (30.9)	210 (69.1)	0.475	0.491
No	29 (27.4)	77 (72.6)		
Polyphagia				
Yes	78 (31.5)	170 (68.5)	0.630	0.427
No	45 (27.8)	117 (72.2)		
Dry mouth				
Yes	83 (32.3)	174 (67.7)	1.728	0.189
No	40 (26.1)	113 (73.9)		
BMI category				
Underweight	34 (33.0)	69 (67.0)	0.613	0.736
Normal	64 (29.2)	155 (70.8)		
Overweight	25 (28.4)	63 (71.6)		
HbA1c (%)				
6.5–7.0	71 (27.0)	192 (73.0)	3.152	0.076
>7.0	52 (35.4)	95 (64.6)		
Random blood sugar (mg/dL)				
<140	36 (32.1)	76 (67.9)	1.383	0.501
140–200	65 (31.0)	145 (69.0)		
>200	22 (25.0)	66 (75.0)		

**p < 0.05 considered statistically significant. BMI: body mass index; HbA1c: glycated haemoglobin.*

Table 4
Association between adherence level and behavioural/treatment factors (n = 410)

Variable	Adherent n (%)	Non-adherent n (%)	χ^2	p value
Dietary pattern				
Vegetarian	73 (28.6)	182 (71.4)	0.605	0.437
Non-vegetarian	50 (32.3)	105 (67.7)		
Alcohol consumption				
Yes	79 (29.5)	189 (70.5)	0.101	0.751
No	44 (31.0)	98 (69.0)		
Regular exercise				
Yes	80 (32.0)	170 (68.0)	1.220	0.269
No	43 (26.9)	117 (73.1)		
Duration of diabetes				
6 months–1 year	40 (34.5)	76 (65.5)	1.548	0.213
>1 year	83 (28.2)	211 (71.8)		
Number of drugs				
One	59 (26.9)	160 (73.1)	2.118	0.347
Two	47 (33.8)	92 (66.2)		
More than two	17 (32.7)	35 (67.3)		
Treatment regimen				
Insulin monotherapy	25 (22.7)	85 (77.3)	4.517	0.105
OHA	92 (33.3)	184 (66.7)		
Combined (OHA + insulin)	6 (25.0)	18 (75.0)		

OHA: oral hypoglycaemic agents. No associations were statistically significant at $p < 0.05$.

No statistically significant associations were identified between treatment adherence and behavioural factors, including dietary pattern, alcohol consumption, and exercise ($p > 0.05$). Similarly, no significant relationships were found between adherence and clinical symptoms (polyuria, polydipsia, polyphagia, dry mouth), body mass index, or random blood sugar.

Table 5
Association between adherence level and comorbidities (n = 410)

Variable	Adherent n (%)	Non-adherent n (%)	χ^2	p value
Comorbidities			**6.646**	**0.010***
Yes	57 (37.5)	95 (62.5)		
No	66 (25.8)	192 (74.2)		

**p < 0.05 considered statistically significant.*

In binary logistic regression, variables eligible for multivariable analysis (p < 0.20) included marital status (crude odds ratio [COR] = 0.687; p = 0.105), education level (COR = 1.414; p = 0.146), HbA1c control (COR = 1.508; p = 0.071), and comorbidities (COR = 0.567; p = 0.010). Participants with HbA1c > 7% had 1.51 times the odds of non-adherence compared with those with controlled glycaemia, although this did not reach statistical significance. Participants with comorbidities had lower odds of non-adherence (COR = 0.567), suggesting heightened health awareness or closer clinical monitoring. After adjustment, age remained the only independent significant predictor of non-adherence at the 0.05 level.

Discussion

This study documented a high prevalence of treatment non-adherence (70.0%) among type 2 DM patients attending Lumbini Provincial Hospital, Nepal. This is consistent with findings from comparable studies across Nepal and other low- and middle-income countries, which report non-adherence rates of 56.3%–71% [10–12]. The magnitude of non-adherence underscores a critical and persistent challenge in diabetes management in resource-constrained settings.

Age was the most prominent sociodemographic factor associated with adherence (p = 0.029), with persons aged 51–60 years exhibiting the highest non-adherence rate (75.3%). This corroborates prior studies [11, 13, 14] suggesting that middle-aged and older adults face unique barriers — including polypharmacy, forgetfulness, and functional impairments — that compromise adherence. In the Nepali context, the transition from joint to nuclear family structures may diminish informal caregiving and daily supervision for this population [15]. Caregiver-assisted medication management, pill organisers, and personalised reminder systems could substantially benefit this subgroup.

HbA1c level showed a borderline non-significant association with adherence (χ^2 = 3.152; p = 0.076). Notably, patients with HbA1c > 7% showed higher adherence rates (35.4%), suggesting that awareness of poor glycaemic control may motivate behaviour change, although this did not reach statistical significance [22]. This observation carries important clinical implications: healthcare providers should leverage glycaemic feedback during consultations as a motivational tool.

Presence of comorbidities was significantly associated with higher treatment adherence ($\chi^2 = 6.646$; $p = 0.010$). Participants without comorbidities showed higher non-adherence (74.2%) compared with those with comorbidities (62.5%). This pattern may reflect heightened illness perception, more frequent healthcare contact, or greater medication familiarity among multimorbid patients — phenomena well documented in the chronic disease literature. Healthcare providers should capitalise on these clinical encounters to reinforce adherence counselling and promote self-management support.

Although education and family support did not reach statistical significance, prior evidence demonstrates that higher health literacy improves comprehension of treatment regimens and facilitates complex self-care behaviours [16, 17]. Family involvement reduces the cognitive burden on patients through consistent reminders, emotional encouragement, and support with dietary and medication management [18, 19]. These associations deserve further investigation in larger, adequately powered studies.

Patients on OHA showed somewhat higher adherence than those on insulin monotherapy, consistent with literature documenting injection-related anxiety, stigma, and difficulties with self-administration as barriers specific to insulin use [20, 21]. Clinicians should proactively address these barriers through structured insulin initiation counselling and peer support programmes.

Alcohol consumption was reported by 65.4% of participants. Although this variable did not attain statistical significance, its known negative impact on glycaemic regulation, drug metabolism, and lifestyle adherence warrants targeted counselling.

Strengths and limitations

This study has several limitations. Treatment adherence was self-reported via the BMQ, which is susceptible to recall and social desirability biases. The cross-sectional design precludes causal inference. The single-centre setting limits generalisability to other regions of Nepal. Future studies should employ objective adherence measures (e.g., pill counts, pharmacy refill records) and longitudinal designs to establish causal pathways.

Conclusions

A high prevalence of treatment non-adherence was documented among type 2 DM patients attending Lumbini Provincial Hospital, with only 30.0% adhering to their prescribed regimen. Age and presence of comorbidities were statistically significant determinants of adherence ($p = 0.029$ and $p = 0.010$, respectively); HbA1c level showed a non-significant trend ($p = 0.076$). An integrative, patient-centred approach incorporating structured education, regular adherence assessment, family engagement, targeted counselling for insulin users, and economic support is essential to address the multifactorial barriers to treatment adherence and improve long-term diabetes outcomes in Nepal.

Healthcare providers should: (i) integrate routine BMQ-based adherence screening into outpatient diabetes follow-up consultations; (ii) offer individualised counselling addressing barriers to medication-taking, particularly for patients in the 51–60 age group and those with suboptimal glycaemic control; (iii) simplify drug regimens where clinically appropriate; (iv) engage family members as active adherence partners; and (v) advocate for uninterrupted access to affordable antidiabetic medications. Future research should employ qualitative methods and multicentre longitudinal designs to comprehensively characterise adherence barriers and evaluate the effectiveness of technology-enabled interventions such as mobile-phone reminders.

Abbreviations

BMI
Body mass index
BMQ
Brief Medication Questionnaire
COR
Crude odds ratio
DM
Diabetes mellitus
HbA1c
Glycated haemoglobin
OHA
Oral hypoglycaemic agent(s)
SPSS
Statistical Package for the Social Sciences.

Declarations

Ethics approval and consent to participate

This study was conducted in accordance with the Declaration of Helsinki. Ethical approval was obtained from the Ethical Review Committee of Lincoln University College, Malaysia (approval reference number: [to be inserted by the authors]); the Nepal Health Research Council (registration/approval reference number: [to be inserted by the authors]); and the Institutional Review Committee of Lumbini Provincial Hospital, Butwal, Nepal (approval reference number: [to be inserted by the authors]). Written informed consent to participate was obtained from all study participants prior to data collection.

Consent for publication

Not applicable. This manuscript does not contain any individual person's data in any form (including individual details, images, or videos).

Competing interests

The authors declare that they have no competing interests.

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Author Contribution

AD conceived and designed the study, carried out the data acquisition, performed the data and statistical analysis, and drafted the manuscript. RPD and MM contributed to the literature search and the definition of intellectual content. AD, RPD and MM critically reviewed and edited the manuscript. All authors read and approved the final manuscript, and all act as guarantors for the work.

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Data Availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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