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Metabolic Control Analysis of Distress and Medication Adherence among Patients with Type 2 Diabetes Mellitus (T2DM) at Puskesmas Kayon Palangka Raya

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Abstract. Type 2 diabetes mellitus is a chronic disease requiring continuous management. Glycemic status, diabetes distress, and medication adherence are important components of diabetes care in primary health services. This study aimed to analyse the association of current glycaemic status, measured by random blood glucose, with diabetes distress and medication adherence among patients with type 2 diabetes mellitus in the working area of UPTD Kayon Public Health Center, Palangka Raya. An observational analytic cross-sectional design was conducted among 64 respondents selected by purposive sampling. Current glycaemic status was assessed using random blood glucose, diabetes distress using the Diabetes Distress Scale-17, and medication adherence using the Morisky Medication Adherence Scale-8. Bivariate analysis used Spearman's rho, while multivariable analysis used ordinal logistic regression. The most frequent categories were moderate glycaemic status (45.3%), high diabetes distress (35.9%), and moderate medication adherence (37.5%). Significant positive associations were found between glycaemic-status category and diabetes distress (rho=0.308; p=0.013) and between glycaemic status and medication adherence (rho=0.620; p<0.001). The ordinal logistic regression model was statistically significant (model-fitting p<0.001), showed adequate fit (Pearson p=0.721; Deviance p=0.618), and had a Nagelkerke R^2 of 0.500. In the adjusted model, medication adherence remained significantly associated with glycaemic status, whereas diabetes distress was not significant. These findings support the integration of glycaemic assessment with medication-adherence and diabetes-distress screening in primary nursing care.

Keywords: diabetes distress; glycaemic status; medication adherence; random blood glucose; type 2 diabetes mellitus.

1. Introduction

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disease characterised by insulin resistance and impaired insulin secretion, resulting in hyperglycaemia. Glycemic management is an important component of diabetes care because suboptimal glucose control is associated with complications and reduced quality of life. Glycemic monitoring is an essential component of diabetes evaluation and management [1].

The global burden of diabetes continues to increase. The International Diabetes Federation reported that more than 537 million people were living with diabetes, with the number projected to increase further [2]. Long-term diabetes management also creates psychological and behavioural burdens. Diabetes distress refers to emotional distress specifically related to the demands of diabetes management, including concerns about blood glucose, complications, treatment regimens, and lifestyle changes [3,4]. Adherence to therapy is also important because inconsistent medication use may be associated with suboptimal glycaemic control [5,6].

In the working area of UPTD Kayon Public Health Center, Palangka Raya, recorded diabetes-related visits increased from 864 in 2022 to 923 in 2023 and 1,191 in 2024. This pattern highlights the need for diabetes management that considers clinical, psychological, and behavioural aspects.

Previous studies have frequently used glycated haemoglobin as a long-term glycaemic indicator and examined diabetes distress or medication adherence in relation to glycaemic control. Evidence specifically examining random blood glucose status in relation to diabetes distress and medication adherence among patients with type 2 diabetes in primary care remains limited. Random blood glucose was used in this study because it is practical and available in primary care; however, it reflects glycaemic status at the time of measurement rather than long-term glycaemic control. Therefore, this study aimed to analyse the association of random blood glucose status with diabetes distress and medication adherence among patients with T2DM. A multivariable analysis was also performed to assess the simultaneous associations of diabetes distress and medication adherence with glycaemic status.

2. Methods

This observational analytical study used a cross-sectional design and was conducted in the working area of UPTD Kayon Public Health Center, Palangka Raya. Medical records were used to identify patients who had routinely attended follow-up during January-March 2026, and data collection was conducted in April-May 2026. The accessible population consisted of 76 patients with type 2 diabetes mellitus who routinely attended follow-up. Using Slovin's formula with a 5% margin of error, 64 respondents were selected through purposive sampling. Inclusion criteria were a recorded diagnosis of type 2 diabetes mellitus, age ≥18 years, at least three months of treatment and routine follow-up, ability to communicate in Indonesian, and willingness to participate. Patients with severe cognitive or communication impairment, severe acute complications or emergency conditions, a history of severe psychiatric disorders, or first-time visits were excluded.

Glycaemic status was measured using capillary random blood glucose with an Autochek digital glucometer and compatible strips. Results were categorised as good (<180 mg/dL), moderate (180–250 mg/dL), or poor (>250 mg/dL). Diabetes distress was assessed using the Diabetes Distress Scale-17 (DDS-17) and categorised as low (<2.0), moderate (2.0-2.9), or high (≥3.0). Medication adherence was assessed using the 8-item Morisky Medication Adherence Scale (MMAS-8) and categorised as high (score 8), moderate (6-<8), or low (<6). Descriptive analysis was used to summarise participant characteristics and variable distributions. Associations between glycaemic status and diabetes distress and between glycaemic status and medication adherence were examined using Spearman's rho. Ordinal logistic regression was used as the multivariable analysis to assess the simultaneous associations of diabetes distress and medication adherence with glycaemic status. Because the study was cross-sectional, all findings were interpreted as associations rather than causal relationships.

3. Results

Table 1 summarises participant characteristics.

Table 1. Participant characteristics

Characteristic	n	%
Female	43	67.2
Male	21	32.8
>60 years	33	51.6
46–60 years	27	42.2
18–45 years	4	6.3

Glycemic status, diabetes distress, and medication adherence distributions are presented in Table 2.

Table 2. Distribution of study variables

Variable	Category	n	%
Glycemic status	Good (<180 mg/dL)	16	25.0
	Moderate (180–250 mg/dL)	29	45.3
	Poor (>250 mg/dL)	19	29.7
Diabetes distress	Low	20	31.3
	Moderate	21	32.8
	High	23	35.9
Medication adherence	High	21	32.8
	Moderate	24	37.5
	Low	19	29.7

Women accounted for 67.2% of the sample, and participants aged >60 years accounted for 51.6%. Moderate glycaemic status was the most frequent category (45.3%), followed by poor (29.7%) and good (25.0%). High diabetes distress was the most frequent category (35.9%), while moderate medication adherence was the most frequent adherence category (37.5%).

Spearman's rho demonstrated a significant positive association between glycaemic-status category and diabetes distress (rho=0.308; p=0.013; n=64). With categories coded from good to poor glycaemic status and from low to high distress, poorer glycaemic status was associated with higher diabetes distress. A stronger association was observed between glycaemic status and medication adherence (rho=0.620; p<0.001; n=64). With adherence coded as high=1, moderate=2, and low=3, poorer glycaemic status was associated with lower medication adherence. Ordinal logistic regression showed that the overall model was significant (χ^2=37.233; p<0.001). Goodness-of-fit tests indicated adequate model fit (Pearson p=0.721; Deviance p=0.618). The Nagelkerke R^2 was 0.500, indicating

that the model accounted for approximately 50% of the variation in glycaemic status. In the adjusted model, medication adherence remained significantly associated with glycaemic status, whereas diabetes distress was not significant.

Table 3. Spearman's rho associations

Association	rho	p
Glycemic status–diabetes distress	0.308	0.013
Glycemic status–medication adherence	0.620	<0.001

The association between glycemic status based on RBG and medication adherence showed a stronger coefficient than the association with diabetes distress, namely rho=0.620 with p<0.001. Considering the category coding, the results indicate that poorer glycemic status was associated with lower medication adherence.

These findings demonstrate the importance of treatment adherence as one component of T2DM management. From the perspective of Orem's Self-Care Theory, taking medication as prescribed represents one form of an individual's ability to meet therapeutic self-care requirements. When self-care ability or consistency is suboptimal, achieving good glycemic status may become more difficult. These findings are also consistent with the study by Suprapti et al., which demonstrated medication adherence problems among patients with T2DM in Indonesia and their association with glycemic control. Previous research cited in the thesis also indicates that medication adherence is an important component of diabetes management. Nevertheless, this association cannot be interpreted as evidence that low adherence directly causes poor glycemic status. Glycemic status may also be influenced by medication type and dosage, diabetes duration, dietary patterns, physical activity, comorbidities, complications, and other factors.

Table 4. Ordinal logistic regression results

Model statistic	Value
Model fitting χ^2	37.233
Model fitting p	<0.001
Pearson goodness-of-fit p	0.721
Deviance goodness-of-fit p	0.618
Nagelkerke R^2	0.500
Medication adherence, partial p	<0.001
Diabetes distress, partial p	>0.05

Ordinal logistic regression analysis showed that diabetes distress and treatment adherence were simultaneously associated with glycemic status. The model demonstrated adequate fit based on the Goodness-of-Fit test, with a Nagelkerke value of 0.500. This indicates that the two variables together provided substantial information for explaining variation in glycemic status in the study sample, although approximately half of the remaining variation was associated with factors not included in the model.

Partial analysis showed that treatment adherence remained significantly associated with glycemic status after diabetes distress was included in the model, whereas diabetes distress no longer showed a statistically significant association. This finding indicates that the behavioral aspect of treatment adherence had a more consistent association with glycemic status than diabetes distress in this study model. However, this result should not be interpreted to mean that diabetes distress is unimportant in T2DM management. Diabetes distress remains an important psychosocial aspect because the bivariate analysis identified an association with glycemic status. The lack of statistical significance in the multivariate model may be related to interrelationships among variables or sample characteristics. Therefore, further research with a larger sample size and control of confounding factors is needed.

Clinically, these findings support an approach to care that focuses not only on blood glucose measurement but also on assessing treatment adherence and diabetes distress. This approach may include screening, identification of barriers, education, counseling, regular monitoring, and follow-up according to patients' needs.

4. Discussion

The predominance of moderate and poor glycaemic status indicates that many participants had not reached the study-defined good category at the time of measurement. Random blood glucose reflects glycaemic status at the time of testing and may be affected by food intake, physical activity, medication use, and acute stress. Therefore, these findings should not be interpreted as evidence of long-term glycaemic control comparable to glycated haemoglobin. The weak positive association between poorer glycaemic status and higher diabetes distress is consistent with the possibility that diabetes-related management demands are accompanied by emotional burden. However, the cross-sectional design does not establish temporal direction or causality. Diabetes distress may also be

influenced by treatment burden, concerns about complications, healthcare interactions, interpersonal support, duration of diabetes, and other psychosocial factors that were not fully measured in this study.

The stronger association between glycaemic status and medication adherence highlights the importance of treatment behaviour in diabetes management. Participants with poorer glycaemic status tended to have lower medication adherence according to the study coding. Nevertheless, the association should not be interpreted as proof that low adherence causes poor glycaemic status because glucose levels may also be affected by medication type and dose, dietary pattern, physical activity, diabetes duration, comorbidities, and other factors. In the multivariable model, medication adherence remained significant whereas diabetes distress did not. This finding suggests that behavioural factors may show a more consistent association with glycaemic status than diabetes distress within this sample. The non-significant adjusted association for diabetes distress does not imply that distress is clinically unimportant, because it was significantly associated with glycaemic status in the bivariate analysis. Larger studies with longitudinal designs and adjustment for potential confounders are needed.

5. Conclusion

Among 64 patients with T2DM in the working area of UPTD Kayon Public Health Center, Palangka Raya, moderate glycaemic status was the most frequent category, high diabetes distress was the most frequent distress category, and moderate medication adherence was the most frequent adherence category. Glycemic status was associated with both diabetes distress and medication adherence. There was a weak positive association between glycemic status based on RBG and diabetes distress (rho=0.308; p=0.013), as well as a stronger association between glycemic status based on RBG and medication adherence (rho=0.620; p<0.001). Poorer glycemic status was associated with higher diabetes distress and lower medication adherence based on the variable coding used in the study. Ordinal logistic regression showed that diabetes distress and medication adherence were simultaneously associated with glycaemic status, with a Nagelkerke R^2 of 0.500. In the adjusted model, medication adherence remained significant whereas diabetes distress was not. These findings support the integration of glycaemic assessment with medication-adherence and diabetes-distress screening in primary nursing care.

6. Practical Implications

Primary nursing services can integrate glycaemic assessment with routine screening of medication adherence and diabetes distress. The findings may support early identification of patients requiring adherence education or psychosocial follow-up.

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