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ORIGINAL RESEARCH

Factors Associated with Poor Therapeutic Compliance Among Diabetic Patients in Health Facilities of Kinshasa

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Background: Poor therapeutic compliance among diabetic patients is one of the public health issues contributing to inadequate diabetes mellitus control and an increased risk of chronic complications. This study aimed to determine the frequency and factors associated with poor therapeutic compliance among diabetic patients in Kinshasa.

Methods: A cross-sectional study was conducted between November 2021 and November 2022 on diabetic patients aged at least 18 years who visited four health facilities in Kinshasa. The Morisky questionnaire was used to assess therapeutic compliance. Data analysis was carried out using SPSS 26 software. Descriptive analyses, Pearson's chi-square test, Mann–Whitney *U*-test, and logistic regression were applied. A p-value < 0.05 was considered statistically significant.

Results: A total of 131 participants were enrolled, of which 88 (67.1%) had poor compliance. The mean age was 53.8 ± 16.5 years, with male participants representing 67.9%. Median values of blood glucose, glycated hemoglobin (HbA1c), triglycerides (TG), and LDL-cholesterol were high in the non-compliant group with respectively 147.5 mg/dL, 8.5%, 146.9 mg/dL, and 116.5 mg/dL. Inadequate self-monitoring (AOR: 10.144, 95% CI 3.543–29.040, p<0.001), treatment mode combining oral antidiabetic drugs (OADs) and insulin (AOR: 3.098 95% CI 1.078–8.904, p=0.036) were significantly associated with poor compliance with treatment.

Conclusion: The present study revealed a suboptimal level of therapeutic compliance among participants while highlighting associated factors such as treatment type and inadequate self-monitoring. Thus, setting up a team focusing on therapeutic education is required for better disease management.

Keywords: non-compliance, diabetes mellitus, Kinshasa

Introduction

Diabetes mellitus is a group of metabolic diseases characterized by chronic hyperglycemia resulting from a defect in insulin secretion, action, or both.[1–3] This chronic hyperglycemia is responsible for long-term complications, dysfunction, and organ failures.[3] It is a severe condition and a major public health problem that has a negative socio-economic impact on those affected, their families, and the community.[4] Ranked among the top ten causes of death in adults, it is estimated that diabetes mellitus caused four million deaths worldwide in 2017.[1–6]

In 2021, the International Diabetes Federation (IDF)[7] estimated that 537 million people were living with diabetes, representing as much as 10.5% of the world's population and resulting in $966 billion in global health expenditures.[7] These health expenditures are expected to reach more than 1054 billion dollars by 2045.[7] In Kinshasa, in 2010, the overall monthly cost for diabetic patient care in specific structures was estimated at approximately USD 27.2.[8]

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The holistic management and follow-up of diabetes mellitus make it a heavy burden for the patient and healthcare systems. They require special care throughout the patient's life, including adherence to a diabetic diet, physical activity, blood glucose monitoring, and adherence to a medication regimen.[9,10]

Previous publications on diabetic patients' compliance have suggested that it results from a complex interaction between several factors. These factors include those associated with the disease (duration of diabetes), the treatment (number of drugs and daily doses), the patient (belief about his health, feeling of personal efficacy), and the healthcare system (quality of relationship with caregivers, frequency of appointments, duration of consultations, reimbursement rate for medications).[4,11] The role of the psycho-social environment, particularly the family and social support, has also been highlighted.[4,11]

One of the ways to effectively control diabetes is good compliance with treatment, which improves glucose control and reduces glycated hemoglobin (HbA1C) and the risk of complications.[12] On the other hand, poor patient therapeutic education and non-compliance with any of the disease management requirements contribute to poor diabetes control and expose patients to harmful complications.[9,10,13–18] In high-income countries (HICs), just over 50% of patients comply with the prescribed treatment, while this rate is even lower in low-income countries[19] where studies addressing this issue are scanty.

This study aimed to determine the frequency and factors associated with therapeutic non-compliance among diabetic patients in Kinshasa.

Methods

Study Design and Population

A cross-sectional study was conducted between November 2021 and November 2022. The study focused on diabetic patients who consulted four healthcare facilities in Kinshasa (namely, the Kinshasa University Hospital, the Central Military Hospital of Kinshasa, the Bondeko Clinic, and the Diamant Medical Center) and met inclusion criteria. We enrolled any consenting diabetic patient aged at least 18 years under treatment and whose file contained variables of interest. The inclusion criteria were: being at least 18 years old, being followed for diabetes mellitus during the study period, and giving consent to participate in the study. The non-inclusion criteria were secondary or gestational diabetes, inability to answer the questionnaire and incomplete medical records. A total of 131 patients were included. However, the minimum sample size determined using single proportion formula was 96 (for lack of estimated proportion of the population with the characteristic of interest, $p = 0.5$), d-marginal error = 10%).

Data Collection

Patients were administered a structured questionnaire, and the Morisky questionnaire[20,21] to evaluate therapeutic compliance. The questionnaire included questions on sociodemographic parameters (age, sex, marital status, religion, profession), clinical parameters (diabetes type, duration of diabetes, current treatment, self-monitoring of blood glucose, tobacco, and alcohol intake), biological parameters (HbA1c, blood glucose, creatinine, urea, triglycerides, total cholesterol, HDL-c, LDL-c).

Operational Definitions of Variables

Poor compliance or non-compliance was defined by a Morisky score of less than 7 (considering non-compliance and minimal non-compliance). Good compliance was defined by a Morisky score of 8.[20,21] Self-monitoring of blood glucose was defined as regular blood glucose monitoring at home by the patient at least once or twice a week, while poor control of diabetes mellitus was defined as a glycated hemoglobin level ≥ 7%.[22] Stable fasting mean blood glucose was defined as a fasting mean plasma glucose level of less than or equal to 130 mg/dl.[23,24] Low levels of HDL-C were defined as ≤40 mg/dl, high LDL-C levels were defined as ≥100 mg/dl, Total cholesterol was defined as TC level ≥200 mg/dl, and hypertriglyceridemia was defined as TGs level ≥150 mg/dl.[24,25]

Statistical Analyses

Data were analyzed using Excel and SPSS 26. Means and standard deviations or median and interquartile range were used to summarize continuous variables, while proportions were used for categorical variables. Pearson's chi-square test was applied to compare proportions and the Mann–Whitney *U*-test to compare continuous variables. Logistic regression was used to determine factors associated with poor therapeutic compliance. A p-value < 0.05 was considered statistically significant.

Results

Sociodemographic Characteristics of Participants by Treatment Compliance

A total of 131 participants were included in the present study, of which 88 (67.2%) had poor compliance. Most participants were male, 89 (67.9%). The mean age of patients with poor compliance was 53.8 ± 16.5 years, with a male predominance 64 (71.9%) (Table 1). Although poor compliance varied by age group, sex, marital status, and religion, no statistically significant difference was observed (Table 1).

Clinical Characteristics of Participants by Treatment Compliance

Type 2 diabetes mellitus and chronic complications were commonly found among patients (76.3% and 61.8% respectively) (Table 2). Poor compliance was mainly observed among patients with an illness duration of at least 5 years (74.4%, p=0.015), patients not practicing self-monitoring (80.9%, p<0.001) and those under oral antidiabetic drugs (OADs) and insulin (82.6%, p=0.002) (Table 2).

Table 1 Sociodemographic Characteristics of Participants by Treatment Compliance

Variables	All (N = 131)	Good-Compliance (n = 43)	Non-Compliance (n = 88)	*p*
Age, year	52.0 ± 17.6	48.5 ± 19.2	53.8 ± 16.5	0.108
Age groups				0.074
< 40 years	33 (25.2)	15 (45.5)	18 (55.5)	
≥ 40 years	98 (74.8)	28 (28.6)	70 (71.4)	
Sex				0.093
Male	89 (67.9)	25 (28.1)	64 (71.9)	
Female	42 (32.1)	18 (42.9)	24 (57.1)	
Marital status				0.083
Married	65 (49.6)	26 (40.0)	39 (60.0)	
Unmarried	66 (50.4)	17 (25.8)	49 (74.2)	
Religion				0.189
Catholic	45 (34.4)	15 (33.3)	30 (66.7)	
Revival Church	54 (41.2)	18 (33.3)	36 (66.7)	
Protestant	24 (18.3)	10 (41.7)	14 (58.3)	
Others	8 (6.1)	0 (0.0)	8 (100.0)	
Active smoking				0.623
Yes	18 (13.7)	5 (27.8)	13 (72.2)	
No	113 (86.3)	38 (33.6)	75 (66.4)	
Alcohol intake				0.302
Yes	18 (13.7)	4 (22.2)	14 (77.8)	
No	113 (86.3)	39 (34.5)	74 (65.5)	
Occupation				0.217
Employed	57 (43.5)	22 (38.6)	35 (61.4)	
Unemployed	74 (56.5)	21 (28.4)	53 (71.6)	

Notes: Variables are represented as numbers (proportion), Non-compliance = poor compliance + minimal non-compliance.

Table 2 Clinical Characteristics of Participants by Treatment Compliance

Variables	All (N = 131)	Good Compliance (n = 43)	Non-Compliance (n = 88)	*p*
Type of diabetes mellitus				0.939
Type 1	31 (23.7)	10 (32.3)	21 (67.7)	
Type 2	100 (76.3)	33 (33.0)	67 (77.0)	
Duration of illness				0.015
< 5 years	45 (34.4)	21 (46.7)	24 (53.3)	
≥ 5 years	86 (65.6)	22 (25.6)	64 (74.4)	
Treatment mode				0.002
OADs	52 (39.7)	26 (50.0)	26 (50.0)	
Insulins	33 (25.2)	9 (27.3)	24 (72.7)	
OADs + insulin	46 (35.1)	8 (17.4)	38 (82.6)	
Self-monitoring				< 0.001
Yes	42 (32.1)	26 (61.9)	16 (38.1)	
No	89 (67.9)	17 (19.1)	72 (80.9)	
Chronic complications				0.322
Yes	81 (61.8)	24 (29.6)	57 (70.4)	
No	50 (38.2)	19 (38.0)	31 (62.0)	

Note: Variables are represented as numbers (proportion).
Abbreviation: OAD, Oral antidiabetic drugs.

Biological Characteristics of Participants by Treatment Compliance

Table 3 compares biological marker values between patients with good compliance and those not complying with the therapeutic regimen. The median blood glucose, HbA1c, and triglyceride values were significantly higher in patients with no compliance (Table 3).

Factors Associated with Poor Treatment Compliance in Patients with Diabetes Mellitus

In univariate analysis, poor treatment compliance was associated with the duration of the disease, self-monitoring, and treatment mode. However, only self-monitoring (AOR:10.144, 95% CI 3.543–29.040, $p<0.001$) and treatment mode (AOR:3.098, 95% CI 1.087–8.904, $p=0.036$) remained associated with treatment compliance in multivariate analysis (Table 4). Participants without self-monitoring and those under OADs and insulin were respectively 10 and 3 times more likely to comply poorly with the treatment (Table 4).

Table 3 Biological Characteristics of Participants by Treatment Compliance

Variables	All (N = 131)	Good Compliance (n = 43)	Non-Compliance (n = 88)	**p*
Blood sugar, mg/dL	138.0 (120.0–176.0)	122.0 (117.0–148.0)	147.5 (123.5–181.0)	0.004
HbA1c, %	8.1 (7.0–9.1)	7.3 (6.9–8.5)	8.4 (7.3–9.3)	0.025
Serum creatinine, mg/dL	1.1 (0.8–1.4)	1.0 (0.8–1.3)	1.1 (0.9–1.7)	0.125
Total cholesterol, mg/dL	200.0 (164.0–249.3)	190.0 (163.0–232.0)	204.0 (165.2–257.8)	0.156
HDL-c, mg/dL	56.7 (41.0–67.0)	62.0 (45.2–71.0)	53.5 (25.9–63.2)	0.001
LDL-c, mg/dL	110.0 (96.0–149.3)	100.0 (96.0–152.0)	116.5 (96.6–148.9)	0.491
Triglycerides, mg/dL	134.0 (112.0–223.8)	121.0 (100.0–143.0)	146.9 (120.0–246.7)	0.013

Notes: Variables expressed as median (interquartile range), *Mann–Whitney *U*-test.

Table 4 Determinants of Poor Treatment Compliance in Patients with Diabetes Mellitus

Variable	OR (95% CI)	*p*	AOR (95% CI)	*p*
Duration of illness				
≥ 5 years	1	0.016	1	0.381
< 5 years	2.545 (1.190–5.443)		1.675 (0.529–5.310)	
Self-monitoring				
Yes	1	<0.001	1	<0.001
No	6.882 (3.041–15.576)		10,144 (3.543–29.040)	
Treatment mode				
OADs	1	0.001	1	0.036
OADs + insulin	0.211 (0.083–0.537)		3.098 (1.078–8.904)	

Abbreviations: OADs, Oral antidiabetic drugs, OR, Odd Ratio, AOR, Adjusted Odd Ratio.

Discussion

Therapeutic compliance in diabetic patients is one of the pillars of treatment success that likely reduces complications, their severity, and the number of hospitalizations.[9,10,13–18] The present study determined the frequency of non-compliance with treatment in diabetic patients and identified associated factors. Identifying these associated factors remains crucial in the development of a community action plan.[26]

In the present study, 88 participants (67.1%) did not comply with treatment. These results are different from those by Egede et al,[27] who reported a proportion of 41.3%. However, a cross-sectional study conducted in general hospitals of Adigrat in Tigrai by Araya et al[13] reported a similar proportion (63.3%) among patients not complying with treatment. A more worrying situation was observed in the study by Suprapti et al, where 83.3% of participants were non-compliant. Altogether, these estimates motivate the development of a tailored approach to the therapeutic education of diabetic patients.

The effect of gender was not identified in the present study, although non-compliant participants were primarily found among males. Of note, several studies have reported an opposite trend.[8,28–30] Nearly 76.1% and 23.7% of patients suffered from type 2 and type 1 diabetes, respectively. The higher proportion of patients with type 2 diabetes found in the study is in keeping with diabetes mellitus epidemiology. Most patients with type 2 diabetes had comorbidities for which they had regular visits, resulting in a shortened time between two appointments. Several studies have shown that this significant frequency of therapeutic non-compliance in type 2 patients was associated with several factors.[13,28,29] Our results could also be explained by the smaller sample size.

Noncompliance was significantly associated with disease duration ≥5 years (p=0.015). This finding was in keeping with findings by Araya et al[13] and Rahmatullah et al.[31]

The present study showed that the values of HbA1c triglycerides were significantly higher among non-compliant patients ($p < 0.05$). Similar findings have been reported by Contreras-Vergara et al.[32] Indeed, many studies have shown that good therapeutic compliance among diabetic patients can significantly reduce glycated hemoglobin.[32–34] Furthermore, non-compliance with treatment contributed to poor control of diabetes mellitus. These results are consistent with those by Suprapti et al[35] that showed HbA1c values were higher in patients who did not comply with treatment. The same findings were reported in Iran by Jafarian-Amirkhizi et al.[12]

On multivariate analysis, the lack of self-monitoring and the use of OADs and insulin increased respectively by ten and 3-fold the risk of therapeutic non-compliance. These observations underscore the need for tailored therapeutic education for diabetic patients. This finding may also result from the unfavorable socio-economic conditions patients are facing, catastrophic health expenditures they need to make for their disease management, and the stress generated by daily injections.

Regarding oral antidiabetic drugs, it is crucial to emphasize that they contribute significantly to diabetes mellitus control and, therefore, to the reduction of HbA1c and the prevention of diabetes-related complications.[34] However, the present study showed that the combination of oral antidiabetic drugs and insulin was associated with poor therapeutic

compliance. Indeed, the treatment mode influences poor therapeutic compliance. It is, therefore, crucial to develop well-targeted strategies for better therapeutic compliance.

Strength and Limitations of the Study

The strength of this study lies in its courage to be the first to focus on factors associated with poor adherence among diabetic patients in the DRC. However, the limitations of this work lie in the poor representativeness of the study population. In our country, the majority of patients with diabetes mellitus live in unfavourable socio-economic conditions, which limit their access to care and affect their regular medical follow-up. The almost total absence of mutual health insurance schemes means that these patients have to finance their consultations, examinations and treatment themselves, which is often an unsustainable financial burden. This situation contributes to the poor representation of these patients in clinical research, introducing a selection bias that affects the generalisation of results to the country's diabetic population as a whole.

Ethical Considerations

All participants provided written informed consent prior to participating in the study. Confidentiality and anonymity of participants were also guaranteed. The protocol was submitted to the scientific committee of the Department of Internal Medicine of the University Clinics of Kinshasa and to the ethics committee of the School of Public Health of the University of Kinshasa acting as the national ethics committee (Approval number: ESP/CE/106/2021).

Conclusion

The present study showed a suboptimal level of therapeutic compliance and highlighted its associated factors, including the mode of treatment and inadequate self-monitoring. These factors are closely linked to the therapeutic education of patients, who are sometimes unaware of their conditions and the various complications related to non-compliance with therapy. Thus, addressing therapeutic non-compliance must be prioritized and carried out by a multidisciplinary team that includes healthcare providers (doctors, nurses) and pharmacists.

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Disclosure

The authors report no conflicts of interest in relation to this work.

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