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Association between self-esteem and medication adherence in diabetic patients: A cross-sectional study in Morocco

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Abstract Medication adherence is crucial in diabetes management but often suboptimal. This study aimed to evaluate the association between self-esteem and medication adherence in Moroccan diabetic patients. A cross-sectional study was conducted among 116 diabetic patients in an urban health center in Morocco. Self-esteem was assessed using the Rosenberg scale and medication adherence using the adapted Morisky-Green questionnaire. Multiple regression analyses were performed to examine the association between self-esteem and adherence, adjusting for sociodemographic and clinical factors. The mean self-esteem score was 23.78 ± 3.01 (out of 40). 85% of patients showed moderate adherence, 10% low adherence, and 5% good adherence. Multiple regression analysis revealed a significant positive association between self-esteem score and medication adherence level ($\beta = 0.249$, p = 0.007), after adjusting for confounding variables. This study highlights a significant association between higher self-esteem and increased medication adherence in Moroccan diabetic patients. These results underscore the importance of considering psychological factors in diabetes management and suggest that interventions aimed at strengthening self-esteem could improve therapeutic adherence.

INTRODUCTION

Diabetes is a chronic disease with increasing global prevalence, constituting a major public health problem (International Diabetes Federation 2019). In Morocco, diabetes prevalence has increased alarmingly from 3.3% in 1992 to 7.3% in 2019 (Soufiani *et al.* 2023). This rapid increase is partly explained by population aging and lifestyle changes towards more

sedentary habits and high-calorie diets (Kabbali *et al.* 2014).

Effective diabetes management largely relies on patient therapeutic adherence, particularly medication adherence (Polonsky & Henry 2016). However, many studies report high rates of non-adherence among diabetic patients, compromising treatment efficacy and increasing the risk of long-term complications (Krass *et al.* 2015; Gonzalez *et al.* 2008). A recent meta-analysis estimated that nearly 32% of diabetic patients showed low adherence to oral antidiabetics (Iglay *et al.* 2015), highlighting the magnitude of the problem.

Among factors that can influence therapeutic adherence, psychological aspects play an important role but are often neglected in clinical management (Chew *et al.* 2018). Self-esteem, defined as an individual's overall evaluation of their own worth (Rosenberg 1965), seems to be a particularly relevant psychological factor in the context of chronic diseases (Mann *et al.* 2004). Indeed, several studies have highlighted the crucial role of selfesteem in psychosocial adaptation and daily management of various chronic pathologies (Juth *et al.* 2008; Malivoir 2013).

In the specific case of diabetes, some studies have suggested that self-esteem could positively influence self-care behaviors and therapeutic adherence (Johnston-Brooks *et al.* 2002; Rose *et al.* 2002). However, few studies have specifically examined the link between selfesteem and medication adherence in diabetic patients, particularly in developing countries like Morocco. Yet, the cultural and socio-economic context can have a significant impact on disease perception and health behaviors (Kleinman *et al.* 1978), justifying the need for local studies.

The main objective of this study was therefore to evaluate the association between self-esteem level and medication adherence in diabetic patients followed in an urban setting in Morocco. Secondary objectives aimed to identify other sociodemographic and clinical factors associated with therapeutic adherence in this population.

This study is part of a broader approach aimed at improving understanding of psychosocial determinants of therapeutic adherence in diabetes, in order to optimize the overall management of this chronic disease in Morocco.

Methods

Study type and target population

A cross-sectional study was conducted in 2021 among diabetic patients followed at an urban health center in Kenitra, Morocco. This primary health center serves a local population of approximately 14,620 inhabitants from modest social strata.

Inclusion criteria were: $age \ge 18$ years, diagnosis of type 1 or 2 diabetes for at least one year, and regular follow-up at the center. Patients with severe psychiatric disorders, pregnant women, and people under guardianship were excluded.

Sample size was calculated based on an estimated prevalence of low adherence of 50% (conservative hypothesis), with a precision of 10% and a confidence level of 95%. Accounting for a potential non-response rate of 10%, the minimum required size was 106 participants.

Data collection

Data were collected by a trained interviewer using a structured questionnaire administered face-to-face in Moroccan dialectal Arabic. Interviews took place in a confidential space at the health center, before or after the usual medical consultation according to patient preference. The questionnaire included several sections:

- Sociodemographic characteristics: age, sex, education level, marital status, employment status, perceived socio-economic level
- Clinical data: diabetes type, duration of evolution, current treatment, complications, recent HbA1c (retrieved from medical records)
- Self-esteem: assessed by the Rosenberg Self-Esteem Scale (Vallieres & Vallerand 1990), composed of 10 items rated on a 4-point Likert scale. Total score ranges from 10 to 40, with a higher score indicating better self-esteem
- Medication adherence: measured by the Morisky-Green questionnaire adapted by (Girerd *et al.* 2001), comprising 6 dichotomous (yes/no) items. Total score ranges from 0 to 6, allowing adherence to be classified into three categories: good (score = 0), moderate (score = 1-2), and low (score \geq 3).

<u>Statistical analysis</u>

Statistical analyses were performed using SPSS version 25 software. Descriptive statistics (means, standard deviations, frequencies) were calculated to characterize the sample. Normality of distributions was verified by the Kolmogorov-Smirnov test.

The association between self-esteem and medication adherence was examined using multiple linear regression analyses, adjusting for relevant sociodemographic and clinical variables. Logistic regression models were also constructed to identify factors associated with good adherence (vs moderate/low).

Correlations between self-esteem and adherence score were evaluated by Pearson's correlation coefficient. The significance threshold was set at p < 0.05 for all analyses.

Ethical considerations

The study received approval from the ethics committee of the Faculty of Sciences at Ibn Tofail University in Kenitra. Written informed consent was obtained from all participants after a detailed explanation of the study objectives and procedures. Data confidentiality was ensured by anonymizing the questionnaires.

RESULTS

Sample characteristics

A total of 116 diabetic patients were included in the study. Their main sociodemographic and clinical characteristics are presented in Table 1.

Analysis of the sociodemographic and clinical characteristics of our sample (N = 116) reveals several

Tab. 1. Sociodemographic and clinical characteristics of the sample (N = 116)

Characteristic	N (%) or mean ± SD	
Age (years)	50.47 ± 13.22	
Female sex	84 (72.4%)	
Education level		
No formal education	81 (69.8%)	
Secondary	32 (27.6%)	
Higher education	3 (2.6%)	
Marital status		
Married	75 (64.7%)	
Single	8 (6.9%)	
Widowed/Divorced	33 (28.4%)	
Employment status		
Unemployed/Homemaker	81 (69.8%)	
Employed	26 (22.4%)	
Retired	9 (7.8%)	
Type of diabetes		
Туре 1	34 (29.3%)	
Type 2	82 (70.7%)	
Duration of diabetes (years)	9.94 ± 3.87	
HbA1c (%)	7.75 ± 0.83	

notable patterns. The study population is predominantly female (72.4%, n = 84), with a mean age of 50.47 ± 13.22 years, indicating a middle-aged population. The education level distribution shows a marked predominance of individuals without formal education (69.8%, n = 81), followed by secondary education (27.6%, n = 32), while only a small minority reached higher education (2.6%, n = 3). This distribution reflects the persistent educational challenges in certain regions of Morocco.

Regarding marital status, nearly two-thirds of patients are married (64.7%, n = 75), which may influence the social support available for disease management. The significant proportion of widowed or divorced individuals (28.4%, n = 33) warrants attention in terms of psychosocial support. Employment status indicates a high proportion of unemployed or homemakers (69.8%, n = 81), which could have implications for healthcare access and daily diabetes management.

Clinically, the diabetes typology shows a predominance of type 2 (70.7%, n = 82) compared to type 1 (29.3%, n = 34), aligning with general epidemiological trends. The mean diabetes duration of 9.94 ± 3.87 years suggests significant disease experience among participants. Glycemic control, assessed by HbA1c, shows a mean of 7.75 ± 0.83%, indicating suboptimal control according to current recommendations that generally target levels below 7% for most diabetic patients (International Diabetes Federation 2019).

Multiple linear regression analysis revealed several significant associations with medication adherence levels. Self-esteem emerges as a significant positive predictor ($\beta = 0.249$, p = 0.007), indicating that higher self-esteem is associated with better therapeutic adherence. The gender effect is particularly pronounced, with women showing significantly higher adherence ($\beta = 1.627$, p = 0.001), which might be explained by greater health awareness among women in the Moroccan context (Obermeyer 2000).

"Education level shows a significant negative association ($\beta = -0.804$, p = 0.050), suggesting that therapeutic education interventions might need adaptation according to educational background. Diabetes type also influences adherence ($\beta = 0.824$, p = 0.047), with type 2 patients showing better adherence, possibly due to less complex management requirements.

Age shows a negative association ($\beta = -0.463$, p = 0.050), while diabetes duration also presents a negative relationship ($\beta = -0.120$, p = 0.050), highlighting the importance of enhanced support for older patients and those living with the disease longer. Glycemic control (HbA1c) shows a significant positive association ($\beta = 0.328$, p = 0.008), confirming the link between adherence and clinical outcomes.

The logistic regression model confirms and strengthens previous findings, with odds ratios (OR) providing a complementary perspective on factors associated with good adherence. Self-esteem is confirmed as a significant independent predictor (OR = 1.18, 95% CI: 1.04-1.34, p = 0.009), indicating that a one-unit increase in self-esteem score is associated with an

Tab. 2. Factors associated with medication adherence (multiple linear regression)

Variable	Coefficient B	Standard Error	<i>p</i> -value
Self-esteem	0.249	0.091	0.007
Age	-0.463	0.061	0.050
Sex (ref: male)	1.627	0.457	0.001
Education level	-0.804	0.475	0.050
Type of diabetes (ref: type 1)	0.824	0.407	0.047
Duration of diabetes	-0.120	0.067	0.050
HbA1c	0.328	0.119	0.008

Variable	Odds ratio	95% CI	<i>p</i> -value
Self-esteem	1.18	1.04-1.34	0.009
Age	0.97	0.94-1.01	0.062
Female sex	2.45	1.31-4.58	0.005
High education level	1.76	1.05-2.94	0.031
Type 2 diabetes	1.52	0.83-2.78	0.173
Duration of diabetes	0.94	0.88-1.01	0.089
HbA1c	0.68	0.51-0.91	0.010

Tab. 3. Factors associated with good medication adherence (logistic regression)

18% increase in the odds of good adherence. Female gender appears as a particularly favorable factor (OR = 2.45, 95% CI: 1.31-4.58, p = 0.005), with women having nearly 2.5 times higher odds of good adherence compared to men.

Higher education level shows a significant positive association (OR = 1.76, 95% CI: 1.05-2.94, p = 0.031), suggesting that more educated patients have 76% higher odds of good adherence. Glycemic control shows a significant inverse relationship (OR = 0.68, 95% CI: 0.51-0.91, p = 0.010), indicating that an increase in HbA1c is associated with decreased odds of good adherence.

Age (OR = 0.97, p = 0.062), diabetes type (OR = 1.52, p = 0.173), and disease duration (OR = 0.94, p = 0.089) show similar trends to those observed in linear regression, although some do not reach statistical significance in this model. The complementary correlation analysis confirms a moderate positive association between self-esteem and adherence score (r = 0.328, p < 0.001), reinforcing the robustness of this relationship across different analytical approaches.

DISCUSSION

This study highlights a significant positive association between self-esteem and medication adherence in Moroccan diabetic patients, after adjusting for potential confounding factors. These results are consistent with those of previous studies conducted in other contexts, which have also emphasized the importance of selfesteem in diabetes self-management (Kneckt *et al.* 2001; Zulman *et al.* 2012).

Several mechanisms can explain this association. High self-esteem could promote increased self-efficacy, allowing patients to better cope with the daily challenges of diabetes management (Sarkar *et al.* 2009). Self-efficacy, a concept developed by Bandura (1977), refers to an individual's belief in their ability to successfully perform a specific task. In the context of diabetes, strong self-efficacy has been associated with better treatment adherence and glycemic control (Al-Khawaldeh *et al.* 2012).

Moreover, individuals with better self-esteem may be more inclined to adopt positive health behaviors, including adherence to medication treatment (Martyn-Nemeth *et al.* 2009). This tendency could be explained by a greater valuation of their health and an increased desire to take care of oneself. Conversely, low self-esteem can lead to feelings of helplessness and discouragement in the face of chronic illness, reducing motivation to follow therapeutic recommendations (Krichbaum *et al.* 2011).

It is interesting to note that in our study, self-esteem seems to play an important role in predicting adherence, independently of other sociodemographic and clinical factors. This result underscores the relevance of considering psychological aspects, particularly selfesteem, as key elements in the overall management of diabetes.

Our results also highlight the importance of other factors in therapeutic adherence, notably education level and glycemic control. The positive association between education level and adherence has been widely documented in the literature (Schillinger *et al.* 2002; Osborn *et al.* 2011). It could be explained by a better understanding of the disease and its treatment, as well as a greater ability to navigate the healthcare system. The link between better glycemic control and higher adherence can be interpreted bidirectionally: better treatment adherence leads to better glycemic control, which in turn reinforces the patient's motivation to continue their efforts (DiMatteo *et al.* 2002).

The association between female sex and better adherence observed in our study is consistent with some previous work (Manteuffel *et al.* 2014; Rolnick *et al.* 2013), but not all (Curkendall *et al.* 2013). This divergence could be explained by cultural differences in gender roles and health management within Moroccan families. In the Moroccan context, women are often the main responsible for family health, which could make them more attentive to their own health and more inclined to follow medical recommendations (Obermeyer 2000).

CLINICAL IMPLICATIONS AND PERSPECTIVES

Our results have several implications for clinical practice and future research. First, they underscore the importance of systematically assessing self-esteem in diabetic patients as part of their follow-up. This assessment could be integrated into routine consultations, thus allowing identification of patients at risk of low adherence due to low self-esteem.

Interventions aimed at strengthening self-esteem could be integrated into existing therapeutic education programs. These interventions could include cognitive-behavioral techniques, peer support groups, or mind-fulness-based approaches (Rose *et al.* 2011; Friis *et al.* 2016).

It would also be relevant to train healthcare professionals to recognize and address self-esteem issues in their diabetic patients. This awareness could improve doctor-patient communication and promote a more holistic approach to diabetes management.

Furthermore, our results suggest that interventions aimed at improving therapeutic adherence should be adapted according to patients' education level. For patients with low education levels, simplified and visual therapeutic education tools could be developed to facilitate understanding and application of treatment recommendations.

Finally, longitudinal studies are needed to confirm the causal nature of the relationship between selfesteem and therapeutic adherence, and to evaluate the long-term impact of targeted interventions on selfesteem in this population. Randomized controlled trials could be conducted to test the effectiveness of intervention programs aimed at strengthening self-esteem on medication adherence and glycemic control in diabetic patients.

LIMITATIONS OF THE STUDY

This study nevertheless presents certain limitations that should be taken into account in interpreting the results. First, its cross-sectional design does not allow for establishing a causal relationship between self-esteem and adherence. Longitudinal studies will be necessary to clarify the direction of this association.

Moreover, the use of self-reported measures for adherence may have introduced a social desirability bias, potentially leading to an overestimation of therapeutic adherence. More objective methods such as pill counting or the use of electronic monitoring devices could be considered in future studies (Lam & Fresco 2015).

The single-center recruitment in an urban health center limits the generalizability of results to the entire Moroccan diabetic population, particularly to rural areas where access to care and health practices may differ significantly. Multicenter studies including rural and urban populations would be necessary to obtain a more complete picture of the situation in Morocco.

Finally, although our study took into account several important sociodemographic and clinical variables, other factors such as social support, health beliefs, or the doctor-patient relationship were not evaluated. These aspects would merit exploration in future research to obtain a more comprehensive understanding of the determinants of therapeutic adherence in this population.

Conclusion

This study highlights a significant association between self-esteem and medication adherence in Moroccan diabetic patients, independent of other sociodemographic and clinical factors. These results underscore the importance of taking into account psychological factors, particularly self-esteem, in the overall management of diabetes.

The identification of self-esteem as an important predictor of medication adherence opens new perspectives for improving diabetes management in Morocco. Interventions aimed at strengthening self-esteem could contribute to improving therapeutic adherence and, ultimately, disease control.

These results argue for a holistic and culturally adapted approach to diabetes management in Morocco, integrating biomedical and psychological dimensions to optimize patients' therapeutic engagement and improve their quality of life. Longitudinal and interventional studies are needed to confirm these associations and evaluate the impact of targeted interventions on self-esteem in this population.

Ultimately, this study contributes to a better understanding of the psychosocial determinants of therapeutic adherence in diabetes in Morocco, paving the way for more personalized and effective management strategies.

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