

Factors Associated with Suboptimal Adherence to Type 2 Diabetes Medications among Internally Displaced Persons in Camps in Al-Dana Subdistrict, Northwest Syria: A Cross-Sectional Study

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Research Article

Keywords: type 2 diabetes mellitus, medication adherence, internally displaced persons, conflict settings

Posted Date: July 1st, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-9997655/v1>

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Additional Declarations: No competing interests reported.

Version of Record: A version of this preprint was published at Globalization and Health on October 6th, 2026. See the published version at <https://doi.org/10.1186/s12992-026-01242-8>.

Abstract

Background

Chronic disease management is challenging in conflict settings, with fragmented health care systems and unstable access to health care. In Northwest Syria, millions of internally displaced persons (IDPs) live in camps where insecurity, geographic barriers, and disrupted health care services complicate the management of noncommunicable diseases, such as type 2 diabetes mellitus. This study aimed to assess medication adherence among Syrian IDPs living in camps in Al-Dana subdistrict in Northwest Syria and to identify the factors associated with suboptimal medication adherence.

Methods

This cross-sectional study was conducted between January and March 2025 among adults with type 2 diabetes mellitus attending two outpatient health centers serving IDP camps. Data were collected using a structured questionnaire assessing sociodemographic characteristics, clinical history, health care access, health literacy, and medication adherence, which was also determined using the Arabic version of the Adherence to Refills and Medications Scale (ARMS). Descriptive statistics and stepwise logistic regression modeling and adjusted odds ratios (AOR) were used to identify the factors associated with adherence.

Results

Medication adherence was low, with 99.1% of participants demonstrating some degree of nonadherence (mean ARMS score = 21.98 ± 5.59). Higher adherence was associated with attending the Albarakeh health center (AOR = 49.44; 95% CI: 14.6–167.1) and receiving encouragement through regular physician visits and access to health information (AOR = 5.26; 95% CI: 2.07–13.38). Lower adherence was associated with female sex (AOR = 0.31; 95% CI: 0.14–0.70), skipping medication due to long distances to health facilities (AOR = 0.28; 95% CI: 0.08–0.98), and discontinuing medication due to side effects (AOR = 0.26; 95% CI: 0.09–0.72).

Conclusions

Adherence to type 2 diabetes mellitus medications among IDPs in Northwest Syria is critically low and influenced by a combination of structural, geographic, and behavioral factors. Adherence is determined primarily by structural factors, whereas patients' demographic characteristics play a significantly smaller role in medication adherence in the cohorts in the region studied.

Introduction

Armed conflict and forced displacement lead to the marked disruption of health systems, damage to health facilities, limited access to health care, fragmentation of health service delivery, and weakening of health governance. Since the escalation of the Syrian conflict in 2012, > 580,000 deaths have been reported, and nearly 13 million people have been displaced (1, 2). Northwest Syria (NWS) has served as a major refuge for displaced populations, and the health system has been shaped by years of conflict, instability, fragmentation, and dependence on humanitarian actors (3, 4).

Although a significant political transition occurred in December 2024 (with changes in the national governance), internally displaced persons (IDPs) continue to face substantial barriers to returning to their areas of origin, primarily because of ongoing economic hardship and extensive damage to essential infrastructure, including housing, schools, health care facilities, and public services (5, 6).

Noncommunicable diseases (NCDs), particularly diabetes mellitus (DM), contribute to a growing health burden among displaced populations (7). An estimated 5.1 million people reside in NWS, including 3.5 million IDPs, many of whom live in camps; approximately 2 million IDPs have been estimated to have limited access to consistent health care services (8, 9). Estimates based on available local data suggest a high burden of DM, with approximately 80% of cases being type 2 diabetes mellitus (T2DM) (Idleb Health Directorate, personal communication, 2024).

Studies among Syrian refugees in neighboring countries have reported that the prevalence rates of NCDs range from 12% (10) to 30% (11). The rates indicate the importance of chronic disease management in humanitarian settings. Medication adherence refers to the extent to which patients' behavior in terms of taking medication, following dietary recommendations, and making lifestyle modifications corresponds with the agreed-upon recommendations of a health care provider (12); adherence is a critical component of effective diabetes management, as low adherence is associated with increased complication rates and adverse health outcomes.

However, for patients, maintaining optimal medication adherence is challenging in conflict-affected and resource-limited settings. Evidence from refugee populations in Jordan (13–15) and Lebanon (16) shows that adherence is influenced by multiple factors, including low health literacy, financial hardship, limited access to health care, transportation barriers, and medication side effects (15–17). Cultural beliefs and reliance on alternative therapies may further affect adherence behaviors (17, 18). Overall, adherence among displaced populations is shaped by a complex interplay of structural, socioeconomic, and behavioral determinants (19). Armed conflicts clearly exacerbate health care-related issues in the camps by disrupting health services and causing a shortage of medicines.

However, context-specific evidence on medication adherence among IDPs in camp settings in NWS remains scarce. Despite the unique challenges posed by the disruption of health systems, geographic barriers, and ongoing instability (20), understanding adherence patterns in this context is essential for informing targeted interventions and improving chronic disease management.

Objectives

Our study aimed to assess adherence to T2DM medications among Syrian IDPs living in camps in Al-Dana subdistrict in NWS and to identify the factors associated with suboptimal adherence. Through this study, we evaluated the relative contributions of patient-level risk factors and key health care system characteristics to adherence patterns among IDPs.

Methods

Study design and setting

This study was conducted among IDPs living in camps located in Al-Dana subdistrict in Idleb Governorate, Syria, where 917,434 IDPs were residing in 2023. This study utilized data from the United Nations Office for the Coordination of Humanitarian Affairs (Action for Humanity, personal communication, 2025). This cross-sectional investigation was implemented in Babalhawa and Albarakeh camps, with population sizes of 40,754 and 36,900 in 2025, respectively, according to the local staff of outpatient health centers operated by Action for Humanity (personal communication). Data collection was conducted between January 7 and March 4, 2025.

Sampling

The study population included patients with T2DM who were registered at the outpatient centers in the two camps. Eligible participants were adults aged 18–75 years who had resided in the camps for at least 6 months. Patients with type 1 diabetes mellitus or gestational diabetes were excluded. Each registered T2DM patient was targeted for data collection.

Data collection

Data were collected from eligible participants during routine monthly clinic visits using a structured questionnaire administered by trained nurses. The questionnaire was integrated into routine clinical care to facilitate participation. Data were recorded electronically using the Kobo Toolbox platform (Harvard Humanitarian Initiative, Boston, MA, USA). All the data collectors received training, and to ensure consistency and data quality, the process was supervised by outpatient center directors.

Outcome variable

Medication adherence was assessed using the Adherence to Refills and Medications Scale (ARMS) (21). ARMS is a validated 12-item instrument that is used to evaluate both patient-level behaviors and structural barriers affecting adherence. The total scores range from 12 to 48, with lower scores indicating higher adherence. An Arabic version of the scale was provided by the original author. For analysis, ARMS scores were dichotomized at the median value to categorize participants into a higher adherence group (including patients with median and lower than median adherence scores; HAG) and a lower adherence group (including patients with higher than median scores; LAG).

Explanatory variables

Explanatory variables included sociodemographic characteristics (age, sex, marital status, employment status, and educational level), clinical characteristics (duration of diabetes, systolic blood pressure, fasting blood glucose, weight, height, waist circumference, smoking status, duration of medication use, number of medications, and presence and treatment of complications), and health care-related factors (including barriers to medication adherence). Barriers to medication adherence was assessed using the Health Care Barriers and Support for Adherence questionnaire. In addition, the use of complementary and alternative medicine was examined as a potential factor influencing medication adherence (13,22,23). Health literacy was assessed using the Brief Health Literacy Screening Tool 3 (24), a validated 3-item instrument designed to evaluate patients' ability to understand medical information. This study used the Arabic version of the screening tool, which has been validated and applied in Arabic-speaking populations, including in Lebanon (25).

Statistical analysis

Descriptive measures for categorical variables were calculated through cross-tabulation with the chi-square test and Fisher's exact test. The non-normally distributed continuous variables are described as medians and interquartile ranges (IQRs), and they were tested using the Mann–Whitney U test. The determinants of dichotomized adherence were examined using a stepwise forward binary logistic regression model. Crude odds ratios (CORs) and adjusted odds ratios (AORs) with 95% confidence intervals (95% CIs) were reported. The impact of risk factors on medication adherence was determined using a regression model. The attributable risk among patients (ARP) was computed to rank the risk factors. All data analyses were conducted and descriptive and inferential statistics were calculated using IBM SPSS Statistics (Version 27).

Ethics approval and consent to participate

Ethical approval for this study was obtained from the Idleb Health Directorate (Approval No.: 1/126/S, December 22, 2024). Oral informed consent was obtained from all participants, as approved by the ethics authority, owing to the low-risk nature of the study and contextual constraints. Participation was voluntary, and the confidentiality of all the collected data was maintained throughout the study. All analyses were conducted using anonymized data.

Results

No eligible patient refused study participation, resulting in a response rate of 100%. A total of 499 patients with DM were identified from the outpatient center records. Of these, 477 had T2DM, and 22 had type 1 diabetes mellitus. Among patients with T2DM, 14 had been living in the camps for <6 months, and 238 had either left the area or transferred to another health facility. Consequently, 225 eligible participants (72 from the Albarakeh camp and 153 from the Babalhawa camp) were included in the

study (**Figure 1**). The mean ARMS ($\pm$ SD) score was 21.98 ($\pm$ 5.59). The distribution of ARMS scores is presented in **Figure 2**. The median score was 20 (IQR = 4).

Sociodemographic characteristics

The HAG consisted of 68 males (68%) and 60 females (32%), and the LAG included 32 males (52%) and 65 females (48%). The difference in sex distribution was significant ($P = 0.003$). In addition, in the HAG, 59.3% and 33.3% of individuals were married and separated, respectively ($P = 0.022$). Participants from the Albarakeh center were more likely to be included in the HAG than those from the Babalhawa center were ($P < 0.001$). A higher proportion of participants who had lived in the camps for 5–7 years exhibited higher medical adherence ($P = 0.012$), as shown in **Table 1**.

Clinical characteristics and diabetes management

Significant differences were found in the number of DM medications prescribed by physicians between the HAG and LAG ($P < 0.001$). A higher proportion of patients in the HAG had measurements of systolic blood pressure (67% vs. 47.4%; $P = 0.003$). Regarding DM complications, a higher proportion of individuals in the HAG experienced complications, such as numbness, tingling, or pain in their hands or feet (62.4% vs. 40%; $P = 0.004$). A lower proportion of patients in the HAG experienced any mental health issue (44% vs. 64.5%; $P = 0.003$). Smokers and former smokers were also more frequently represented in the HAG ($P < 0.001$) (**Table 2**).

Health care barriers and support factors

More than three-quarters (76%) of the participants who received a different medication than the one prescribed, due to the unavailability of the prescribed medication, belonged to the HAG. In comparison, 54.4% of patients who did not receive alternative medications were adherent ($P = 0.041$). In the HAG, 41.3% of the patients stopped taking diabetes medication because of side effects, without consulting a physician; however, 60.9% of those in the HAG continued taking diabetes medications ($P = 0.017$). Among patients who believe that herbal remedies and alternative treatments are better than conventional DM medications, 47.4% were from the HAG, and 52.6% were from the LAG ($P = 0.034$) (**Table 3**).

Multivariate modeling

Sex, center location, skipping medication due to long distances to health facilities, stopping medication without physician consultation because of side effects, and receiving encouragement to adhere to the medications significantly influenced the dichotomized medication adherence score in the stepwise multivariable logistic regression analysis ($r^2 = 0.460$). Compared with male patients, female patients exhibited lower medication adherence (AOR = 0.312; 95% CI: 0.140-0.697). Patients who skipped medication because of distances to health centers exhibited reduced medication adherence (AOR = 0.282; 95% CI: 0.081-0.981). Patients who stopped taking medication without physician consultation because of side effects also exhibited reduced adherence (AOR = 0.255; 95% CI: 0.091 –

0.718). High adherence was much more common among individuals attending the Albarakeh center than among those attending the Babalhawa center (AOR = 49.444; 95% CI: 14.630–167.108). Patients who received encouragement through regular doctor visits and better access to health information exhibited higher adherence (AOR = 5.263; 95% CI: 2.070–13.382) than those who received encouragement through free medication. (**Table 4**)

According to the regression model, location ($ARP_{\text{reference-Babalhawa}} = -45.40\%$) and patient encouragement by physicians ($ARP_{\text{reference-by free medication}} = -39.40\%$) were with the highest impact on having better adherence. The side effects of medication ($ARP = 7.82\%$) and the distance to the health center ($ARP = 4.20\%$) exerted less influence on medication adherence. Sex had an intermediate impact ($ARP_{\text{reference-male}} = 26.13\%$).

Discussion

Main findings

Medication adherence among IDPs with T2DM in NWS was extremely low, with a mean ARMS score ($\pm$ SD) of 21.98 ($\pm$ 5.59). None of the participants achieved perfect adherence, and 99.1% demonstrated some degree of nonadherence. Adherence levels in this study were substantially lower than those reported among Syrian refugees in neighboring countries (13,26,27). A Lebanese household survey similarly reported higher medication interruption among refugees than among host communities, which was mainly driven by barriers to health care access (18). The markedly low adherence observed in our study likely reflects the cumulative effects of prolonged conflict, insecurity, economic hardship, population displacement, and fragmentation of the health care system in NWS, all of which compromise the continuity of care and medication access (3, 20).

Multivariate analysis revealed several independent predictors of adherence, including health center location, distance-related barriers, sex, discontinuation of medication due to side effects, and the type of encouragement received. Contextual and health system-related factors exerted a high influence on medication adherence; for example, patients attending the Albarakeh health center exhibited nearly 50-fold higher odds of adherence than those attending the Babalhawa health center. These findings demonstrate that in conflict-affected settings, the influence of structural conditions may be higher than that of individual-level determinants.

The observed effect of the center location likely reflects the differences in security stability, geographic accessibility, and health care delivery continuity. The Albarakeh center is located in a relatively stable and safer area, which facilitates routine follow-up, medication collection, and sustained patient–provider interactions. Evidence has demonstrated that attacks on health infrastructure and insecurity reduce health care utilization and disrupt chronic disease management in NWS (20,29), as reflected by the principle that “there cannot be health without peace” (30). On the other hand, Babalhawa’s mountainous terrain and poor road access, particularly during winter, create substantial barriers to accessing health

care services and medications; this observation is consistent with regional reports (31). Differences in community outreach may also contribute to the effect of the center location, as more active and supervised community health worker (CHW) programs are prevalent in Albarakeh, whereas outreach activities in Babalhawa are constrained by insecurity and population mobility. Similar evidence indicates that the effectiveness of CHW programs in humanitarian settings depends substantially on stability, supervision, and accessibility (32). Together, these findings reinforce the important roles of health system resilience and community connectivity in sustaining chronic disease management during conflict.

Distance-related barriers also played a significant role in adherence. Patients who skipped medications because of the distance to the health center exhibited substantially lower odds of adherence. Geographic inaccessibility is a recognized structural determinant of nonadherence, particularly in conflict settings where transportation difficulties, insecurity, and damaged infrastructure limit health care access (33). Similar declines in medication adherence during periods of conflict and restricted mobility have been documented in Gaza and Sudan (34,35). The consistent influence of the center location and distance-related barriers on adherence indicates the central role of health care accessibility in chronic disease management for displaced populations.

Although some European studies have shown that women generally exhibit slightly more adherence than men (36,37), in the case of T2DM, no clear sex difference in adherence has been observed (38,39). In contrast, in our study, female participants exhibited significantly lower adherence. This finding is consistent with evidence derived from low-resource and humanitarian crisis settings, where women often experience greater barriers to chronic disease care (40). In displaced Syrian populations, women experience mobility restrictions, caregiving responsibilities, financial dependence, and limited autonomy in health care decision-making (41). These social and structural constraints likely contribute to reduced health care engagement and medication adherence among female patients (33,35).

Patients who stopped taking medication because of side effects exhibited significantly lower adherence. This result is consistent with the finding that concerns regarding adverse effects contribute to intentional nonadherence in chronic disease management (42). Among Syrian IDPs, displacement-related stress, limited continuity of care, reduced counseling opportunities, and misconceptions regarding diabetes medications may further increase concerns related to gastrointestinal symptoms or hypoglycemia (43, 44). Similar associations between adverse effects and reduced adherence have also been reported among Syrian refugees in Jordan (13).

Patients encouraged through regular physician visits and health information access exhibited significantly higher adherence than those who relied primarily on free medication provision. These findings suggest that adherence is influenced not only by financial access to medication, but also by personal interactions (patient engagement and counseling). Previous studies have shown that compared with passive medication distribution alone, structured follow-up, provider feedback, and health education more effectively improve medication adherence (43,45). A study on refugees in Lebanon similarly

demonstrated improved adherence and glycemic control among patients receiving regular follow-up care (26). In this study context, routine clinical visits likely led to improvement in adherence by combining medication provision with consultation, disease monitoring, and ongoing therapeutic support.

Implications

Health system resilience should be strengthened for improving medication adherence among IDPs with T2DM in NWS. The related measures include the protection of health care facilities, stabilization of medication supply chains, expansion of community outreach programs, and implementation of flexible service delivery models. In remote and underserved areas, geographic accessibility should be prioritized through the establishment of mobile clinics, community-based distribution of drugs, and improvement of transportation support (31,32). Gender-sensitive approaches, including female-focused services and female health care workers, may help reduce disparities in access to care. In addition, structured counseling, regular follow-up, and patient-centered health education should be integrated into chronic disease management programs for addressing medication misconceptions, improving the management of side effects, and strengthening long-term adherence behaviors.

Strengths and limitations

A major strength of this study is that it was conducted in conflict-affected camp settings in NWS, which is a highly vulnerable and under-researched context where evidence on medication adherence among IDPs remains scarce. In addition, the study used validated instruments and examined a wide range of sociodemographic, clinical, and health system-related factors, enabling the comprehensive assessment of adherence determinants in a complex humanitarian setting. The study also achieved a high participation rate of 100%, reducing the likelihood of nonresponse bias and increasing internal validity.

However, the cross-sectional design limits causal inference. The use of self-reported measures may also introduce recall and social desirability bias. Selection bias is also possible because only patients attending health care facilities were included, potentially excluding individuals with the greatest barriers to care. This study was restricted to two centers, which may limit the generalizability of the findings to other regions of NWS. Residual confounding from unmeasured factors (types of T2DM medications, contribution of CHWs) may also affect the findings. In addition, ongoing political and security instability during data collection may have affected patient accessibility, population mobility, and sample size.

Conclusions

T2DM medication adherence among IDPs in NWS was critically low, reflecting the effects of conflict, insecurity, displacement, and health system fragility. The strongest and most important determinants of adherence were location- and health system-related factors, particularly the safety and stability of health care services, geographic accessibility, and continuity of care. Patient engagement through regular follow-up and health education exerted less influence on adherence. Individual factors, including female sex and reactions to medication side effects, were also associated with lower adherence but appeared

to be less influential than structural barriers were. These findings demonstrate that in humanitarian settings, health system conditions may play a greater role than individual characteristics in shaping chronic disease management.

In conflict-affected settings, ensuring safe and continuous health care services is essential for sustaining the management of NCD (such as T2DM). Strengthening health system resilience through the protection of health care facilities, improved geographic access, community-based outreach, gender-sensitive interventions, the management of medication side effects, and sustained patient engagement may improve adherence and chronic disease outcomes among displaced people.

Declarations

Ethics approval and consent to participate

Ethical approval for this study was obtained from the Idleb Health Directorate (approval number: 1/126/S, dated 22 December 2024). The study used anonymized data. Verbal informed consent was obtained from all participants, and all procedures were conducted in accordance with relevant ethical standards.

Consent for publication

Not applicable.

Availability of data and materials

The database of the investigation had been archived in the figshare repository (<https://doi.org/10.6084/m9.figshare.17158121.v1>). This file can be downloaded without any restriction. All the indicators reported in our manuscript can be produced from this dataset. The personal identifiers of the participants have been removed from the dataset, in order to prevent the violation of the personal rights of participants.

Competing interests

The authors declare that they have no competing interests.

Funding

This reported study was supported by the Stipendium Hungaricum Scholarship Program (grant SHE-00714-004/2020 to L.A.). The project was co-financed by the Hungarian Research Network—HUN-REN (TKCS-2021/32).

Authors' contributions

L.A. prepared the literature review, analyzed and interpreted the data, and prepared the draft of the paper; A.A.A. and A.K. prepared the primary database; S.N.S., B.A.A., and A.C. analyzed and interpreted the data; J.S. elaborated on the design, conceived and interpreted the results, and finalized the manuscript. All authors have read and agreed to the published version of the manuscript.

Use of artificial intelligence (AI) tools

The authors used artificial intelligence (AI) tools to assist with language refinement. All content, interpretations, and conclusions are the sole responsibility of the authors, who reviewed and approved the final version of the manuscript.

Acknowledgments

The author gratefully acknowledges Dr. Abdulkarim Ekzayez, MD, PhD, co-lead of the Research for Health System Strengthening in Syria (R4HSSS) project at King's College London and Syria Country Director of Action for Humanity, for his guidance and support. Appreciation is also extended to Action for Humanity for its institutional support, and all healthcare providers, field data collectors, and participants for their essential contributions under challenging field conditions.

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Tables

Table 1

Distribution of patients' sociodemographic characteristics according to their medication adherence.

Variables		Medication adherence		P-value
		median and lower-than median n (%)	higher than median n (%)	
Age	18–50 years	29 (64.4)	16 (35.6)	0.330
	51–70 years	91 (56.2)	71 (43.8)	
	> 70 years	8 (44.4)	10 (55.6)	
Sex	Male	68 (68.0)	32 (32.0)	0.003
	Female	60 (48.0)	65 (52.0)	
Marital status	Married	121 (59.3)	83 (40.7)	0.022
	Widowed/divorced	7 (33.3)	14 (66.7)	
Education	Illiterate	48 (53.3)	42 (46.7)	0.062
	Elementary/preparatory	50 (56.8)	38 (43.2)	
	Secondary	18 (52.9)	16 (47.1)	
	Tertiary	12 (92.3)	1 (7.7)	
Employment	Employed	7 (58.3)	5 (41.7)	0.917
	Unemployed	121 (56.8)	92 (43.2)	
Camps' location	Albarakeh	63 (87.5)	9 (12.5)	< 0.001
	Babalhawa	65 (42.5)	88 (57.5)	
Staying in camp	0–4 years	12 (54.5)	10 (45.5)	0.012
	5–7 years	71 (67.0)	35 (33.0)	
	> 8 years	45 (46.4)	52 (53.6)	
Total		128	97	

Table 2
Distribution of patients' clinical status according to their medication adherence

Variables		Medication adherence		P-value
		median and lower than median, n (%)	higher than median, n (%)	
Time since diagnosis	≤ 3 years	38 (66.7)	19 (33.3)	0.107
	4–7 years	37 (59.7)	25 (40.3)	
	≥ 8 years	53 (50.0)	53 (50.0)	
Number of medications	one	31 (79.5)	8 (20.5)	< 0.001
	two	75 (48.4)	80 (51.6)	
	≥three	22 (71.0)	9 (29.0)	
Duration of medication	1–3 years	40 (67.8)	19 (32.2)	0.115
	4–7 years	36 (56.3)	28 (43.8)	
	≥ 8	52 (51.0)	50 (49.0)	
Systolic blood pressure	registered	73 (67.0)	36 (33.0)	0.003
	not registered	55 (47.4)	61 (52.6)	
Fasting blood glucose	registered	114 (57.6)	84 (42.4)	0.680
	not registered	14 (51.9)	13 (48.1)	
Body weight	registered	37 (64.9)	20 (35.1)	0.157
	not registered	91 (54.2)	77 (45.8)	
Height	registered	31 (62.0)	19 (38.0)	0.408
	not registered	97 (55.4)	78 (44.6)	
Waist circumference	registered	9 (64.3)	5 (35.7)	0.564
	not registered	119 (56.4)	92 (43.6)	
Smoking	non-smoker	87 (59.6)	59 (40.4)	< 0.001
	former smoker	9 (27.3)	24 (72.7)	
	smoker	32 (69.6)	14 (30.4)	
Treatment for complication	yes	93 (61.6)	58 (38.4)	0.110
* Related to DM				

	no	28 (51.9)	26 (48.1)	
	no complication	7 (35.0)	13 (65.0)	
Blurred vision	present	93 (53.8)	80 (46.2)	0.084
	absent	35 (67.3)	17 (32.7)	
Kidney involvement	present	16 (66.7)	8 (33.3)	0.306
	absent	112 (55.7)	89 (44.3)	
Numbness, tingling, or pain in hands or feet	present	106 (62.4)	64 (37.6)	0.004
	absent	22 (40.0)	33 (60.0)	
Heart disease, heart attack, stroke	present	26 (54.2)	22 (45.8)	0.668
	absent	102 (57.6)	75 (42.4)	
Foot sore, infection or amputations*	present	30 (68.2)	14 (31.8)	0.092
	absent	98 (54.1)	83 (49.9)	
Hypertension	present	61 (64.2)	34 (35.8)	0.058
	absent	67 (51.5)	63 (48.5)	
Skin manifestations	present	25 (58.1)	18 (41.9)	0.854
	absent	103 (56.6)	79 (43.4)	
Gum's alterations	present	22 (62.9)	13 (37.1)	0.438
	absent	106 (55.8)	84 (44.2)	
Mental health issues	present	37 (44.0)	47 (56.0)	0.003
	absent	91 (64.5)	50 (35.5)	
Belief in herbal/alternative over conventional medication	Yes	37(47.4)	41(52.6)	0.034
	No	70(58.8)	49(41.2)	
	Uncertain	21(75.0)	7(25.0)	
* Related to DM				

Table 3

Distribution of features of services provided in camps according to the dichotomized adherence score

Determinants		Medication adherence		P-value
		median and lower than median, n (%)	higher than median, n (%)	
Obtaining diabetes medication	Free of charge from health clinic and center	127 (57.2)	95 (42.8)	0.719
	Private pharmacy	1 (50.0)	1 (50.0)	
Skip medication due to distance	Yes	13 (44.8)	16 (55.2)	0.160
	No	115 (58.7)	81 (41.3)	
Distance of health center	Less than 10 minutes	62 (59.0)	43 (41.0)	0.775
	10 to 30 minutes	60 (55.6)	48 (44.4)	
	More than 30 minutes	6 (50.0)	6 (50.0)	
Asked others for medication	Yes	38 (51.4)	36 (48.6)	0.240
	No	90 (59.6)	61 (40.4)	
Medication substitution due to shortage	Yes	19 (76.0)	6 (24.0)	0.041
	No	109 (54.5)	91 (45.5)	
Buy medication due to not available	Yes	113 (58.2)	81 (41.8)	0.303
	No	15 (48.4)	16 (51.6)	
Cost affects adherence	Yes	125 (56.6)	96 (43.4)	0.636
	No	3 (75.0)	1 (25.0)	
Satisfaction with camp healthcare	Yes	125 (57.6)	92 (42.4)	0.295
	No	3 (37.5)	5 (62.5)	
Stops medication without consultation	Yes	19 (41.3)	27 (58.7)	0.017
	No	109 (60.9)	70 (39.1)	
Encouragement to adhere	Availability of medication free of charge	47 (51.6)	44 (48.4)	0.191
	Regular doctor visits and better health information access	81 (60.4)	53 (39.6)	

Determinants		Medication adherence		P-value
		median and lower than median, n (%)	higher than median, n (%)	
Physician recommends healthy lifestyle change	Yes	127 (57.2)	95 (42.8)	0.579
	No	1 (33.3)	2 (66.7)	
Difficulty in adherence	Cost of medication	102 (59.3)	70 (40.7)	0.377
	Forgetting to take medication	9 (45.0)	11 (55.0)	
	others	17 (51.5)	16 (48.5)	
Availability of cost-free DM medications dispensed by NGOs health facility	Rarely/sometimes	48 (49.5)	49 (50.5)	0.051
	Always	80 (62.5)	48 (37.5)	
Awareness that diabetes leads to complications if it is not treated	Yes	120 (58.0)	87 (42.0)	0.266
	No	8 (44.4)	10 (55.6)	
Health literacy	median, IQR	5 (4–9)	5 (4–7)	0.545

Table 4

Determinants of medication adherence, according to stepwise logistic regression modelling.

Variable		AOR (95%CI)
Sex	Male	Reference
	Female	0.312 (0.140–0.697)
Center's location	Babalhawa	Reference
	Albarakeh	49.444 (14.630–167.108)
Skip medication due to distance	No	Reference
	Yes	0.282 (0.081–0.981)
Stop medication without consultation	No	Ref
	Yes	0.255 (0.091–0.718)
Encouragement to adhere	Availability of medication free of charge	Reference
	Regular doctor visits and better health information access	5.263 (2.070–13.382)

Figures

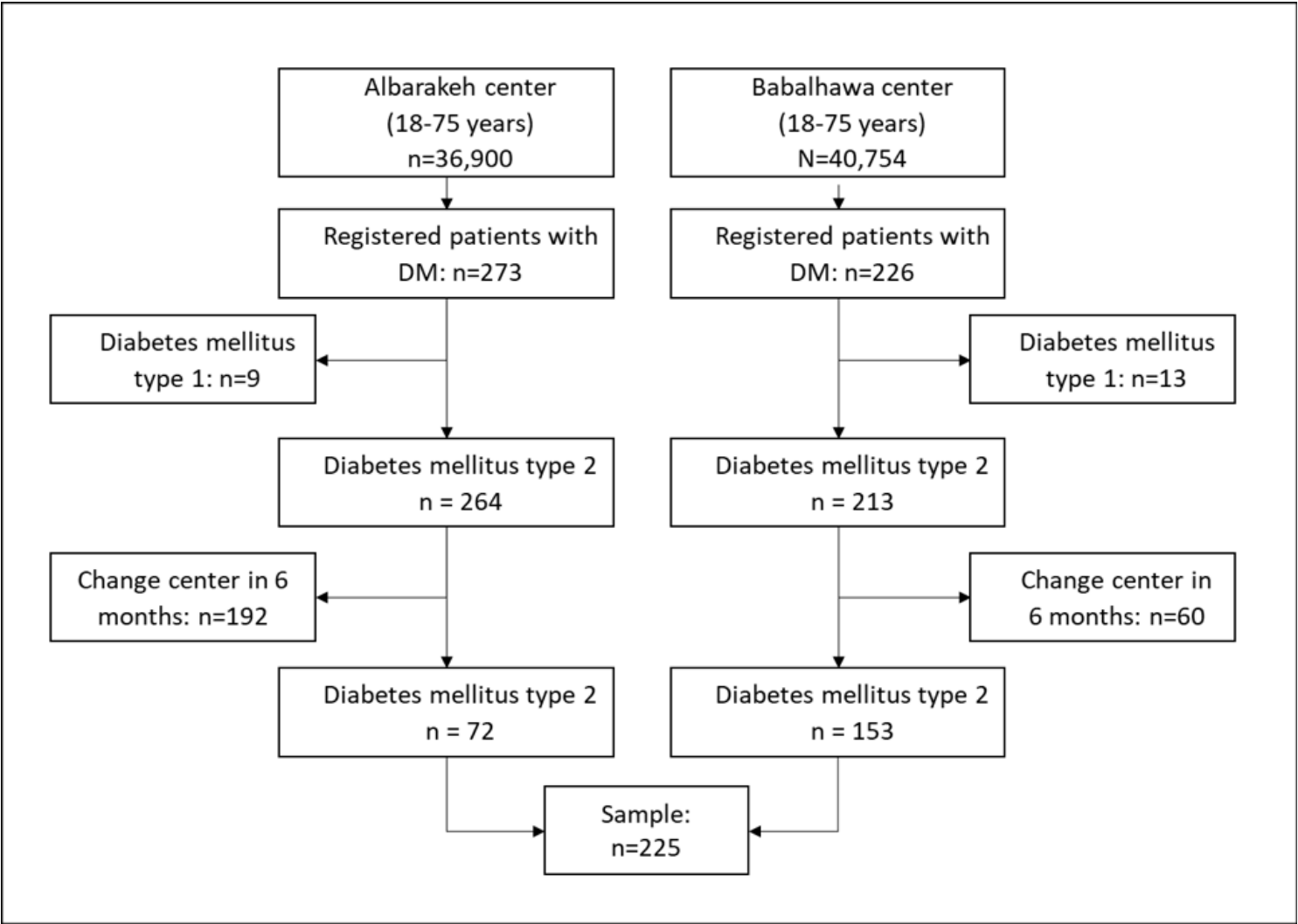


Figure 1

Flow chart on patients' selection

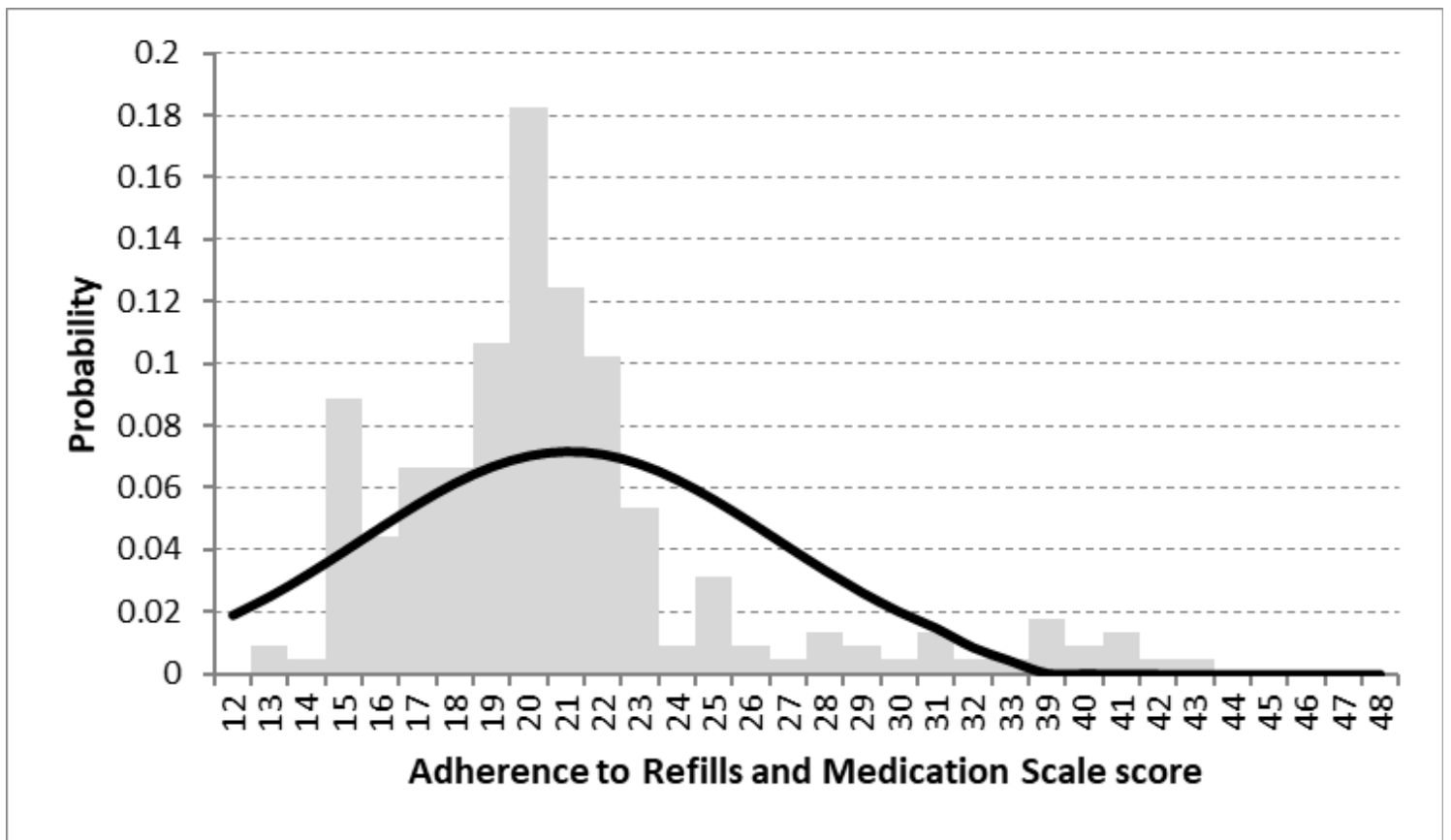


Figure 2

The distribution of ARMS scores (with normal curve: mean= 21.1, SD= 5.593, $p_{\text{Kolmogorov-Smirnov test}} < 0.001$)