Pharmacist-led screening for social determinants of health and diabetes distress in adults with type 2 diabetes

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Abstract

Introduction: Social determinants of health (SDOH) significantly influence Type 2 diabetes (T2DM) outcomes but are often unaddressed in traditional care models. Diabetes-related distress (DD) also contributes to suboptimal disease control. Pharmacists in ambulatory settings are well-positioned to screen for and respond to these non-clinical barriers.

Objective: To assess the prevalence of SDOH needs and DD among patients in a pharmacist-led clinic and describe interventions provided in response.

Methods: This cross-sectional study was conducted over a seven-month period. Forty adult patients with T2DM attending in-person pharmacist-led visits were screened for SDOH and DD using validated tools. Descriptive statistics and Spearman correlations were used to analyze relationships among HbA1c, SDOH burden, and DD.

Results: The majority of patients were female (72.5%) and African American (87.5%). SDOH needs were identified in 67.5% of patients, with the most common being lack of social support (44.4%), financial strain (40.7%), and food insecurity (29.6%). Moderate to high DD (T2-DDAS CORE ≥2.0) was present in 50.0% of patients. A significant, moderate positive correlation was observed between baseline HbA1c and T2-DDAS CORE scores (Spearman $\rho = 0.423$, $p = 0.007$; $R^2 = 0.191$). Pharmacists provided a mean of 1.9 ± 0.9 interventions per patient visit, which included both routine clinical actions and screening-prompted interventions. Routine care most commonly included medication adjustment (n=23) and diabetes self-management education and support (n=19), whereas referral to community resources were the most frequent screening-prompted interventions, driven by both SDOH (n=11) and DD (n=6) findings. The mean combined time to complete both screenings was 6.45 ± 2.32 minutes.

Conclusion: Pharmacist-led screenings identified a high prevalence of unmet SDOH needs and DD. Interventions prompted by SDOH and DD screenings were feasible to implement and may support improved diabetes management.

Keywords: clinical pharmacist; ambulatory care; diabetes mellitus, type 2; social determinants of health; diabetes-related distress

Introduction

Unmet social determinants of health (SDOH) needs – such as food or housing insecurity, transportation gaps, and financial strain – directly impact medication access, self-management, and glycemic control for patients with Type 2 Diabetes Mellitus (T2DM).[1,2] Despite evidence on the effectiveness of SDOH screening for improved outcomes in T2DM, there has been limited uptake and capacity for these screenings in routine primary care practices, which highlights an opportunity for ambulatory care pharmacists embedded in these settings.[3–5] Clinical pharmacists embedded into ambulatory care teams across the U.S. contribute to therapeutic decision-making for patients with T2DM, and numerous studies have been published on their impact in lowering glycated hemoglobin (HbA1c) and improving disease outcomes.[6]

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As such, these clinical pharmacists are uniquely positioned to screen for, and intervene on, SDOH. In a recent multi-site evaluation of a brief SDOH screening implemented at a network of Federally Qualified Health Centers, more than half of patients with T2DM screened by pharmacists during comprehensive medication management encounters had at least one SDOH barrier identified; embedding the systematic SDOH screening was found to be associated with clinically meaningful improvements in HbA1c.[7]

Diabetes-related distress (DD) – the emotional distress that results from living with diabetes and the requirements of self-management – poses an independent challenge in managing T2DM as it is more prevalent than comorbid depression and anxiety in these patients.[8–10] Data suggests that higher DD is a predictor for lower medication adherence over time and is more strongly associated with elevated HbA1c than depressive symptoms alone.[11] A recent study in a pharmacist-run clinic demonstrated that routine DD screening, accompanied by patient counseling and medication optimization significantly reduced distress while also improving HbA1c.[12] Embedding the DD assessment alongside the SDOH screening therefore offers a pathway for ambulatory care pharmacists to provide more comprehensive patient-centered care during routine medication management encounters.

Cooper Green *Mercy* Health Services Authority (CGMHSA) is a safety-net ambulatory clinic in Birmingham, AL, serving a predominantly African-American population in an area with a high prevalence of T2DM.[13] Ambulatory care clinical pharmacists are embedded within the primary care service and support two clinical "pods," with one full-time clinical pharmacist assigned to each "pod." Pharmacists provide medication management in the Clinical Pharmacy (CP) clinic under a collaborative practice agreement (CPA). Patients are referred to CP clinic by their primary care provider (PCP) for the management of conditions such as T2DM, hypertension, dyslipidemia, smoking cessation, and other chronic disease states. Clinical pharmacists also conduct same-day, in-person consultations for complex patients identified by PCPs. In addition to the two full-time clinical pharmacists, an academic faculty pharmacist practices at the site on a part-time basis and contributes to both direct patient care and experiential education of pharmacy students. This integrated care model, with pharmacists embedded within primary care teams, provides an ideal opportunity to incorporate systematic SDOH and DD screening into routine care for CP clinic patients with T2DM.

Published studies examining pharmacist-led screening for either SDOH barriers or DD in underserved populations with T2DM is sparse.[7,12,14] To the authors' knowledge, there is no published evidence describing a workflow in which ambulatory care pharmacists screen for both SDOH and DD during the same visit while providing tailored interventions to identified social needs and diabetes-related emotional distress. This highlights the need for the present analysis. This study aimed to (1) quantify the prevalence of unmet SDOH needs and DD among adults with T2DM seen by ambulatory care pharmacists at CGMHSA; and (2) describe the frequency and type of pharmacist interventions delivered to mitigate the impact of these non-clinical barriers to care. Investigators hypothesized that ≥50% of screened patients would have ≥1 SDOH barrier and that higher levels of DD would positively correlate with baseline HbA1c, number of diabetes medications, and the number of identified SDOH barriers.

Methods

Study Design and Setting

This cross-sectional study was conducted at CGMHSA, an urban ambulatory clinic in Birmingham, Alabama, from October 10, 2024, through May 5, 2025. The study was reviewed and deemed exempt by the Samford University Institutional Review Board and the CGMHSA Research and Grants Review Committee. The STROBE reporting guidelines were followed.[15]

Patient Selection

Patients are routinely referred to CP clinic by their PCP for T2DM pharmacotherapy management and assistance with complex clinical needs – such as polypharmacy, labile glycemic patterns, barriers to medication access, and the need for device- or education-related support. During the study period, pharmacists screened consecutive, newly referred patients presenting in-person to the CP clinic for T2DM management. Enrollment occurred sequentially from the start of the study period until forty in-person CP clinic visit encounters were completed. The target of forty completed encounters was reached before any previously screened patient returned for a subsequent in-person visit; thus, no patient was screened more than once in the present study.

Patients were included if they were ≥19 years old, English-speaking, and had a documented diagnosis for T2DM within the electronic health record (EHR). In-person visits were chosen for screening over telehealth visits given the sensitive nature of SDOH and DD questions. Patients were excluded if they were pregnant, declined the screening, or had cognitive impairment requiring a guardian/caregiver for medical management.

A goal of forty completed visits was selected because samples of ≥30 are commonly viewed as sufficient, as stated by the Central Limit Theorem, to yield an approximately normal sample distribution; thus, producing more reliable descriptive statistics.[15] Given the pharmacist-run clinic's approximate 45% no-show rate for face-to-face visits, and high percentage of telehealth visits, the authors calculated that 73 in-person appointments had to be scheduled to meet the target of 40 completed encounters. A seven-month recruitment period was chosen to give ample time to reach the enrollment goal, while accounting for routine absences, the clinic's high no-show rate for in-person visits, and several days of "downtime" during CGMHSA's relocation to a new facility in December 2024.

Visit Structure and Screening Instruments

In-person visits for T2DM management in CP clinic typically include review of medical history, medication reconciliation, review of glycemic data and labs, pharmacotherapy management, and documentation of the visit encounter within the EHR.

For patients who provided verbal consent to participate, at the start of each visit, pharmacists verbally administered two validated tools: the Health Leads Screening Toolkit to identify unmet SDOH needs[16] and the Type 2 Diabetes Distress Assessment System (T2-DDAS) CORE to measure DD.[17] These tools were utilized because they are among the shortest validated instruments available for their respective domains, allowing for an efficient pilot of the screenings within a busy pharmacist-run clinic.

The Health Leads Screening Toolkit[16] contains ten "Yes/No" items which screen for social needs in the following domains: food insecurity, utility needs, housing instability, child care barriers, cost-related barriers to medical care, transportation barriers to accessing health care, difficulty reading hospital

materials, and social isolation – with a follow-up item assessing whether patients who endorsed a need would like assistance in addressing it. Affirmative ("yes") responses were considered a positive screen for a social need in the corresponding domain, and responses to the concluding item on desire for assistance were used to guide pharmacist action.

The T2-DDAS[17] instrument consists of 29 items, including an 8-item CORE scale that assesses overall DD and a 21-item SOURCE scale that assesses specific sources of DD (e.g. concerns about long-term complications, interactions with healthcare providers, and lack of support from family or friends). Items are rated on a 5-point Likert-type scale, ranging from 1 = "not a problem" to 5 = "a very serious problem." For this study, the 8-item T2-DDAS CORE scale was used as a brief measure of patients' general emotional burden associated with living with and managing T2DM. Item scores were averaged to generate a mean distress score – with mean scores <2.0 indicating little/no distress, 2.0–2.9 moderate distress, and ≥3.0 high distress.[17]

Of note, medication adherence was assessed qualitatively during the in-person encounters using open-ended questions and clinical judgement; because this informal approach has not undergone psychometric validation, adherence data are not reported in the present manuscript.

Pharmacist Interventions

Using CPA authority, pharmacists adjusted pharmacotherapy, requested orders for lab tests, and provided diabetes self-management education and support (DSMES). Based on screening results, pharmacists also delivered tailored interventions that included medication-access support (e.g., prescription-assistance programs), referrals to community resources for identified SDOH barriers (e.g., food banks, community health worker, utility-assistance programs, social support), nutrition counseling, and referral to social work for needs that could not be addressed through the pharmacists' direct referral network. Consistent with Health Leads guidance,[16] SDOH-related interventions were pursued only for patients who indicated a desire for assistance on the concluding item.

For each intervention delivered, actions were categorized as those implemented as routine care (i.e., would have occurred irrespective of screening findings), prompted by SDOH screening results, prompted by DD screening findings, or attributable to more than one category. Interventions were not mutually exclusive, and some actions were attributed to more than one category when clinically appropriate.

Data Collection and Statistical Analysis

The study's primary outcomes were number of unmet SDOH needs (assessed via Health Leads)[16] and level of DD (assessed via T2-DDAS CORE).[17] The use of validated instruments to assess unmet SDOH needs and DD was intended to minimize measurement bias. The secondary outcomes were frequency and type of pharmacist-led interventions and association between T2-DDAS CORE score and baseline HbA1c, number of antihyperglycemic medications, and number of unmet SDOH needs.

Demographic data (e.g., age, gender, employment, and insurance status) and clinical characteristics (e.g., number of currently prescribed medications for T2DM and baseline HbA1c) were collected from the EHR. Number and type of pharmacist interventions delivered during the visits (e.g., therapeutic adjustment, DSMES, medication-access support, and community-resource referral) and the screening time were also collected and documented in real-time to reduce information bias. All study variables were complete, and no observations were missing.

Unadjusted descriptive statistics (i.e., means ± standard deviation [SD] for continuous data and frequencies and percentages for categorical data) and Spearman [ρ] correlations were generated with IBM SPSS Statistics v29 (IBM Corp., Armonk, NY). Statistical significance was established as *p*-value <.05. No subgroup or sensitivity analyses were conducted given the modest sample size (n=40).

Results

During the seven-month study period, 41 consecutive, eligible patients showed for their in-person CP clinic visit and were offered the screening intervention. One patient declined, resulting in 40 completed screenings for analysis. Most patients were female (72.5%) and African American (87.5%). The mean baseline HbA1c was 9.5% ± 2.7, and the majority (97.5%) of patients were taking antihyperglycemic medicines. Complete demographic variables and clinical characteristics are presented in Table 1. The mean time for completion of the combined screenings was 6.45 ± 2.32 minutes.

Table 1. Demographic Variables and Clinical Characteristics

		n (%)
Demographics	**Race**	
	African American	35 (87.5)
	White	4 (10.0)
	Other	1 (2.5)
	Gender	
	Male	11 (27.5)
	Female	29 (72.5)
	Employment status	
	Employed	19 (47.5)
	Unemployed	17 (42.5)
	Retired	4 (10.0)
	Insurance Status	
	Insured	29 (72.5)
	Uninsured	11 (27.5)
	Age in years, *mean (±SD[a])*	55.7 (10.7)

Clinical Characteristics	**Baseline HbA1c[b] [%], *mean (±SD[a])***	9.5 (2.7)
	Number of patients prescribed AhM, *n (%)*	39 (97.5)
	Number of AhM per patient, *mean (±SD[a])*	2.6 (1.0)

[a]SD = standard deviation
[b]HbA1c= glycated hemoglobin
[c]AhM= anti-hyperglycemic medication

SDOH Screening

Of the 40 patients screened, 27 (67.5 %) had at least one unmet SDOH need. Pharmacists recorded 44 distinct barriers overall, yielding a mean of 1.10 ± 1.08 needs per patient across the full cohort. Among those impacted 27 patients with identified SDOH needs, the most frequently reported were lack of social support (44.4%), financial strain (40.7%), and food insecurity (29.6%). Education/employment needs (18.5 %), utility insecurity (14.8 %), transportation gaps (14.8 %), and housing instability (3.7 %) were less common. No patients reported childcare needs or exposure to violence during the screening.

DD Screening

Twenty (50%) of the patients screened were noted to have little or no distress on the T2-DDAS CORE screening. Twenty-four (35.0%) and six (15.0%) patients were noted with moderate and high distress, respectively. The mean T2-DDAS CORE score of patients was 2.27 ±1.27 – which is indicative of moderate distress. Spearman correlation analysis revealed a statistically significant, moderate positive association between baseline HbA1c and T2-DDAS CORE scores (Spearman ρ = 0.423, $p = 0.007$; $R^2 = 0.191$), indicating that higher HbA1c values were associated with greater level of DD. No statistically significant relationships were observed between T2-DDAS CORE scores and the number of diabetes medications (Spearman ρ = 0.121, $p = 0.457$; $R^2 = 0.009$) or the number of SDOH barriers (Spearman ρ = 0.225, $p = 0.163$; $R^2 = 0.090$). The Spearman correlation scatterplots with lines of best fit are presented in Figure 1.

Clinical Pharmacist Interventions

Across all 40 visits, pharmacists delivered an intervention during 97.5% of encounters – with a mean of 1.9 ± 0.9 interventions per patient. Interventions are displayed by category in Table 2. Of the 76 interventions attributed to a discrete category, the majority (65.8%) reflected routine clinical care – which most commonly involved medication adjustment and DSMES. While screening-prompted interventions represented a smaller proportion of total actions, they identified additional needs that may not have been discovered during routine care. SDOH screening most frequently prompted community resource referrals and medication-access assistance, and DD screening prompted a unique nutrition education and social work referral intervention. One DSMES intervention and six community resource referrals were attributed to more than one category. Notably, no instances were encountered in which an identified need – whether routine, SDOH- or DD-related – could not be addressed through pharmacist action or referral within the clinic's available resource network.

Table 2. Pharmacist Interventions by Category (n=40)

Intervention type	Routine n (%)	SDOH-prompted† n (%)	DD-prompted n (%)
Medication adjustment	23[ɣ] (57.5)	2* (5.0)	0 (0.0)
DSMES	19 (47.5)	3 (7.5)	1 (2.5)‡
Medication-access assistance	5 (12.5)	7 (17.5)	0 (0.0)
Community resource referral	0 (0.0)	11 (27.5)	6 (15.0)§
Nutrition counseling referral	1 (2.5)	0 (0.0)	1 (2.5)
Other (i.e., social work referral for psychotherapy, assistance with advanced directives, and utility assistance)	2 (5.0)	1 (2.5)	1 (2.5)

[ɣ] For routine care medication adjustment, 82.6% were dose escalations due to poor glycemic control and the remaining 17.4% were regimen simplification.
* For SDOH-prompted medication adjustment, both were regimen simplifications undertaken for feasibility/access reasons.
† SDOH assistance was provided only when patients indicated they wanted assistance.
‡ One DSMES event was attributed to both routine care and elevated DD.
§ DD-prompted community referrals occurred in patients who also had an SDOH need identified (double attribution

Discussion

SDOH Prevalence

Two-thirds of patients in this study had at least one unmet SDOH need, a prevalence exceeding most published research. A recently published seven-site evaluation by Farley et. al. included a large percentage (63.6%) of patients with T2DM and noted a prevalence of at least one unmet SDOH need in 55.1% of patients.[7] Similarly at the population level, Hacker et. al. analyzed 324,631 adults – with 66.3% reporting at least one chronic disease – using the Centers for Disease Control and Prevention's Social Determinants and Health Equity module and found a prevalence of at least one unmet SDOH need in 59.4% of patients.[18] In contrast, a study conducted at a safety-net clinic serving predominantly Hispanic patients, noted a markedly higher SDOH burden of 92% in patients with insulin-dependent T2DM.[14] Collectively, these data highlight the sizeable SDOH burden experienced by adults in the U.S. – particularly those with T2DM – and reinforce the importance of systematic screening and tailored intervention strategies.

Lack of social support was the most noted SDOH barrier in the present study. This finding aligns with evidence that stronger social networks are associated with lower HbA1c and is notable, as our cohort's mean HbA1c exceeded the American Diabetes Association's general goal of <7.0%.[19] Financial strain, food insecurity, education/employment needs, utility assistance, and transportation gaps followed in prevalence. These findings mirror published data from the Southeastern U.S. "Diabetes Belt," where poor food access, economic hardship, limited educational attainment and transportation are well-documented barriers.[13]

Diabetes-related Distress

Consistent with the published data on predominantly minority populations, one in two patients in the current study had at least moderate diabetes-related distress.[20,21] Additionally, baseline HbA1c showed a significant positive association with T2-DDAS CORE scores (Spearman $\rho = 0.44$, $p < 0.01$); the corresponding R^2 of 0.19 suggests that baseline glycemic control explains approximately 19% of the variability in DD. These results reinforce published evidence that the emotional burden of T2DM is independently linked to glycemic control,[22,23] underscoring the need to integrate routine distress screening and targeted interventions into standard T2DM care.

In contrast, neither the number of diabetes medications nor the cumulative count of SDOH needs was significantly associated with level of DD in the present study. Several explanations are plausible. First, the modest sample size may have limited the ability to detect associations. Second, the use of a simple count of SDOH needs without evaluation of the specific domain or severity of need may not fully capture factors associated with distress – such as social support, which has been linked to DD in the literature.[24,25] Third, medication count alone may not adequately reflect perceived treatment burden. Measures of regimen complexity, such as the Medication Regimen Complexity Index (MRCI), may more accurately capture treatment burden and have a documented association to poorer disease control, which may contribute to DD.[26]

Pharmacist Intervention and Practice Implications

In the current study, pharmacists delivered interventions in nearly all encounters – averaging 1.9 actions per visit encounter. Routine clinical care accounted for many of the interventions, with medication adjustment and DSMES representing the most frequent actions. This finding is expected, as historically, the majority (>75%) of referrals to CGMHSA's CP clinic are for medication management. As such, pharmacotherapy actions – such as dose titration, regimen simplification, or adherence-support services and DSMES – would be expected regardless SDOH and DD screening results.

Systematic SDOH and DD screening was found to expand the types of interventions provided and identified additional needs that may not have been detected during standard clinical encounters. A prior study has demonstrated that pharmacist-led SDOH screening programs can uncover social barriers affecting health outcomes and facilitate referrals to community resources.[27] In the present study, SDOH-prompted actions most frequently included community resource referrals and medication-access support, suggesting that screening identified actionable social barriers that required connection to non-clinical resources, such as food banks and transportation assistance. Similarly, although fewer interventions were prompted by elevated DD, screening led to additional referrals for nutrition education and consultation with social work. Prior studies have shown that pharmacist-led assessment and educational interventions can reduce DD and improve patient outcomes, highlighting the importance of addressing psychosocial aspects of diabetes care alongside pharmacotherapy.[28,29] Notably, community resource referral overlapped between SDOH- and DD-prompted interventions, reflecting the interconnected nature of the social and emotional burdens of T2DM described in the literature.[30]

Taken together, these findings illustrate how adding a brief SDOH and DD screening into pharmacist-led visits can broaden the scope of care. Literature is replete with evidence that pharmacist participation in primary care teams significantly lowers HbA1c relative to usual care. The findings of the present study extend this evidence by demonstrating that pharmacists can pair a SDOH and DD screening with usual pharmacotherapy management – without a substantial time burden. Additionally, the average of 1.9 interventions provided per visit underscores the value of using screening to support more comprehensive, patient-centered T2DM care.

Future Direction

Longitudinal follow-up is needed to assess whether the pharmacist-led efforts to mitigate identified SDOH barriers and level of DD translated into sustained improvements in HbA1c and quality of life. Additionally, future research should evaluate the relative impact of specific interventions to identify those that most effectively enhance clinical outcomes.

Limitations

This study has important limitations. A convenience sample from a single ambulatory clinic was utilized, introducing the potential for selection bias. Additionally, because patients were referred to CP clinic by their PCP, referral bias may also be present as the sample may have over-represented individuals with greater clinical complexity. The modest sample size limited the ability to adjust for confounders, and the cross-sectional design permitted only the identification of associations rather than causal relationships. Finally, the results may not be broadly generalizable because patients who missed in-person visits or received care via telehealth were not screened.

Conclusion

Integrating a brief (~6-minute) SDOH and DD screening into pharmacist-run visits proved feasible, and in doing so, uncovered actionable barriers to care for most patients seen in a safety-net ambulatory care setting. These findings underscore the opportunity and value in expanding the ambulatory care clinical pharmacist's role beyond medication management to include systematic SDOH and DD assessments and intervention as a standard component of patient-centered diabetes care.

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Data availability statement: The data underlying this study are not publicly available due to patient privacy.

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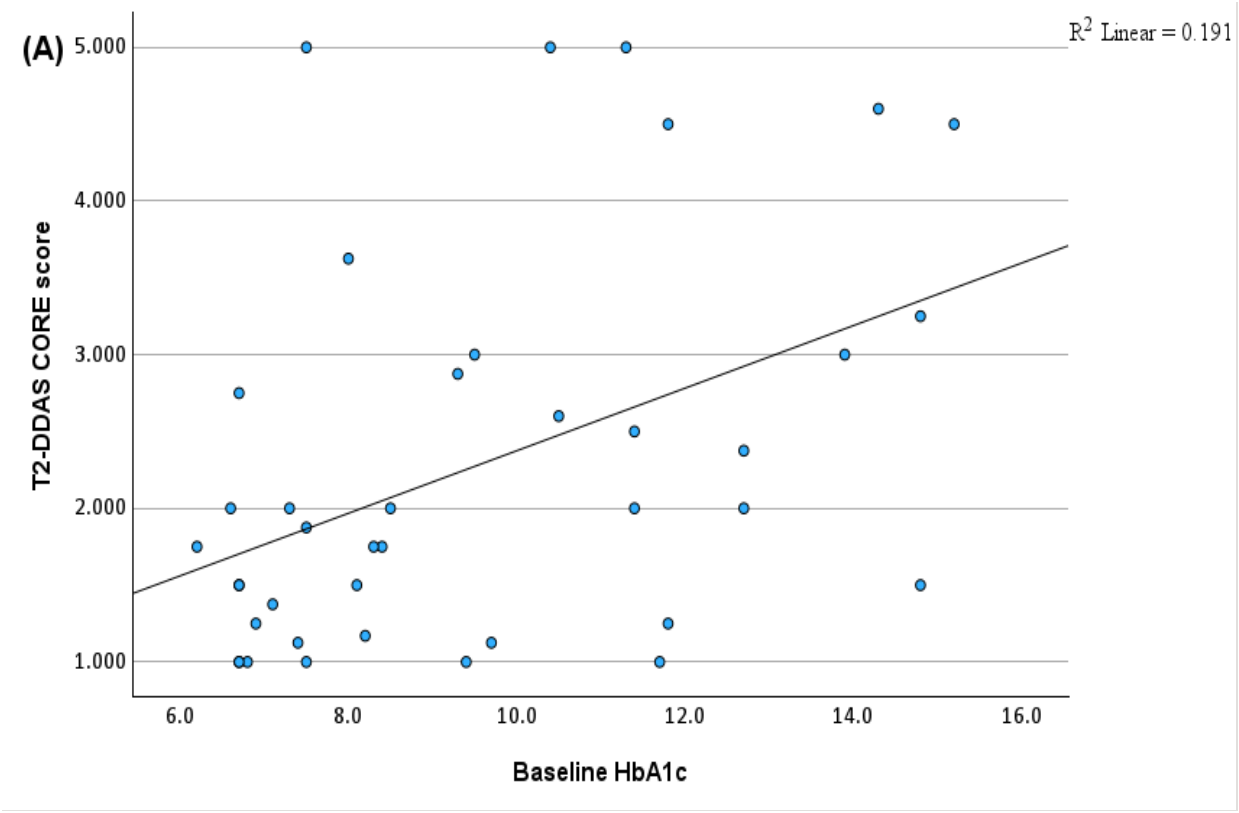
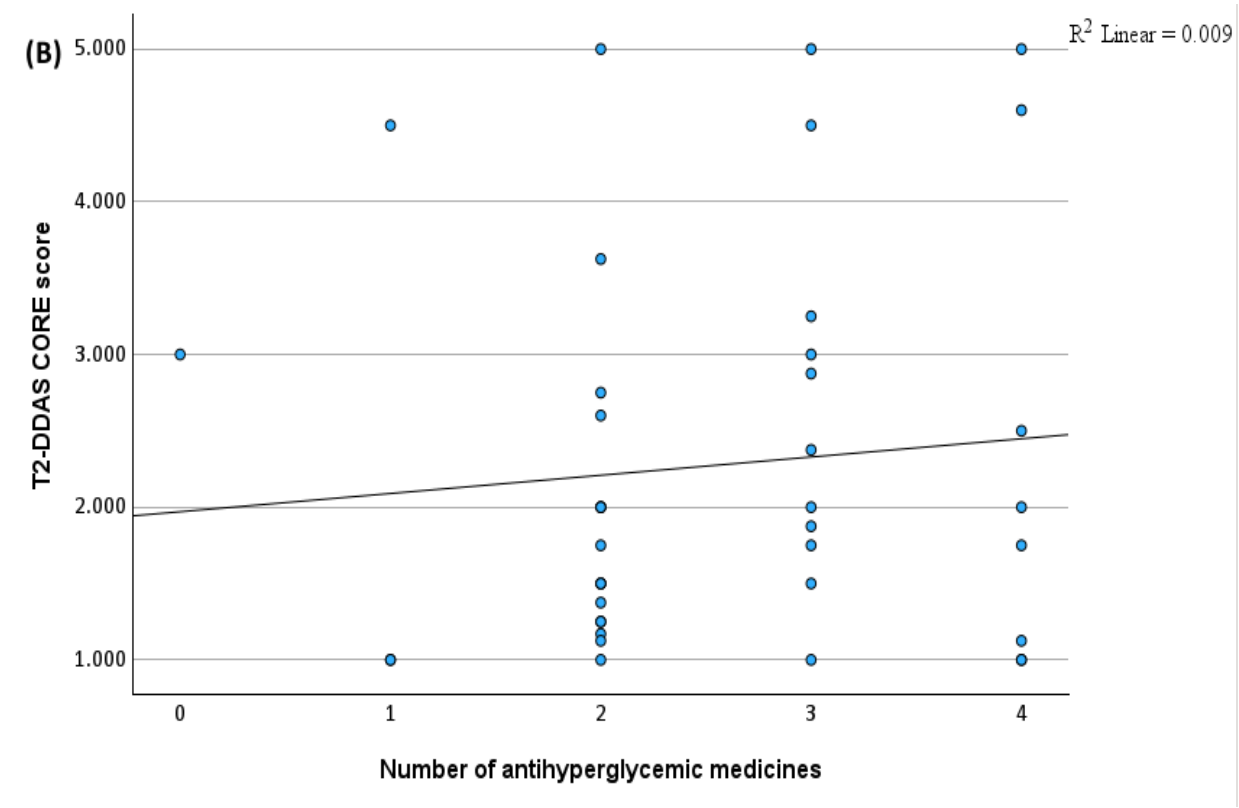
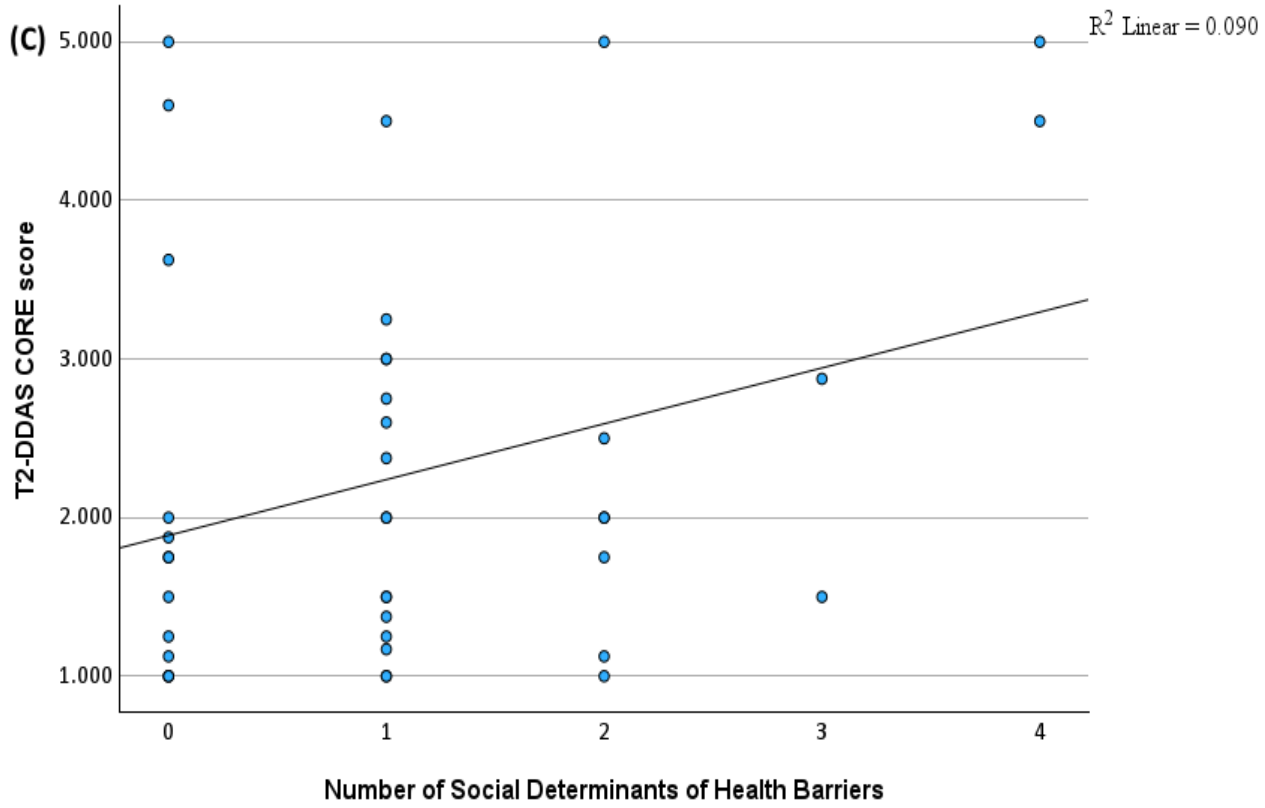
Figure 1. Spearman scatterplots with fitted regression lines illustrating the relationships between **(A)** baseline HbA1c and T2-DDAS CORE distress score, **(B)** number of diabetes medications and T2-DDAS CORE distress score, and **(C)** count of unmet SDOH barriers and T2






(C)
R^2 Linear = 0.090
T2-DDAS CORE score
5.000
4.000
3.000
2.000
1.000
0
1
2
3
4
Number of Social Determinants of Health Barriers