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Abstract

Introduction. Burden of diabetes in the U.S. is greater in racial-ethnic minority populations than non-Hispanic Whites. Depression and diabetes-related distress (DRD) are recognized as relatively common and important psychosocial areas to address in people living with diabetes. Limited research in the U.S. has focused on DRD in racial-ethnic minority populations. The purpose of this study is to describe patterns of DRD and co-occurrence with depressive symptoms in urban low-income African American and Hispanic/Latinx adults with type 2 Diabetes Mellitus (T2DM).

Method. We examined the baseline data collected for a randomized clinical trial (RCT) studying the impact of a culturally tailored diabetes self-care intervention. Individuals with T2DM who self-identified as African American or Hispanic/Latinx were recruited from Federally Qualified Health Centers (FQHCs). Measurement scales included the Patient Health Questionnaire (PHQ-9) and Diabetes Distress Scale (DDS). Participants were categorized into four groups based on the PHQ-9 and DDS: high distress (without probable clinical depression), probable clinical depression (without high distress), both high distress and probable depression, or neither high distress nor probable depression. Baseline variables were summarized by sex, age and racial-ethnic group. Analyses included independent sample t-tests, Chi-square tests, and one-way Analysis of Variance (ANOVA).

Results. The study sample included 247 participants with 118 (47.8%) Hispanic/Latinx and 129 (52.2%) African American adults with T2DM. The mean age was 52.9 years (SD=12.2) and 68.0% were female. Based on PHQ-9 scores, 51.4% had none to minimal, 23.5% mild, and 25.1% moderate-severe depressive symptomatology. Based on the DDS, 37.7% had little to no DRD, 27.1% moderate, and 35.2% high DRD. There was not a statistically significant relationship between sex and depression or DRD levels. There was not a statistically significant difference between age and depression; however, there was a statistically significant difference between age and DRD (p=.002). When examining the co-occurrence of DRD and depression, over half of the participants did not experience high distress nor probable clinical depression (57.5%), 17.8% experienced both high distress and depression, 17.4% experienced high distress without depression, and 7.3% experienced depression without distress. There was no statistically significant relationship found between sex and co-occurrence groups; however, there was a statistically significant difference for age (p=.003).

Discussion. A substantial proportion of individuals from both racial-ethnic groups experienced high DRD and/or probable clinical depression with some differences for age. Patterns found for specific DRD areas and co-occurrence of DRD and depressive symptoms can help clinicians better understand and address these challenges.

Keywords

Diabetes; Depression; Diabetes Distress; African American; Hispanic/Latinx

Cover Page Footnote

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ABSTRACT

Introduction**.** Burden of diabetes in the U.S. is greater in racial-ethnic minority populations than non-Hispanic Whites. Depression and diabetes-related distress (DRD) are recognized as relatively common and important psychosocial areas to address in people living with diabetes. Limited research in the U.S. has focused on DRD in racial-ethnic minority populations. The purpose of this study is to describe patterns of DRD and co-occurrence with depressive symptoms in urban low-income African American and Hispanic/Latinx adults with type 2 Diabetes Mellitus (T2DM).

Method. We examined the baseline data collected for a randomized clinical trial (RCT) studying the impact of a culturally tailored diabetes self-care intervention. Individuals with T2DM who self-identified as African American or Hispanic/Latinx were recruited from Federally Qualified Health Centers (FQHCs). Measurement scales included the Patient Health Questionnaire (PHQ-9) and Diabetes Distress Scale (DDS). Participants were categorized into four groups based on the PHQ-9 and DDS: high distress (without probable clinical depression), probable clinical depression (without high distress), both high distress and probable depression, or neither high distress nor probable depression. Baseline variables were summarized by sex, age and racial-ethnic group. Analyses included independent sample t-tests, Chi-square tests, and one-way Analysis of Variance (ANOVA).

Results. The study sample included 247 participants with 118 (47.8%) Hispanic/Latinx and 129 (52.2%) African American adults with T2DM. The mean age was 52.9 years (SD=12.2) and 68.0% were female. Based on PHQ-9 scores, 51.4% had none to minimal, 23.5% mild, and 25.1%

moderate-severe depressive symptomatology. Based on the DDS, 37.7% had little to no DRD, 27.1% moderate, and 35.2% high DRD. There was not a statistically significant relationship between sex and depression or DRD levels. There was not a statistically significant difference between age and depression; however, there was a statistically significant difference between age and DRD (p=.002). When examining the co-occurrence of DRD and depression, over half of the participants did not experience high distress nor probable clinical depression (57.5%), 17.8% experienced both high distress and depression, 17.4% experienced high distress without depression, and 7.3% experienced depression without distress. There was no statistically significant relationship found between sex and co-occurrence groups; however, there was a statistically significant difference for age (p=.003).
Discussion. A substantial proportion of individuals from both racial-ethnic groups experienced high DRD and/or probable clinical depression with some differences for age. Patterns found for specific DRD areas and co-occurrence of DRD and depressive symptoms can help clinicians better understand and address these challenges.

Keywords: Diabetes, Depression, Diabetes Distress, African American, Hispanic/Latinx

INTRODUCTION

According to the Centers for Disease Control and Prevention (CDC), 37.3 million people in the United States (U.S.) have diabetes (i.e., 28.7 million diagnosed, estimated 8.5 million undiagnosed) representing approximately 11.3% of the total population (CDC, 2023). The burden of diabetes in the U.S. is greater in racial-ethnic minority populations than non-Hispanic Whites. Estimates of the 2018-2019 National Health Interview Survey indicate age-adjusted prevalence rates of 11.8% in Hispanic/Latinx adults (≥18 years) and 12.1% in non-Hispanic Black adults compared with 7.4% in non-Hispanic White adults (CDC, 2023). Compared to non-Hispanic Whites, Hispanic/Latinx and Black adults are diagnosed with diabetes at a younger age, report less knowledge on recommended diabetes self-care practices, and have less familiarity with Medicare coverage policies for testing supplies and reimbursement for diabetes education (CDC, 2021; CMS OMH and NORC, 2017). Racial-ethnic minorities also have higher rates of uncontrolled blood glucose and diabetes-related mortality (CDC 2021; AHRQ, 2022). Low income has also been associated with increased diabetes prevalence (CDC, 2023; Chen, 2021).

Living with type 2 diabetes (T2DM) involves daily engagement in multiple complex self-care behaviors, including eating healthy, getting regular physical activity, taking oral medications and/or insulin, self-monitoring blood sugars, and engaging in risk reducing behaviors, such as footcare and smoking cessation. It also places substantial responsibility on the individual, including (a) making decisions about the complex and inter-related diabetes self-care activities; (b) engaging in effective problem solving when needed to adjust for changing personal situations and blood sugar levels; and (c) engaging in healthy coping strategies to deal with the overall complexities, stresses, and emotions of living with diabetes (Association of Diabetes Care and Education Specialists, & Kolb, 2021; American Diabetes Association (ADA), 2022).

In addition, people with diabetes (PWD) may experience multiple serious long-term complications, such as kidney disease, blindness, or lower extremity amputation which places further burden on the individual (Cowie et al., 2018). Non-Hispanic Black and Hispanic/Latinx adults with diabetes experience higher rates of complications, such as retinopathy, nephropathy, and non-traumatic lower limb amputations than non-Hispanic Whites (Haw, Shah, Turbow, Egeolu, & Umpierrez, 2021). Engaging in complex diabetes self-management activities has long been recognized as central to managing diabetes and associated with better health outcomes (ADA Professional Practice Committee, 2022; Powers, et al, 2020).

The potential negative impact of diabetes on psychosocial well-being has been well-established (Young-Hyman et al., 2016). Depression and diabetes-related distress have been recognized as relatively common and important psychosocial areas to address in PWD (ADA, 2022; Anderson, Freeland, Clouse, & Lustman, 2001; Holt, de Groot, & Golden, 2014; de Groot, Hill-Golden, & Wagner, 2016; Roy & Lloyd, 2012; Owens-Gary, Zhang, Jawanda, Bullard, Allweis, & Smith, 2018; Skinner, Joensen, & Parkin, 2020; Young-Hyman, et al., 2016). The prevalence of depression in people with T2DM has been estimated as approximately 19% or nearly twice that of people without diabetes (Roy & Lloyd, 2012) and the negative impact of depression in diabetes has been extensively described (e.g., Darwish, Beroncal, Sison, & Swardfager, 2018; Gonzalez, et al, 2008; Holt et al., 2014; Owens-Gary et al, 2018; van der Feltz-Cornelis, Allen, Holt, Roberts, Nouwen, & Sartorius, 2021).

"Diabetes-related distress" (DRD) is a term specific to the diabetes field and has been described as the "worries, concerns, fears and threats that are associated with struggling with a demanding chronic disease like diabetes over time, including its management, threats of complications, potential loss of functioning and concerns about access to care" (Fisher, Polonsky, & Hessler, 2019). DRD has been found to be associated with lower levels of self-care (Skinner et al, 2020) underscoring the importance of screening for and addressing distress in PWD. A large multi-country study assessed psychosocial outcomes in people with diabetes (PWD) (N=8596; Diabetes Attitudes, Wishes, & Needs; DAWN2; e.g., Nicolucci et al, 2013) and found that 44.6% of PWD experienced DRD. A systematic review and meta-analysis of studies examining DRD (Perrin, Davies, Robertson, Snoek, & Khunti, 2017) estimated an overall prevalence of 36% across 55 international studies (n=36,998), 38% prevalence in studies specifically in the Americas (n=27 studies); 44% in Black/ethnic minorities (n=20 studies); and 42% in studies (n=21 studies) specifically using the Diabetes Distress Scale. This review found greater prevalence of DRD in samples with a female majority and with higher prevalence of depressive symptomatology.

Limited research in the U.S. has focused on diabetes-related distress in racial-ethnic minority populations. One study (Peyrot et al, 2014; DAWN2 Study; N=1055) assessed psychological outcomes among ethnic groups and found that racial-ethnic minority groups (African American, Hispanic/Latinx, Chinese-American) had higher DRD compared with non-Hispanic Whites and Hispanic/Latinx individuals reported higher DRD than African Americans. The Skinner et al review (2020) also noted differences in DRD for demographic characteristics, including ethnicity, age, and sex, specifically ethnic minority groups, younger people and females may experience higher DRD. Another study (Hernandez, et al, 2014) examined potential patient-related, biomedical/disease-related, and psychosocial correlates of diabetes self-care, including diabetes-related distress, in African Americans and Hispanic/Latinx with T2DM. DRD was found to have the strongest association with self-care, such that higher reported diabetes-related distress was associated with lower engagement in various aspects of self-care for both groups. Additionally, behavioral interventions focused on improving DRD have resulted in significant improvements in A1C values in people with T2DM, including in a Hispanic/Latinx group (Leyva, Zagarins, Allen, & Welch, 2011; Zagarins, Allen, Garb, & Welch, 2012). The limited research on DRD in racial-ethnic minorities in the U.S., coupled with their increased diabetes burden, underscores the need for research to help better understand DRD in these populations.

It is notable that DRD and depression in PWD have been described as distinct constructs, but also show a 20-30% overlap or shared variance (Skinner et al., 2020). These constructs have demonstrated differential associations with self-care, quality of life, and diabetes outcomes (e.g., Aikens, 2012; Carper, Traeger, Gonzalez, Wexler, Psaros, & Safren, 2014; Fisher, Glasgow, & Strycker, 2010; Perrin, et al, 2017; Skinner et al., 2020; Snoek, Bremmer, & Hermanns, 2015). One study examined their association with glycemic control using both cross-sectional and longitudinal analyses and showed that DRD, but not clinical depression or depressive symptoms, was associated with glycemic control (Fisher, et al, 2010). Another paper suggested that DRD may mediate the association between glycemic control and depression (Snoek, et al, 2015). More research is needed to better understand their co-occurrence to support health care providers in addressing these important areas in PWD, especially racial-ethnic minorities who experience greater burden of diabetes.

Some research has examined the co-occurrence of depression and DRD in general, but few studies have specifically been conducted with racial-ethnic minorities. One study estimated the individual occurrence and co-occurrence of these constructs based on a review of meta-analyses, systematic reviews, narrative reviews, and empirical studies that used a variety of measures for depression and diabetes-related distress (Skinner, et al, 2020). It was estimated that 20-30% of people with diabetes are "distressed" (i.e., high levels of diabetes distress), 5-10% are "depressed" (i.e., high levels of depressive symptomatology; possibly depressed), 5-15% are "distressed and depressed" and 50-70% experience no to low levels of DRD or depression. One study examined occurrence and co-occurrence of DRD and depression in an ethnically diverse population of military service members and family members (N = 314) with type 1 or 2 diabetes (Wardian, Kanzler, True, Glotfelter, & Sauerwein, 2019). This study found that 5.7% of the sample screened positive for depression (Patient Health Questionnaire - 9 $\geq$10; PHQ-9) without high DRD, 17.8% experienced high DRD (Diabetes Distress Scale $\geq$3) without depression, 6.1% experienced both, and 70.4% experienced neither high distress nor screened positive for depression. To our knowledge, no studies have specifically examined the co-occurrence of diabetes-related distress and depression in urban low-income racial-ethnic minority populations with T2DM.

The purpose of the current study is to describe the patterns of diabetes-related distress and the co-occurrence with depressive symptoms in urban low-income African American and Hispanic/Latinx adults with T2DM. This knowledge will help inform a culturally competent approach to these challenges as health care providers address screening and treatment in these populations (Stubbe, 2020).

Our specific research questions include:

- What are the overall and subscale levels of diabetes-related distress across sex and age in urban low-income African American and Hispanic/Latinx adults with T2DM?
- What are the rates of probable clinical depression, diabetes-related distress, and the co-occurrence of high diabetes-related distress and probable depression in urban low-income African American and Hispanic/Latinx adults with T2DM?
- Within each of the African American and Hispanic/Latinx groups, do the distress-depression co-occurrence categories differ by sex? Co-occurrence groups include: high distress (without probable clinical depression), probable clinical depression (without high distress), both high distress and probable depression; and neither high distress nor probable depression.

METHODS

Design, Sampling, and Assessment procedure.

Design. The data source for this study is the baseline data collected for a randomized clinical trial (RCT) that examined the impact of a culturally tailored diabetes self-care coaching intervention with Medical Assistants at Federally Qualified Health Centers (FQHC) (Ruggiero, et al, 2014). The present analyses are distinct given that DRD and depression were not simultaneously examined in prior papers based on this RCT. Data were collected prior to COVID-19.

Sampling. Details of the recruitment process, sample and group comparisons, and methods have been previously reported in detail (Hernandez et al, 2014; Hernandez, et al., 2016; Ruggiero, et al, 2014). In brief, individuals with diagnosed T2DM who self-identified as African American or Hispanic/Latinx were recruited from primary care clinics of Federally Qualified Health Centers (FQHC) in a large mid-western city. Additional inclusion criteria included being age 18 years or older, English or Spanish fluency, recent A1C lab values greater than or equal to 6.5%, treated with insulin and/or oral diabetes medications, having a diagnosis of diabetes for at least six months, and able to provide informed consent. The recruitment strategy included informational sessions for clinic staff and the display of informational materials (e.g., brochures and posters) in the patient waiting areas. Interested patients who were identified as potentially eligible met with study staff to confirm eligibility. If eligibility was confirmed, then the informed consent process was completed. Recruitment materials and research interactions were available in English or Spanish.

Assessment Procedure. The current study is based on the RCT baseline self-report assessment. Self-report measures were administered using English or Spanish versions as preferred by participant. This study uses two validated measures collected during the baseline assessment, i.e., Patient Health Questionnaire (PHQ-9) and Diabetes Distress Scale (DDS). While the RCT study included 270 participants, this secondary analysis included 247 participants with complete data on measures of interest.

Measures

Patient Health Questionnaire (PHQ-9). The PHQ-9 is a 9-item scale that asks about the frequency of depressive symptoms experienced over the past two weeks using a 4-item (0-3) response scale from “not at all” to “every day” with a total score range from 0–27 (Kroenke, Spitzer, & Williams, 2001). The PHQ-9 has demonstrated reliability and validity in screening for depression (Costantini, 2021; El-Den, Chen, Gan, Wong, & O'Reilly, 2018; Kroenke, et al., 2001). PHQ-9 cut-off scores of 5 (mild), 10 (moderate), 15 (moderately severe), and 20 (severe) were used for descriptive purposes (Kroenke, et al, 2001). Depression levels were then calculated based on recommended thresholds (above) along with dichotomized categories of none to mild (<10) and moderate to severe (≥10) (Levis, Benedetti, Thombs, DEPRESsion Screening Data Collaboration, 2019). The PHQ-9 has demonstrated diagnostic validity (Gilbody, Richards, Brealey, & Hewitt, 2007), sensitivity and specificity in identifying depression (Kroenke, et al, 2001). We use the term "probable clinical depression" in our study results for PHQ-9 scores at or above 10.

Diabetes Distress Scale (DDS). The DDS is a 17-item measure of four distress-related domains: emotional burden (e.g., feeling overwhelmed by the demands of living with diabetes), physician-related distress (e.g., feeling that my doctor doesn't give me clear enough directions on how to manage my diabetes), regimen-related distress (e.g., not feeling confident in my day-to-day ability to manage diabetes), and diabetes-related interpersonal distress (e.g., feeling that friends or family don't appreciate how difficult living with diabetes can be) (Polonsky, et al., 2005). Ratings inquire about the past month and assess the degree to which each area bothers an individual, using a 6-item response scale from "not a problem" (1) to "a very serious problem" (6). The range for the total DDS score and each subscale is 0-6. The DDS has demonstrated reliability and validity (Polonsky, et al., 2005). DDS cut-offs of <2.0 (little to no distress), 2.0-2.99 (moderate), and ≥3.0 (high) were used for descriptive purposes (Fisher, Hessler, Polonsky, & Mullan, 2012). Cronbach's alpha coefficients were calculated for our sample and were found to be .93, .92, .94 for the total sample, African American group, and Hispanic/Latinx group, respectively. DRD levels based on recommended DDS cut-offs (above) were calculated.

Combined PHQ-9 and DDS Grouping. Following the Wardian et al study (2018) approach to estimating the co-occurrence of reported DRD and depression, participants were categorized into four groups based on their responses to both the PHQ-9 and DDS: high distress (without probable clinical depression) (DDS ≥3; PHQ-9 < 10), probable clinical depression (without high distress) (DDS <3; PHQ-9 ≥ 10), both high distress and probable depression (DDS ≥ 3; PHQ-9 ≥ 10), or neither high distress nor probable depression (DDS <3; PHQ-9 < 10).

Statistical Analyses

Baseline variables were summarized by sex, age and racial-ethnic group, i.e., African American and Hispanic/Latinx. Differences in means between groups were tested using independent sample t-tests. Differences in proportions were tested using Chi-square tests. One-way Analysis of Variance (ANOVA) with Tukey post-hoc test was used to examine differences across the four Distress-Depression groups for continuous variables (i.e., age). SPSS Version 28.0 (IBM Corp, 2021) quantitative data analysis software was used. An alpha level of .05 was used for all statistical tests for significance.

RESULTS

Participant Characteristics. A sample of 247 participants are included in this study with 118 (47.8%) Hispanic/Latinx and 129 (52.2%) African American adults with T2DM. The characteristics of this sample include (not shown in Tables) a mean age of 52.9 years (SD=12.2) and 68.0% female. Additionally, 38.9% were married, 27.2% divorced/widowed/separated, and 23.8% identified as never married. Regarding employment, 38.9% were employed/self-employed, while 21.7% were unemployed, 7.4% identified as “homemaker”, 0.4% “student”, 12.7% “retired” and 18.9% “unable to work”. Regarding education, 60.2% reported less than a high school education, 18.9% reported being a high school graduate or obtaining a GED, and 19.9% some college or college degree. For income, 58.2% reported under $20,000 income, 14.3% reported $20-35,000, 6.2% over $35,000, and 21.3% indicated they did not know their income. The average A1C was 8.59% (SD=2.37).

Patterns of DRD and Depression Overall and by Age and Sex. The PHQ-9 and DDS measures for the total sample can be found in Table 1. Based on the PHQ-9, 51.4% had none to minimal, 23.5% mild, and 25.1% moderate-severe depression. Based on the DDS, 37.7% had little to no, 27.1% moderate, and 35.2% high DRD.

When looking at distributions across sex (shown in Table 1), 26.2% of female and 22.8% of male participants reported moderate to severe depressive symptomology; and 36.3% of female and 32.9% of male participants reported high levels of DRD. There was not a statistically significant relationship between sex and those with moderate to severe depression (X^2 (1, N=247) =0.331, p=.565) nor between sex and high DRD (X^2 (1, N=247) =0.272, p=.602). When looking at age and depression (shown in Table 1), those with moderate or moderately severe depressive symptomatology were younger on average than those with none-to-mild or mild depression and those with severe depressive symptomatology; this difference was not statistically significant (F(4,246) =1.233, p=.297). There was a statistically significant difference between age and DRD (i.e., DDS level) (F(2,246)=6.388, p=.002). Those in the high DRD group were significantly younger on average than those with little to no or moderate DRD.

Table 1. Depression and DRD overall and by age and sex.

Scale	Levels	Overall (N=247) %	Male (n=79) %	Female (n=168) %	Age (N=247) Mean (SD)
PHQ	None to Minimal (<5)	51.4	51.9	51.2	54.1 (12.5)
	Mild (5-9)	23.5	25.3	22.6	52.9 (11.4)
	Moderate (10-14)	15.0	12.7	16.1	49.8 (12.1)
	Moderately Severe (15-19)	7.3	6.3	7.7	49.8 (13.7)
	Severe (≥20)	2.8	3.8	2.4	54.0 (6.7)
DDS	Little to No distress (<2)	37.7	34.2	39.3	54.7 (12.7)
	Moderate (2-2.99)	27.1	32.9	24.4	55.0 (11.1)
	High (≥3)	35.2	32.9	36.3	49.2 (11.8)*

* $p<0.01$

Patterns for DRD and Depressive Symptoms for African American and Hispanic/Latinx Groups Overall and by Sex. The patterns across PHQ-9 and DDS levels for the African American and Hispanic/Latinx groups by sex are shown in Table 2. There was not a statistically significant relationship between sex and moderate to severe depression (X^2 (1, N=129) =1.070, p=.301) nor between sex and high DRD (X^2 (1, N=129) =1.140, p=.286) for African American participants. There was not a statistically significant relationship between sex and moderate to severe depression (X^2 (1, N=118) =.005, p=.946) nor between sex and high DRD (X^2 (1, N=118) =.083, p=.773) for Hispanic/Latinx participants.

Table 2. Levels of depressive symptoms and DRD for African American and Hispanic/Latinx groups overall and by sex

Scale	Levels	African American			Hispanic/Latinx		
		Total (N=129) %	Male (n=46) (%)	Female (n=83) (%)	Total (N=118) %	Male (n=33) (%)	Female (n=85) (%)
PHQ-9	None to Minimal (<5)	44.2	41.3	45.8	59.3	66.7	56.5
	Mild (5-9)	24.0	32.6	19.3	22.9	15.2	25.9
	Moderate (10-14)	18.6	15.2	20.5	11.0	9.1	11.8
	Moderately Severe (15-19)	10.1	8.7	10.8	4.2	3.0	4.7
	Severe (≥20)	3.1	2.2	3.6	2.5	6.1	1.2
DDS	Little to No distress (<2)	33.3	32.6	33.7	42.4	36.4	44.7
	Moderate (2-2.99)	27.9	34.8	24.1	26.3	30.3	24.7
	High (≥3)	38.8	32.6	42.2	31.4	33.3	30.6

Note: Percents have been rounded and may not total 100%.

DDS Subscale Scores Overall and by Age and Sex. The DDS subscale scores for the overall sample are shown in Table 3. Distress was highest in the emotional burden (47%) and regimen-related (44.5%) subscales, followed by inter-personal distress (31.6%) and the lowest for physician-related distress (20.6%). There was a statistically significant relationship between sex and high regimen-related distress (Table 3): A larger proportion of male participants than female participants (54.4% vs 39.9%) experienced high regimen-related distress (X^2 (1, N=247) =4.605, p=.032).

Table 3. DDS Subscale scores overall and by age and sex.

DDS Subscale	Levels	Overall (N=247) %	Male (n=79) %	Female (n=168) %	Age (N=247) Mean (SD)
Emotional Burden	Low (<2)	28.3	26.6	29.2	54.4 (11.9)
	Moderate (2-2.99)	24.7	26.6	23.8	55.5 (12.3)
	High (≥3)	47.0	46.8	47.0	50.6 (12.0)*
Physician-Related	Low (<2)	65.2	62.0	66.7	52.9 (12.8)
	Moderate (2-2.99)	14.2	20.3	11.3	54.0 (9.9)
	High (≥3)	20.6	17.7	22.0	51.8 (12.0)
Regimen Related	Low (<2)	33.2	29.1	35.1	56.4 (13.3)
	Moderate (2-2.99)	22.3	16.5	25.0	53.8 (10.6)
	High (≥3)	44.5	54.4*	39.9	49.7 (11.4)**
Interpersonal	Low (<2)	53.4	55.7	52.4	53.9 (11.7)
	Moderate (2-2.99)	15.0	13.9	15.5	54.8 (13.2)
	High (≥3)	31.6	30.4	32.1	50.1 (12.3)

*p<0.05; **p<0.001

Overall, participants experiencing high distress in the DDS subscales tended to be younger than those experiencing low-to-none or moderate distress (Table 3). This difference was statistically significant for those with elevated emotional burden distress (F(2,246)=4.009, p=.019)) and regimen-related DDS subscale scores (F(2,246)=7.644, p<.001)) but not between age groups and physician-related DDS subscale scores (F(2,246)=.344, p=.709)) or interpersonal-related distress (F(2,246)=2.994, p=.052)). Those with high distress related to emotional burden (M=50.6, SD=12.0) were significantly younger than those with moderate distress related to emotional burden (M=55.5, SD=12.3) but not those with low to none (M=54.4, SD=11.9). A Tukey-post hoc test revealed that those with those with high regimen-related distress (M=49.7, SD=11.4) were significantly younger than those with low-to-no regimen-related distress (M=56.4, SD=13.3) but not those with moderate regimen-related distress (M=53.8, SD=10.6).

Elevated DDS subscale scores for African American and Hispanic/Latinx groups overall and by sex. Almost half of African American participants noted high distress related to emotional burden (48.1%) and similarly for regimen-related (48.8%) (Table 4). Over a quarter reported high physician related burden (25.6%) and similarly for high interpersonal distress (30.5%). There were no statistically significant relationships between sex and elevated DDS subscale scores for African Americans, including elevated emotional burden (X^2 (1, N=129) =.002, p=.286) and interpersonal distress (X^2 (1, N=118) =.001, p=.976). Still notable, a larger proportion of male participants experienced regimen-related distress than female participants (56.5% vs 44.6%; X^2 (1, N=129) =1.690, p=.194)) and a larger proportion of female participants than male participants (30.1% vs 17.4%) experienced high physician-related distress (X^2 (1, N=129) =2.519, p=.112).

Almost half of Hispanic/Latinx participants experienced high emotional burden distress (45.8%) (Table 4). Over one-third (39.8%) reported high regimen-related distress and almost one-third (32.6%) reported high interpersonal distress. The lowest proportion (15.3%) experienced high physician-related distress. There were no statistically significant relationships found between sex and elevated DDS Subscale scores for Hispanic/Latinx participants, including high distress related to emotional burden (X^2 (1, N=118) =.002, p=.967), physician related high distress (X^2 (1, N=118) =.304, p=.582) and high interpersonal distress (X^2 (1, N=118) =.001, p=.976)). Still notable, more male participants (51.5%) than female participants (35.3%) reported high regimen-related distress (X^2 (1, N=118) =2.610, p=.106).

Table 4. Elevated DDS Subscales for African American and Hispanic/Latinx groups overall and by sex.

Elevated DDS Subscale ($\geq$3)	African American			Hispanic/Latinx		
	Total (N=129) %	Male (n=46) (%)	Female (n=83) (%)	Total (N=118) %	Male (n=33) (%)	Female (n=85) (%)
High Emotional Burden	48.1	47.8	48.2	45.8	45.5	45.9
High Physician Related	25.6	17.4	30.1	15.3	18.2	14.1
High Regimen Related	48.8	56.5	44.6	39.8	51.5	35.3
High Interpersonal	30.5	30.3	30.6	32.6	30.4	33.7

Co-occurrence of Depression and DRD Overall and by Age and Sex. Over half of the participants did not experience high distress or probable clinical depression (57.5%) (Table 5).

Over one-half of male (60.8%) and of female (56.0%) participants experienced none to low levels of distress/depressive symptoms and DRD; 16.5% of male and 18.5% of female participants experienced both high DRD and depression. Nearly one-fifth (17.8%) experienced both high distress and probable clinical depression and 17.4% experienced high distress without depression. Under one-tenth (7.3%) experienced probable clinical depression without distress. There was no statistically significant relationship found between sex and co-occurrence groups (X^2 (3, N=247) =.543, p=.909). There was a statistically significant difference between age and probable depression/distress co-occurrence (F(3,246)=4.692, p=.003)). Those who were distressed were significantly younger (M=48.8, SD=11.5) than those who were neither depressed nor distressed (M=55.2, SD=12.0). Additionally, those who were both distressed and experienced probable depression were significantly younger (M=49.6, SD=12.3) than those who were neither depressed nor distressed.

Table 5. Co-occurrence of DRD and depression overall and by age and sex.

Distressed/Depressed Subgroups	Overall (N=247) %	Male (n=79)	Female (n=168)	Age (n=247) M(SD)
None to low levels distress/depressive symptoms (DDS<3; PHQ-9<10)	57.5	60.8	56.0	55.2 (12.0)
Probable depression (without distress) (DDS <3; PHQ-9≥10)	7.3	6.3	7.7	51.9 (11.7)
Distress without depression (DDS≥3; PHQ-9<10)	17.4	16.5	17.9	48.8 (11.5)
Both distress and probable depression (DDS≥3; PHQ-9≥10)	17.8	16.5	18.5	49.6 (12.3)

Note: Percents have been rounded and may not total 100%.

Co-occurrence of Depression and DRD in African American and Hispanic/Latinx Groups Overall and by Sex. Differences across these distress/depression categories were examined by racial-ethnic group and sex (Table 6). The majority (51.9%) of African American participants reported experiencing none to low levels of depressive symptoms and DRD. Greater than 1 in 5 (22.5%) reported both high distress and probable depression; there was not a statistically significant relationship between sex and both high distress/probable depression (X^2 (1, N=129) 1.063, p=.303). For Hispanic/Latinx participants, the majority (63.6%) did not report experiencing either depressive symptoms or DRD. A total of 18.6% reported experiencing high distress; there was not a statistically significant relationship between sex and high distress without depression (X^2 (1, N=118) 0.8, p=.773).

Table 6. Co-occurrence of DRD and depressive symptoms in African American and Hispanic/Latinx groups overall and by sex.

Distressed/Depressed Subgroups	African American			Hispanic/ Latinx		
	Overall (N=129) %	Male (n=46) %	Female (n=83) %	Overall (N=118) %	Male (n=33) %	Female (n=85) %
None to low levels distress/depressive symptoms (DDS<3; PHQ-9<10)	51.9	58.7	48.2	63.6	63.6	63.5
Probable Depression (without Distress) (DDS <3; PHQ-9>10)	9.3	8.7	9.6	5.1	3.0	5.9
Distress without Depression (DDS≥3; PHQ-9<10)	16.3	15.2	16.9	18.6	18.2	18.8
Both Distress and Probable Depression (DDS≥3; PHQ-9>10)	22.5	17.4	25.3	12.7	15.2	11.8

DISCUSSION

Overall rates of Depression and Distress. One notable finding is that a substantial proportion (62.3%) of individuals from both racial-ethnic groups experienced moderate to high DRD and 1 in 4 reported moderate to severe depressive symptomatology. This is generally consistent with the literature noting higher levels of depression and DRD (moderate levels, on average) in racial-ethnic minority individuals with diabetes (Baek, Tanenbaum, & Gonzalez, 2014; Hood, Irby-Shasanmi, de Groot, Martin, & LaJoie, 2018; Peyrot et al, 2014, Skinner et al, 2020). This study extends this understanding to a population of urban low-income African American and Hispanic/Latinx adults receiving care in primary care clinics.

Our study also examined differences based on age and sex. Although no sex differences were identified overall, we found that those in the high DRD group were younger than those with little to moderate DRD levels. This suggests that age may be an important risk factor to consider in addressing DRD in these groups. One study (Peyrot et al, 2014) examined ethnic difference in psychological outcomes among people with diabetes and found that that although differences were found across ethnic groups (i.e., White non-Hispanic, African American, Hispanic, Chinese American), once potential mediators (i.e., disease/demographic/socioeconomic; health status;

healthcare access/utilization; subjective burden of diabetes; social support/burden) were controlled, the impact of ethnicity was reduced. For example, older individuals and those with higher income and education had more positive psychological outcomes, however, the authors note that these associations were complex and mediated by other factors studied. The authors emphasized the need to continue to examine culturally specific models to best understand the impact of diverse factors on psychological outcomes and to support the development of culturally tailored interventions.

Specific Areas of DRD. Our findings indicated more individuals had high reported distress on the emotional burden and regimen-related subscales overall and specifically for those of younger age. This overall pattern is similar to that found in other studies with diverse populations, including racial-ethnic minority adults (Baek, et al., 2014; Fisher, et al, 2015; Hood, et al., 2018; Helgeson, Naqvi, Korytkowski, & Gary-Webb, 2021). Furthermore, more males had high regimen-related distress compared with females and African American males had the greatest proportion (56.5%) with high regimen-related distress of all groups. The Hood study (Hood et al, 2018) also examined psychosocial support preferences in urban African Americans with T2DM and offered insights into addressing DRD. In focus groups, their participants noted an interest in culturally sensitive and gender-specific support groups. Furthermore, young adults requested support resources tailored to their age-specific needs (e.g., managing school, employment, and being socially accepted among peers). One study (Fisher et al, 2013) examined three interventions specifically designed to address the areas of emotional burden and regimen-related distress. These included computer-assisted self-management (CASM), CASM plus diabetes distress-specific problem solving, and a computer-administered minimal supportive intervention. All three approaches resulted in significant and clinically meaningful improvements in these two DDS subscales but no significant between group differences emerged. These findings offer promising interventions to address these areas.

Co-occurrence of Distress and Depression. When examining the co-occurrence of DRD and depression, a large proportion of individuals across racial-ethnic groups (42.5%) reported experiencing high DRD, depressive symptomatology or both. In addition, comparisons of the four distress-depression co-occurrence subgroups on age and sex found differences only by age with younger individuals more likely to be distressed or experience both distress and depressive symptoms.

When comparing the current findings to the overall estimates from Skinner et al 2020, proportions were comparable for those reporting depression only (7.3% of the current sample, compared to the 5-10% estimated). A slightly smaller proportion of the current sample (17.4%) was distressed (without depression) than the previous estimates of 20-30% (Skinner et al, 2020). A higher proportion in our sample reported being distressed and depressed (17.8%) than estimates of 5-15% (Skinner et al, 2020). The results for those with none to low levels of distress/depression (57.5%) were consistent with the previously published estimates of 50-70% (Skinner et al, 2020). Also consistent with Skinner et al (2020) study, younger age was associated with greater emotional challenges. In particular, in our study, younger age was associated with greater levels of distress alone and co-occurrence of distress and depression than those with neither depression nor distress. It is important to clarify that in our study, the average age for the distress only group (48.8), and co-occurrence group (49.6) would be considered middle-aged adults. Recent research found that the mean age at diagnosis overall was 49.9 years, with Mexican American (44.9 years) and non-Hispanic Black (47.2 years) adults reporting a younger mean age at diagnosis (Wang, Shah, Carnethon, O'Brien, & Khan, 2021). There may be multiple hypotheses about the increased distress and co-occurrence in this age group, such as emotional response to the diagnosis; challenges in learning about diabetes and incorporating diabetes self-management activities into active lives; and ongoing complexity of balancing work, family, other life activities, and diabetes care. Further research is needed to better understand the diversity of factors that might impact distress and depression in racial-ethnic minority individuals with diabetes. This underscores the importance of health care provider's consideration of the overall life experiences of a person with diabetes in providing care.

When comparing our findings to those from the Wardian et al. study (2018) of Airforce Diabetes Center participants, the proportion of no-depression/no distress was lower in this current study (57.5% vs 70.4%). It was similar for those experiencing probable depression without distress (7.3% vs 5.7%) and distressed without depression (17.4% vs 17.8%). Our sample had a larger proportion with the co-occurrence of probable clinical depression and DRD (17.8% vs 6.1%). This may be associated with income levels, access to care, or diabetes type, among other possibilities. For example, individuals in the Wardian sample included those with either type 1 or type 2 diabetes, were part of a military health system, and did not need to pay any out-of-pocket expenses for health care, supplies or medication.

The National Institute on Minority Health and Health Disparities' (NIMHD) "Minority Health and Health Disparities Framework" (2017) emphasizes considering multiple levels of influence, including individual, intrapersonal, community, and societal factors, along with various dimensions of influence, including biological, behavioral, physical/built environment, sociocultural environment, and health care system. More research is needed to continue to explore context at multiple levels highlighted in this framework, as well as risk and protective factors, associated with distress and depression in diverse groups of individuals with diabetes. One study (Lebron, et al., 2014) has examined self-reported racial/ethnic discrimination and DRD in African American and Hispanic/Latinx adults with diabetes. This study (Lebron et al., 2014) found a significant association for the Hispanic/Latinx but not the African American groups, thereby underscoring the need to better understand potential differences in context and lived experiences of different racial-ethnic groups, among other factors, that may influence negative affect.

Strengths and Limitations. This study has multiple strengths, including its focus on two racial-ethnic groups that experience greater burden of diabetes. Another strength is the inclusion of both English and Spanish speaking individuals. The use of well-validated measures of depression and diabetes distress is also a strength. The study suffers from common limitations of self-report studies, such as social desirability bias. Generalizability is limited to the population included in this study and the study was not designed to make comparisons with non-Hispanic white populations. Also, since it was conducted prior to COVID-19, it cannot be generalized to understand the patterns of depression and diabetes distress during the pandemic.

CONCLUSION

Our findings indicate that the low-income racial-ethnic minority groups in this study experienced substantial levels of DRD and depressive symptomatology, underscoring the importance of assessing and addressing these important areas. Furthermore, our findings suggest that younger age may be a risk factor for these challenges emphasizing the importance of taking the person's full lived experience into consideration in providing care.

The American Diabetes Association's "Standards of Medical Care in Diabetes" (ADA, 2022) recommendations for facilitating behavior change and well-being in people with diabetes emphasizes that clinicians should include regular screening and interventions for both depression and DRD. Specific recommendations for choosing reliable and valid assessment measures for screening for depression and DRD have been described in the literature (Young-Hyman et al, 2016; Polonsky et al., 2022). Recommendations are also available for identifying effective intervention approaches for each of these problem areas (ADA, 2022; Sturt, Dennick, Hessler, Hunter, Oliver, Fisher, 2015; Young-Hyman et al., 2016). Access to mental health has been found to be lower in racial-ethnic minority groups and multiple barriers may contribute to this disparity, such as lack of health insurance, cultural stigma, shortage of Spanish-speaking clinicians, and lack of culturally tailored treatment options (Cook, Trinh, Li, Hou, & Progovac, 2017; McGuire & Miranda, 2008). More work is needed to identify treatment options tailored for ethnic-racial minorities that incorporate their cultural preferences, world view, and historical traditions.

The current findings may equip health care providers with a better understanding of co-occurrence levels and patterns of DRD and depression in two low-income racial-ethnic minority groups and support them when initiating culturally sensitive conversations with racial and ethnically diverse PWD (Stubbe, 2020). This is especially critical since research has indicated that African Americans with T2DM, in particular, were less likely than White individuals to initiate a discussion of depressive symptoms with healthcare providers (Wagner, Perkins, Piette, Lipton, & Aikens, 2009). This underscores the need for the provider to initiate conversations with their patients about emotional challenges. Knowledge of the general levels of depression and distress in these groups may help equip clinicians with information to normalize the experience of these conditions in their conversations and possibly make it more comfortable to share personal symptoms, if present. Understanding where people may experience higher distress, such as emotional coping and self-management (i.e., regimen-related), may help health care providers initiate culturally sensitive conversations about these experiences related to living with diabetes. Furthermore, our findings that a large proportion of African American males experienced high regimen-related distress may offer clinicians a specific idea for an initial focus area that may be less sensitive and help open the door to further discussion. Framing the conversation around common challenges of living with diabetes may help more comfortably introduce this important discussion for both the clinician and person with diabetes and may create an opportunity for a continued discussion about mental health, where needed. Finally, avoiding approaching the discussion from a deficit or problem perspective and focusing instead on areas of strength and resilience may make the discussion more comfortable.

Implications of these findings for research and public health include the need to expand inclusion of research participants belonging to racial/ethnic minority groups when testing interventions designed to improve emotional well-being in the context of diabetes, especially clinical trials targeting improved diabetes self-management (Bibbins-Domingo, Kirsten, Helman, & Dzau, 2022; NIMHD, 2017). This will inform optimal cross-cultural treatment approaches in racial/ethnic minority groups. Additionally, because regimen-related distress was prevalent in our sample, public health policies should explore potential community (e.g., food insecurity, neighborhood safety and walkability, presence of greenspace) and federal-level (e.g., cost of medication and self-care supplies) barriers to management. Inability to access resources for disease management may contribute to regimen-related and global distress levels. The ADA promotes a population health approach to diabetes care that includes consideration of the individual, systems, and policy levels and, along with others, emphasizes the importance of social determinants of health (ElSayed, et al, 2023; Hill, et al, 2013; Hill-Briggs et al., 2020). Finally, given the importance of family support in ethnic/racial minorities (e.g., Hu, Amirehsani, Wallace, McCoy, & Silva, 2016; Peyrot, Egede, Funnell, Hsu, Ruggiero, & Stuckey, 2018), interventions designed to support diabetes self-management should ideally incorporate family members and offer family members relevant education and resources. This may also serve to attenuate interpersonal distress.

Understanding the pattern of depression-distress co-occurrence in these groups may also help clinicians tailor their treatment approach and possible referrals to other professionals, such as a diabetes care and education specialist and/or a mental health professional. One paper (Snoek et al, 2015) describes strategies for addressing individuals in each of the four distress-depression subgroups. For example, people with both depression and distress might benefit from a comprehensive multidisciplinary approach including the primary health care provider, along with referral to a mental health provider and diabetes educator for diabetes self-management education and support. For those who report DRD without depressive symptoms, educational or supportive counselling approaches are suggested to help improve their problem-solving skills and coping with the daily demands of diabetes self-care (Snoek et al, 2015). Others also underscore the value of using a collaborative care approach (ElSayed, et al, 2023) as well as addressing potential barriers to addressing depression and diabetes distress at the patient, provider, and practice levels (Owens-Gary et al, 2018).

In summary, understanding the patterns of depression and DRD in diverse groups with T2DM may help support health care providers in their work to deliver culturally sensitive care. More research is needed with larger U.S. samples, including more diverse racial-ethnic groups, (e.g., country of origin, level of acculturation, language spoken) and examination of social determinants of health to further clarify patterns and identify potential risk and protective factors to help address these important challenges for people living with diabetes.

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