High Diabetes Distress Among Ethnic Minorities Is Not Explained by Metabolic, Cardiovascular, or Lifestyle Factors: Findings From the Dutch Diabetes Pearl Cohort

High Diabetes Distress Among Ethnic Minorities Is Not Explained by Metabolic, Cardiovascular, or Lifestyle Factors: Findings From the Dutch Diabetes Pearl Cohort

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OBJECTIVE

Diabetes distress among patients from ethnic minorities is still poorly understood. We investigated the association between ethnicity and diabetes distress among ethnic minority groups of people with type 2 diabetes in the Netherlands, focusing on the possible effects of glycemic control, lifestyle factors, cardiovascular risk factors, and diabetes complications.

RESEARCH DESIGN AND METHODS

Cross-sectional data from the Dutch Diabetes Pearl cohort included people with type 2 diabetes from primary, secondary, and tertiary diabetes care programs. We used the 20-item Problem Areas in Diabetes Survey (PAID) scale to assess diabetes distress; a score ≥40 is considered to represent high distress. Ethnicity was estimated on the basis of country of birth. Sociodemographic and lifestyle data were self-reported; cardiovascular and metabolic data were retrieved from medical charts. Logistic regression analysis determined the association between ethnicity and diabetes distress, with Caucasians as the reference group.

RESULTS

Diabetes distress scores and ethnicity were available for 4,191 people with type 2 diabetes: 3,684 were Caucasian, 83 were Asian, 51 were Moroccan, 92 were African, 134 were Latin American, 46 were Turkish, and 101 were Hindustani-Surinamese. Overall, participants in minority groups had worse health outcomes than those of Caucasian descent, and diabetes distress was more prevalent (ranging from 9.6 to 31.7%, compared with 5.8% among Caucasians), even after adjusting for age, sex, education level, alcohol use, smoking, BMI, lipid profile, HbA_{1c}, medication use, and the presence of diabetes complications.

CONCLUSIONS

Among people with type 2 diabetes in the Netherlands, ethnicity is independently associated with high diabetes distress. Further research is warranted to explain the higher prevalence of diabetes distress in minority groups and to develop effective interventions.

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The prevalence of diabetes is rising globally, and an estimated 8.5% of adults are affected by the disease (1). About 90% of all cases of diabetes are type 2 diabetes, the disease related to physical inactivity and overweight (1). The prevalence of type 2 diabetes is particularly high among ethnic minorities living in Western societies (2). End-stage diabetes complications (3) and related mortality (4) are more common among ethnic minorities.

Psychosocial well-being is an often overlooked aspect in people with type 2 diabetes (5)—regardless of ethnicity—and is of key importance to their ability to manage their diabetes. The emotional burden, stress, and worry associated with diabetes are collectively known as diabetes distress (6). The Distress and Depression in Diabetes Study (3D Study) has indicated that over 40% of all people with type 2 diabetes suffer from at least a moderate degree of diabetes distress (7), and almost 30% experience a high level of diabetes distress (8).

In view of this, combined with the fact that ethnic minorities often experience migration-related stress, we hypothesized that ethnic minorities have a greater chance of suffering from diabetes distress than do patients of Caucasian descent. Indeed, three recent studies have shown a higher prevalence of diabetes distress among ethnic minorities (9,10). By contrast, the Amsterdam Health Monitor Study did not find diabetes distress to be more common among immigrants with diabetes than among native Dutch patients with diabetes (11). However, these studies had relatively small sample sizes and were restricted to a few ethnic minority groups (9–11). The question, therefore, is whether ethnic minorities are indeed at greater risk of suffering from diabetes distress relative to those of Caucasian descent, and whether lifestyle and metabolic and cardiovascular risk factors play an explanatory role.

In this study we investigated the prevalence of diabetes distress among multiple ethnic minority groups of people with type 2 diabetes in the Netherlands, and whether the association between ethnicity and diabetes distress is explained by metabolic control, lifestyle factors, cardiovascular risk factors, and the presence of diabetes complications.

RESEARCH DESIGN AND METHODS

This study was part of the Parelsnoer Initiative, a partnership between all eight university medical centers in the Netherlands. The Dutch Diabetes Pearl is an observational cohort study within this partnership, consisting of 6,666 people with type 2 diabetes treated in various geographical areas and settings (i.e., primary, secondary, and tertiary care). For this study we selected people with type 2 diabetes for whom we had complete data for ethnicity, obtained from the Problem Areas in Diabetes Survey (PAID), and for covariates (n = 4,191 [63%]; see the flowchart in the Supplementary Data). Data regarding prior cardiovascular disease (CVD), neuropathy, and nephropathy were available for a smaller sample.

The medical ethical committees of all eight university medical centers approved the study. All participants provided written informed consent. People with a language barrier were not able to participate in this study, as they could not fulfill the informed consent criteria. Details on the design of the Dutch Diabetes Pearl were previously published (12). Data were collected between 2009 and 2015, and included information on demographics, physical examinations, and laboratory measurements, and information from various questionnaires.

Ethnicity

The Netherlands has a long history of immigration and is home to many ethnic groups; this is described in the Supplementary Data. The largest groups originate from Morocco, Turkey, Asia, and Suriname. The latter group consists of Hindustani-Surinamese, a group that originated in the northern part of India but moved to Suriname in the 19th century and migrated to the Netherlands from 1975 onward. This specific group has different genetic and cultural backgrounds than Asian people (13).

Ethnicity was estimated based on country of birth and/or judged by study nurses based on conversations during which patients were asked about their ethnicity. The latter was done to overcome misclassification of ethnicity for individuals who had been born in the Netherlands but who had a different ethnic background, as we did not register the country of birth of patients' parents (14). In the case of a discrepancy between the country of birth and the judgement of the study nurse, we used the latter to define ethnicity, applying the following categories: Caucasian, Asian, Moroccan, African, Latin American (commonly known as Hispanic in the U.S.), Turkish, and Hindustani-Surinamese (Table 1 and Supplementary Data).

Diabetes Distress (PAID)

We used the PAID questionnaire—a 20-item questionnaire that measures the emotional impact of diabetes and various other aspects of diabetes-related quality of life (9,10)—to assess diabetes-related distress. The Dutch version of the PAID scale has good factorial validity, good internal consistency, and good convergent and discriminative validity (15). The PAID applies a five-point Likert scale ranging from "not a problem" (score of 0) to "serious problem" (score of 4). Multiplying the summed score by a factor of 1.25 provides the PAID score, which can range from 0 to 100; higher scores indicate greater levels of distress. Participants with a score $\geq$40 were considered to have high diabetes distress, further referred to as diabetes distress (8).

Covariates

Data on age and sex were collected from hospital information systems. Education level was self-reported. A low education level was defined as no education, primary school not finished, primary education, or low vocational education. A moderate education level was defined as intermediate vocational education, high secondary education, or high vocational education. A high education level was defined as high professional education or university education.

In line with published alcohol guidelines, low-risk alcohol consumption was defined as no more than 7 drinks/week for women and no more than 14 drinks/week for men (16). Smoking was categorized as never, former, and current smoking. BMI was defined as a person's weight (kilograms) divided by square of height (meters).

Levels of fasting glucose, lipids, HbA_{1c}, and serum creatinine were measured in venous plasma. Urinary albumin and creatinine were measured in a sample of urine collected in the morning. All measurements took place in certified on-site laboratories (12). The metabolic laboratory variables were measured using the

Table 1—General characteristics of the study population (*n* = 4,191)

	Caucasian (*n* = 3,684)	Asian (*n* = 83)	Moroccan (*n* = 51)	African (*n* = 92)	Latin American (*n* = 134)	Turkish (*n* = 46)	Hindustani-Surinamese (*n* = 101)
Age, years	62.9 ± 9.8	60.4 ± 9.9	57.5 ± 12.5	55.1 ± 12.4	57.3 ± 9.5	54.2 ± 11.6	54.7 ± 11.5
Female sex	1,434 (39)	36 (43)	18 (35)	56 (61)	75 (56)	17 (37)	51 (50)
Height, cm	172.9 ± 9.6	165.0 ± 9.2	166.8 ± 9.4	167.0 ± 8.6	166.3 ± 8.4	164.7 ± 8.3	163.5 ± 10.0
Weight, kg	92.4 ± 19.1	78.0 ± 14.7	87.3 ± 14.2	88.8 ± 16.1	86.7 ± 20.0	92.1 ± 18.5	81.6 ± 16.8
BMI, kg/m^2	30.9 ± 6.0	28.5 ± 4.0	30.5 ± 5.6	31.9 ± 6.1	31.4 ± 7.2	33.9 ± 6.3	30.5 ± 5.6
Waist circumference, cm (*n* = 3,598)	107.3 ± 14.5	98.4 ± 10.5	108.3 ± 12.9	106.6 ± 13.6	104.4 ± 16.5	112.0 ± 14.5	104.1 ± 14.9
Education level, %*							
Low	35.6	20.5	70.6	46.7	39.6	73.9	42.6
Moderate	42.8	55.4	21.6	38.0	48.5	21.7	47.5
High	21.6	24.1	7.8	15.2	11.9	2.3	9.9
Smoking, %							
Never	31.9	41.0	54.9	65.2	50.0	43.5	64.4
Former	50.6	42.2	31.4	16.3	29.1	26.1	23.8
Current	17.5	16.9	13.7	18.5	20.9	30.4	11.9
Alcohol use, %†							
None	41.3	63.9	98.0	75.0	56.0	89.7	75.2
Low	46.0	31.3	2.0	25.0	42.5	8.7	24.8
High	12.7	4.8	0.0	0.0	1.5	2.2	0.0
Triglycerides, mmol/L	1.78 ± 1.00	1.82 ± 1.04	1.62 ± 0.79	1.27 ± 0.75	1.49 ± 1.13	1.91 ± 1.02	1.84 ± 1.13
Total cholesterol, mmol/L	4.37 ± 0.98	4.21 ± 1.01	4.28 ± 0.88	4.63 ± 1.22	4.49 ± 1.00	4.50 ± 1.07	4.46 ± 1.26
HDL cholesterol, mmol/L	1.23 ± 0.36	1.23 ± 0.34	1.14 ± 0.37	1.41 ± 0.40	1.23 ± 0.34	1.17 ± 0.37	1.19 ± 0.31
LDL cholesterol, mmol/L	2.4 ± 0.8	2.2 ± 0.8	2.5 ± 0.7	2.7 ± 1.1	2.6 ± 0.9	2.7 ± 0.9	2.6 ± 1.1
HbA_{1c}, % (mmol/mol)	7.1 ± 1.15 (54.6 ± 12.6)	7.2 ± 1.23 (55.6 ± 13.4)	8.0 ± 1.55 (64.2 ± 16.9)	7.8 ± 1.65 (62.7 ± 18.0)	7.6 ± 1.44 (59.9 ± 15.7)	8.6 ± 1.65 (70.8 ± 18.0)	8.1 ± 1.66 (65.1 ± 18.2)
PAID score	5.0 (1.3; 15.8)	8.8 (2.5; 21.3)	18.4 (10.0; 35.0)	19.4 (6.3; 38.4)	15.0 (2.5; 36.4)	28.8 (12.2; 55.7)	18.8 (5.0; 48.1)
Diabetes distress‡	215 (5.8)	8 (9.6)	10 (19.6)	21 (22.8)	29 (21.6)	14 (30.4)	32 (31.7)
Medication use (available in *n* = 4,124)							
Oral only	1,720/3,620 (47.5)	36/82 (43.9)	12/51 (23.5)	24/92 (26.1)	51/132 (38.6)	9/46 (19.6)	25/101 (24.8)
Insulin only	542 (15.0.7)	11 (13.4)	12 (23.5)	21 (22.8)	18 (13.6)	11 (23.9)	19 (18.8)
Oral + insulin	903 (24.9)	29 (35.4)	24 (47.1)	44 (47.8)	56 (42.4)	26 (56.5)	53 (52.5)
Lipid modifying	2,448 (66.4)	60 (72.3)	32 (62.7)	53 (57.6)	88 (65.7)	32 (69.6)	74 (73.3)
Antihypertensive	2,498 (67.8)	62 (74.7)	30 (58.8)	67 (72.8)	97 (72.4)	35 (76.1)	75 (74.3)
Nephropathy (available in *n* = 1,767)							
Microalbuminuria§	333/1,440 (23.1)	13/43 (30.2)	14/30 (46.7)	14/52 (26.9)	30/89 (33.7)	12/39 (30.8)	19/74 (25.7)
Macroalbuminuria	79 (5.5)	5 (11.6)	4 (13.3)	5 (9.6)	10 (11.2)	10 (25.6)	16 (21.6)
Neuropathy (available in *n* = 1,878)‖	474/1,505 (31.5)	10/43 (23.3)	14/46 (30.4)	12/76 (15.8)	19/80 (23.8)	9/38 (23.7)	20/90 (22.2)
Prior CVD (available in *n* = 3,938)	1,224/3,492 (35.1)	38/81 (46.9)	16/44 (36.4)	21/77 (27.3)	43/116 (37.1)	20/42 (47.6)	40/86 (46.5)

Results are presented as the mean ± SD, *n* (%), *n*/*N* (%), or median (interquartile range). *Low education includes no education, primary school not finished, primary education, and low vocational education. Moderate education includes intermediate vocational education, high secondary education, and high vocational education. High education includes high professional education and university education. †Women: low ≤7 drinks/week, high >7 drinks/week; men: low ≤14 drinks/week, high >14 drinks/week. ‡PAID score ≥40. §Albumin-to-creatinine ratio of 30–300 mg albumin/g creatinine. ‖Low risk: VPT <25 V; high risk: VPT ≥25 V.

same methodology at all but one center. This was also the case for HbA_{1c}, which were measured with high-performance liquid chromatography at all centers but one, which used affinity chromatography.

Information on prior CVD was collected via questionnaires, as previously described (12). Information regarding

nephropathy was derived from the albumin-to-creatinine ratio determined in the morning urine sample. Microalbuminuria is defined as an albumin-to-creatinine ratio of 30–300 mg albumin/g creatinine (17). Neuropathy was measured using a Horwell neurothesiometer (Scientific Laboratory Supplies, Nottingham, U.K.), a device that assesses the vibration perception threshold (VPT) at the distal phalanx of the hallux. The neurothesiometer was used at six centers (not at the VU and Leiden University Medical Centers). Vibration thresholds were tested eight times for each participant. Mean vibration threshold then was calculated as the mean of the six highest vibration thresholds. A VPT of 25 V or higher indicated neuropathy (18).

Statistical Analysis

Descriptive statistics were used to assess the characteristics of participants from seven ethnic groups, and these data were expressed as the mean ± SD, median (range), or number (percentage). We examined the association between ethnicity and diabetes distress with logistic regression, with the Caucasian group as the reference. The regression model was cumulatively adjusted for age, sex, education level, smoking, alcohol use, BMI, cholesterol profile, HbA_{1c}, diabetes medication, lipid medication, antihypertensive medication, prior CVD, nephropathy, and neuropathy. Although systolic and diastolic blood pressures were recorded, we did not include these measurements as covariates in the analyses because neither systolic nor diastolic blood pressure was significantly different among the ethnic groups (data not shown). Blood pressure therefore could not confound the association between ethnicity and diabetes distress.

SPSS Statistics version 23.0 (IBM Corp, Armonk, NY) was used to carry out statistical analysis. The significance level was $\alpha = 0.05$. Two-tailed P values ≤ 0.05 were considered significant.

RESULTS

Patient Characteristics

Table 1 describes the characteristics of participants in all seven ethnic groups, of whom 3,684 were Caucasian, 83 were Asian, 51 were Moroccan, 92 were African, 134 were Latin American, 46 were Turkish, and 101 were Hindustani-Surinamese. The Caucasians and Asians had the highest mean age of all ethnic groups. Among the Caucasians, Asians, Latin Americans, and Hindustani-Surinamese, most participants had an intermediate level of education, whereas most Moroccan, African, and Turkish participants had a low level of education.

The mean BMI of Asian, Moroccan, and Hindustani-Surinamese participants was lower than that of Caucasian participants, whereas the mean BMI was higher in African, Latin American, and Turkish participants. Both the lipid profile and mean HbA_{1c} levels were more favorable in Caucasians than in the ethnic minority groups.

Caucasians and Asians mostly used oral diabetes drugs. It is notable that Turks had the lowest use of oral diabetes medications and the highest use of insulin. Lipid-modifying medication use was lower among Moroccans, Africans, and Latin Americans than among Caucasians, whereas it was higher in the other ethnic groups.

Among Caucasians, 9.0% had microalbuminuria and 2.1% had macroalbuminuria, whereas these percentages were higher in other ethnic groups. The highest percentage of albuminuria was found among Turks. The largest proportion of participants with neuropathy was found among Moroccans, and the largest proportion of participants with prior CVD was found among Asians.

Ethnicity and Diabetes Distress

Compared with the prevalence of diabetes distress among Caucasians (5.8%), this prevalence was higher in all other ethnic groups, ranging from 9.6% among Asians to 31.7% among Hindustani-Surinamese. Table 2 depicts the odds of having diabetes distress, both unadjusted and after adjustment for nine possible confounders (age, sex, education, smoking, alcohol use, BMI, HbA_{1c}, CVD risk factors, and medication use), with Caucasians as the reference group. In unadjusted analyses, compared with Caucasians, participants with a Moroccan, African, Latin American, Turkish, or Hindustani-Surinamese ethnicity had a 4- to 7.5-fold greater odds of reporting diabetes distress, whereas the risk was not significantly different for Asians. After adjustment for age, sex, and level of education (model 2), the odds ratios decreased slightly, mainly because of age. Additional adjustments for the lifestyle factors smoking, alcohol use, and BMI (model 3) resulted in slightly altered odds ratios, caused mainly by differences in alcohol use and BMI. After adjustment for cholesterol profile and HbA_{1c} (model 4), the odds ratios decreased slightly and were no longer statistically significant for the Moroccan group. The odds of having diabetes distress did not change after additional adjustment for diabetes medication, lipid medication, and antihypertensive medication (model 5). Figure 1 shows the odds of having diabetes distress for all ethnic minorities after full adjustment, with Caucasian participants as the reference group. While we also further adjusted the model for primary and secondary/tertiary care, this did not affect these results (60% of participants were in primary care and 40% were in secondary/tertiary care). Additional adjustment for prior CVD, neuropathy, or nephropathy in subgroup analysis did not change the association between ethnicity and diabetes distress (Table 3).

CONCLUSIONS

The main finding of this cohort study was that an important association exists between ethnicity and diabetes distress among multiple minority groups with type 2 diabetes living in the Netherlands. Diabetes distress was 2.7- to 4.4-fold higher among African, Latin American, Turkish, and Hindustani-Surinamese minority groups than among Caucasians. This association was found to be independent of age, sex, education level, lifestyle factors, lipid profile, HbA_{1c}, CVD risk factors, medication use, or diabetes complications. Diabetes distress was also higher among patients of Asian and Moroccan descent than among Caucasians, although this association was not statistically significant. These findings may have important implications for the delivery of care to individuals with type 2 diabetes from ethnic minorities.

Our current observations are in agreement with results of the second Diabetes Attitudes, Wishes and Needs (DAWN2) study, which reported higher diabetes distress among African American, Hispanic, and Chinese American minority groups living in the U.S. (9). In addition, in a recent article, Schmidt et al. (19) showed that diabetes distress was more prevalent among ethnic minorities, in particular

Table 2—Linear regression analyses between ethnicity and diabetes distress in Dutch people with type 2 diabetes, with Caucasians as the reference group

	Ethnicity											
	Asian		Moroccan		African		Latin American		Turkish		Hindustani-Surinamese	
Model*	OR (95% CI)	*P* value	OR (95% CI)	*P* value	OR (95% CI)	*P* value	OR (95% CI)	*P* value	OR (95% CI)	*P* value	OR (95% CI)	*P* value
1	1.72 (0.8, 3.6)	0.151	3.94 (2.0, 7.9)	**<0.001**	4.77 (2.9, 7.9)	**<0.001**	4.46 (2.9, 6.9)	**<0.001**	7.06 (3.7, 13.4)	**<0.001**	7.48 (4.8, 11.6)	**<0.001**
2	1.70 (0.8, 3.6)	0.165	3.04 (1.5, 6.2)	**0.003**	3.70 (2.2, 6.2)	**<0.001**	3.79 (2.4, 5.9)	**<0.001**	4.99 (2.6, 9.7)	**<0.001**	5.93 (3.8, 9.33)	**<0.001**
3	1.90 (0.9, 4.0)	0.095	2.79 (1.4, 5.8)	**0.006**	3.73 (2.2, 6.4)	**<0.001**	3.96 (2.5, 6.2)	**<0.001**	4.18 (2.1, 8.2)	**<0.001**	6.38 (4.0, 10.2)	**<0.001**
4	1.95 (0.9, 4.2)	0.084	2.16 (1.0, 4.6)	**0.046**	3.05 (1.8, 5.3)	**<0.001**	3.55 (2.2, 5.6)	**<0.001**	2.80 (1.4, 5.6)	**0.004**	4.83 (3.0, 7.9)	**<0.001**
5	1.86 (0.9, 3.9)	0.113	2.02 (0.10, 4.3)	0.068	2.70 (1.5, 4.7)	**0.001**	3.37 (2.1, 5.4)	**<0.001**	2.56 (1.3, 5.2)	**0.008**	4.36 (2.7, 7.1)	**<0.001**

Statistically significant data ($P < 0.05$) appear in boldface type. OR, odds ratio. *Model 1 is the crude analysis. Model 2 is adjusted for age, sex, and education level. Model 3 is adjusted for the model 2 variables as well as smoking, alcohol use, and BMI. Model 4 is adjusted for the model 3 variables as well as cholesterol profile and HbA_{1c}. Model 5 is adjusted for the model 4 variables as well as insulin and oral diabetes medication.

Figure 1—Risk for diabetes distress among ethnic minority groups. Caucasians are the reference group. Data were adjusted for age, sex, education level, lifestyle, BMI, HbA_{1c}, and CVD factors. OR, odds ratio.

Moroccans, than among native Dutch persons, whereas the associations for Turkish and Surinamese were explained by differences in socioeconomic status and HbA_{1c}. However, these studies included both individuals with type 1 and individuals with type 2 diabetes, whereas we included only individuals with type 2 diabetes.

We investigated whether clinical variables such as glycemic control, level of education, and lifestyle factors confounded the association between ethnicity and diabetes distress. While some of the adjustments did indeed attenuate the observed associations, differences in diabetes distress remained statistically significant.

Furthermore, in our study the association of ethnicity with diabetes distress was independent of complication status and care setting, both of which have been found to associate with diabetes distress (10) and are known to differ among ethnic minority groups (20). Our results support the notion that being a member of an ethnic minority in a Western society—independent of other factors—is associated with an increased risk of diabetes distress relative to being from the ethnic majority.

Several possible explanations exist for the difference in diabetes distress between ethnic minorities and Caucasians observed in our study. Unmeasured factors related to ethnic origin (e.g., migration-related stress, language problems, health illiteracy, comprehension issues, and cultural differences) could contribute to diabetes distress (21–23). Also, religion and religious coping strategies might affect diabetes distress and help-seeking behaviors. For example, Moroccan and Turkish persons are generally Muslim and perhaps rely more on religion to help them cope with the burden of diabetes, rather than seeking social support or professional help (24). Although they report high levels of distress on the PAID questionnaire, showing any sign of distress to family and friends may be considered a weakness and therefore is experienced as shameful; this leads to more use of "private" coping and the avoidance of disclosing personal distress (25). Furthermore, previous findings suggest that acculturation (integration, assimilation, separation, and marginalization) is associated with depressive symptoms in Turkish minorities in the Netherlands (26). Previous studies have shown that attempted control by family members or friends is related to more psychological symptomatology in adults with diabetes but may result in improved diabetes self-efficacy (27). Diabetes self-efficacy is defined as a person's beliefs about their ability to adhere to self-care behaviors (28) and is known to be related to both psychological distress and ethnicity (28,29). Snoek et al. (8) found that relatively high levels of diabetes distress were associated with less diabetes self-management. In addition, differences in cultural perceptions

of disease could be involved. People from ethnic minorities are known to differ in their perception of emotional or physical experiences as problems (30). Finally, ethnic minority groups have more concerns about medication use (31) and may receive less adequate treatment for comorbid depression (32) than do Caucasians.

We strongly recommend, based on our results, that awareness of the high levels of diabetes distress in ethnic minorities with type 2 diabetes—and of the consequences for diabetes self-management—be increased among health care professionals. Several studies have shown that poorly regulated diabetes will not be resolved unless diabetes distress is reduced (30,33). Offering psychological support that aims to reduce distress should therefore be considered. Patients with diabetes distress are highly responsive to intervention (34). One strategy to reduce diabetes distress is to offer self-management support (35), which is relatively inexpensive and easily available for large patient populations (36). As an alternative, such interventions could focus on emotional themes underlying diabetes distress. It is known that if distress increases over time as a result of unsuccessful diabetes management, the person's attention narrows and they become less able to apply "behavioral solutions" (37). This increased diabetes distress thus leads to even poorer coping. As a consequence, the patient is faced with unrealistic expectations and goals and is unable to gain new knowledge and skills, and any attempts to discuss inaccurate personal beliefs and perceptions become self-defeating (38). Reduced diabetes distress is associated with improved well-being and may also result in better diabetes-related health outcomes (39). In support of this notion, the American Diabetes Association's *Standards of Medical Care in Diabetes—2017* recommends routine screening of patients with type 2 diabetes for diabetes-related distress. The new guidelines suggest that providers screen all of their patients with diabetes using standardized tests for these conditions (40).

The strengths of this study include the large study population, the wide variety of measures included (covering medical, sociodemographic, and psychological parameters), and the seven-group stratification. This allowed for a

Table 3—Subgroup analyses to assess the influence of diabetes complication status on the association between ethnicity and diabetes distress

	Ethnicity													
	Asian		Moroccan		African		Latin American		Turkish		Hindustani-Surinamese			
	OR (95% CI)	*P* value	OR (95% CI)	*P* value	OR (95% CI)	*P* value	OR (95% CI)	*P* value	OR (95% CI)	*P* value	OR (95% CI)	*P* value		
Prior CVD (available in *n* = 3,873)														
Model 1	2.08 (0.96, 4.50)	0.063	1.85 (0.80, 4.29)	0.150	2.13 (1.12, 4.08)	0.022	3.16 (1.87, 5.33)	<0.001	1.79 (0.82, 3.94)	0.147	4.12 (2.39, 7.09)	<0.001		
Model 2	1.94 (0.89, 4.21)	0.094	1.84 (0.79, 4.31)	0.160	2.18 (1.14, 4.17)	0.019	3.14 (1.86, 5.30)	<0.001	1.73 (0.79, 3.83)	0.169	3.85 (2.23, 6.65)	<0.001		
Neuropathy (available in *n* = 1,764)														
Model 1	1.36 (0.46, 3.98)	0.578	1.49 (0.66, 3.40)	0.338	1.54 (0.77, 3.07)	0.226	3.17 (1.79, 5.61)	<0.001	2.58 (1.19, 5.58)	0.016	3.26 (1.89, 5.64)	<0.001		
Model 2	1.36 (0.46, 3.98)	0.578	1.49 (0.66, 3.39)	0.340	1.55 (0.77, 3.10)	0.218	3.17 (1.78, 5.62)	<0.001	2.61 (1.20, 5.64)	0.015	3.27 (1.89, 5.65)	<0.001		
Nephropathy (available in *n* = 1,744)														
Model 1	3.80 (1.58, 9.31)	0.003	1.39 (0.48, 4.04)	0.549	3.37 (1.57, 7.23)	0.002	4.77 (2.68, 8.47)	<0.001	2.88 (1.32, 6.30)	0.008	5.36 (2.94, 9.76)	<0.001		
Model 2	3.99 (1.66, 9.62)	0.002	1.53 (0.52, 4.48)	0.438	3.55 (1.65, 7.66)	0.001	5.15 (2.88, 9.20)	<0.001	3.29 (1.49, 7.26)	0.003	6.00 (3.25, 11.07)	<0.001		

Model 1 is fully adjusted for age, sex, education level, smoking, alcohol use, BMI, lipid profile, HbA_{1c}, and medication use (data on medication use were incomplete for 65 participants with CVD complications, for 114 participants with neuropathy, and for 23 participants with nephropathy). Model 2 received additional adjustment for prior CVD, neuropathy, or nephropathy. OR, odds ratio.

detailed analysis of ethnic differences in diabetes distress among a cohort of people with type 2 diabetes from various care settings in the Netherlands. Furthermore, we included people with type 2 diabetes from various regions in the Netherlands, adding to the study's external validity. The study also has some limitations. First, ethnicity was estimated from participants' country of birth and the judgement of study nurses. A better estimation of ethnicity could be achieved by adding the country of birth of both parents. Second, a relatively high number of patients had missing data on complication status and were therefore excluded from those specific analyses. Nevertheless, these adjustments had hardly any effect on the observed associations. Third, we included only individuals who were able to read and write Dutch. This meant that we included only assimilated groups of migrants, which may have led to an underestimation of the observed associations. Fourth, we cannot rule out the possibility of participation bias, because people with a language barrier could not adequately fill in the questionnaires. However, eliminating participation bias by providing questionnaires in multiple languages would have increased the number of participants in each ethnic group, which would have increased further the strength of the association. Finally, sample sizes of the various ethnic minority groups were relatively small because of the population-based design of this study. However, this is, to our knowledge, by far the largest study from the European continent.

This study shows that non-Caucasian ethnicity is associated with significantly higher levels of diabetes-related emotional distress in individuals with type 2 diabetes in the Netherlands. This association occurs independent of demographic characteristics, lifestyle factors, glycemic control, medication use, cardiovascular risk factors, diabetes complications, and care setting. A better understanding of the underlying causes of diabetes distress and the specific care needs of distressed patients is called for in order to improve health outcomes.

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