## Title
Perception of Risk for Developing Diabetes Among Foreign-Born Spanish-Speaking US Latinos.



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# Perception of Risk for Developing Diabetes Among Foreign-Born Spanish-Speaking US Latinos

## Purpose

The purpose of the study was to describe perception of risk for developing diabetes among foreign-born Spanish-speaking US Latinos.

## Methods

Participants (N = 146), recruited at food-pantry distribution events and free clinics, were surveyed using the Risk Perception Survey for Developing Diabetes in Spanish. Type 2 diabetes risk factors measured included body mass index, physical activity, and A1C.

## Results

Sample characteristics were mean (SD) age of 39.5 (9.9) years, 58% with less than a high school graduate-level education, and 65% with a family income less than $15,000/year. Prevalence of risk factors was 81% overweight or obese, 47% less than 150 minutes/week moderate/vigorous-intensity physical activity, and 12% A1C consistent with prediabetes. Of the 135 participants with complete data, 31% perceived a high/moderate risk for developing diabetes. In univariate logistic regression analyses, 9 of 18 potential variables were significant ($P < .05$) predictors of perception of risk. When these 9 variables were entered into a multiple logistic regression model, 5 were significant predictors of perception of risk: history of gestational diabetes, high school graduate or above, optimistic bias, worry, and perceived personal disease risk.

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## Conclusions

Use of the Spanish-language translation of the Risk Perception Survey for Developing Diabetes revealed factors influencing perception of risk for developing diabetes. Results can be used to promote culturally acceptable type 2 diabetes primary prevention strategies and provide a useful comparison to other populations.

An estimated 29 million adults in the United States have diabetes, and 86 million are at high risk for developing diabetes.[1] Diabetes can lead to chronic complications that can be devastating for individuals and their families, and the economic costs associated with diabetes are unsustainable for society.[2] Type 2 diabetes, comprising 90% to 95% of all diabetes, can be delayed and in some cases prevented in adults at high risk for developing diabetes, regardless of racial and ethnic background, through preventive interventions that facilitate positive modification of lifestyle risk factors, including diet, physical activity, and body weight.[3,4] Public health campaigns are under way nationwide to deploy and promote accessible community-based diabetes primary preventive lifestyle modification programs.[5] Compared with non-Latino whites, Latinos in the United States are disproportionately affected by diabetes, with higher rates of diabetes diagnosis, diabetes-associated kidney failure, and diabetes-related mortality.[6] Foreign-born Latino US adults who predominately speak Spanish are vulnerable to not receiving adequate type 2 diabetes primary preventive health services.[7]

In health care settings, clinicians and other health care team members can play key roles in diabetes primary prevention efforts through individualized patient assessment and communication of risk for developing diabetes and benefit of participating in diabetes primary preventive lifestyle modification programs.[8] Understanding risk perception among diverse racial and ethnic groups in the United States may help to communicate diabetes risk and engage individuals at high risk for diabetes in primary preventive lifestyle modification. Perception of risk for developing diabetes and perception of benefit of healthy lifestyle modification are believed to be important determinants of diabetes primary preventive health behavior.[9]

While descriptions of perception of risk for developing diabetes among Latino US adults exist,[10-13] there is limited literature on perception of risk for developing diabetes among foreign-born Latino US adults who speak predominately Spanish. No published studies exist in this population that have used the validated instrument, Risk Perception Survey for Developing Diabetes (RPS-DD),[14] to describe perception of risk for developing diabetes in foreign-born Spanish-speaking US Latinos.

The purpose of the study was to describe perception of risk for developing diabetes among foreign-born Spanish-speaking US Latinos. Specific aims of the study were to (1) describe perception of risk for developing diabetes and (2) identify factors associated with perception of risk for developing diabetes.

## Research Design and Methods

### Research Design

The study employed a descriptive cross-sectional study design in which measurements were made at a single point in time. The principal advantage of using this design was that it allowed us to make observations of participants enrolled in the study with respect to many different variables in a cost-efficient manner.

### Sample/Setting

Foreign-born Latino US adults, age 20 years or older, who reported speaking predominantly Spanish, were enrolled in August and September 2014 from those attending local food-pantry distribution and health promotion events and free health clinics in the San Francisco Bay Area of California. Inclusion criteria included age ≥20 years, Latino origin, foreign-born residing in the United States, and speaking predominately Spanish at home. Exclusion criteria included known medical history of diabetes (other than gestational diabetes) and current pregnancy. Assessment of inclusion and exclusion criteria was limited to self-report. Spanish-speaking research staff distributed written 1-page flyers containing a description of the study in Spanish and English to adults arriving at recruitment sites. Research staff informed potential participants that the study was being conducted to find out more about perception of risk for developing diabetes. Once flyers were distributed, the research staff was present and available to supply further information about the study in Spanish and English to potential participants expressing interest in the study.

## Data Collection

Enrollment and completion of the study took place on-site. Enrolled participants self-administered a questionnaire, with assistance available from research staff members for reading and comprehension, and had measurements of height, body weight, and A1C. The components of the questionnaire assessed perception of risk for developing diabetes, sociodemographics, health characteristics, physical activity, and diet. Participants received a $10 gift card for their time. All participants provided written consent prior to study enrollment. The study was approved by the Institutional Review Board of the University of California, San Francisco.

## Measures

### Perception of risk for developing diabetes and potential modifying factors

A Spanish-language translation of the RPS-DD was used to measure perception of risk for developing diabetes and factors that may modify perception of risk.[14] The 43-item RPS-DD consists of 6 measures including the Personal Disease Risk scale, Environmental Health Risk scale, Personal Control subscale, Optimistic Bias subscale, Worry subscale, and Diabetes Risk Knowledge test. A single item in the Personal Disease Risk scale measures perceived risk for developing diabetes. The remaining items in the scale measure perceived risk to health of other chronic conditions. The Personal Disease Risk scale employs a 4-point Likert scale response format from 1 (*almost no risk*) to 4 (*high risk*). Scoring of the scale uses an average item response across all items. A higher score is interpreted as a higher perceived risk to health of chronic health conditions. In a similar manner, the Environmental Health Risk scale measures perceptions of risk to health of potential environmental health hazards.

Three subscales measure general attitudes that may modify perception of risk for developing diabetes, including the Personal Control subscale, Optimistic Bias subscale, and Worry subscale. A 4-point agreement Likert scale response from 1 (*strongly agree*) to 4 (*strongly disagree*) is employed. Each subscale is scored as the average item response across all items, with higher scores being interpreted as a higher level of the assessed factor. The final section of the questionnaire is the Diabetes Risk Knowledge test, which measures knowledge of risk factors for developing diabetes. The test items are dichotomously scored (correct/incorrect), with the number of correct responses being tallied. A higher test score is interpreted as being more knowledgeable of risk factors for developing diabetes.

In a separately published article,[15] the details of the process used to create the Spanish-language translation of the RPS-DD used in this study and its psychometric properties are described. Briefly, a new preliminary Spanish-language translation was created, and an existing but untested Spanish translation was obtained. These 2 Spanish translations were harmonized and pretested in a focus group of Latino Spanish-speaking community health workers experienced in delivering preventative health services to foreign-born US Latino adults from Mexico and Central America. Based on focus group results, a modified harmonized version was created, back-translated to English, and then presented to the author of the original RPS-DD for review and consultation. The final Spanish translation was used in this study. Supporting evidence of validation in the population was obtained through field testing. Internal consistency reliabilities of the scales and subscales ranged from a Cronbach's α of 0.54 to 0.88.

### Physical activity and diet

Physical activity was assessed using a validated Spanish-language version[16] of the Stanford Brief Activity Survey (SBAS).[17] Respondents to the SBAS chose 1 of 5 brief descriptions that best matched their occupational and leisure-time physical activity over the past year: inactive, light-intensity activity, moderate-intensity activity, hard-intensity activity, or very hard-intensity activity. Participants were considered to meet the recommended level of physical activity to reduce the risk for developing type 2 diabetes of 150 minutes per week of aerobic activity of moderate intensity or greater,[18] if their overall level of physical activity using the SBAS was determined as moderate-intensity activity, hard-intensity activity, or very hard-intensity activity.[17]

Diet was assessed using a validated Spanish-language Block Fruit and Vegetable Food Frequency Screener.[19] The instrument assesses average portions per day of fruits and vegetables consumed over the past month in 7 categories: fruit (fresh, frozen, and canned), fruit juice, green salad, tomatoes (and salsa), vegetable soup, potatoes, and other vegetables.

### Sociodemographics and health characteristics

Sociodemographics and health characteristics assessed in the questionnaire included age, sex, country of origin,

education level, yearly household income, history of prediabetes, history of gestational diabetes, and family history of diabetes. Height and weight were measured, with participants wearing light clothing and shoes, by research staff using a portable stadiometer (Handi Stat; Perspective Enterprises, Portage, Michigan) and digital scale (UC-300 Precision Health Scale; A & N Engineering, Milpitas, California). Body mass index (BMI) was calculated based on the measured height and weight with a standard method (formula: BMI = weight (lb) / [height (in)]$^2$ × 703).

### Indicators of risk for developing diabetes

The American Diabetes Association (ADA) Type 2 Diabetes Risk Test was used to assess level of risk for diabetes based on the presence of diabetes risk factors: age, sex, history of gestational diabetes, family history of diabetes, history of high blood pressure, level of physical activity, and BMI.[20] Physical activity on the ADA Type 2 Diabetes Risk Test was scored based on whether participants meet the recommended 150 minutes per week of aerobic activity at moderate intensity or greater determined by the SBAS.[17] Participants who were scored on the ADA Type 2 Diabetes Risk Test as having 5 points or greater were considered at increased risk for diabetes.[20]

### A1C

A1C level was measured using a point-of-care CLIA-waived device (Siemens DCA 2000 Analyzer; Siemens Diagnostics, Tarrytown, New York). Participants were classified into 1 of 3 categories based on A1C result: less than 5.7% (39 mmol/mol), greater than or equal to 5.7% (39 mmol/mol) and less than 6.5% (48 mmol/mol), and 6.5% (48 mmol/mol) or greater.[21] Participants were provided, verbally and in writing, the results of their A1C measurement accompanied by a written statement in Spanish. This included a brief interpretation of the results and general advice to follow up with a health care provider in the event their A1C results were consistent with undiagnosed prediabetes or diabetes based on ADA standards for testing for prediabetes and diabetes in asymptomatic adults.[21] The written information received by participants included a list of primary care resources in the nearby area in case participants did not have a regular medical provider. Participants with A1C levels consistent with prediabetes were considered at high risk for developing diabetes.[21]

## Data Analysis

Descriptive statistics were used to analyze means and standard deviations of quantitative variables after normality of distribution was confirmed, while frequency and percentage were calculated to describe categorical variables.

A series of logistic regression analyses were used to explore the influence of modifying factors on perception of risk for developing diabetes. The dependent variable for the logistic regression analyses was perception of risk for developing diabetes measured using the response to the single item about diabetes in the Personal Disease Risk scale in the RPS-DD. Participants who perceived their own risk for developing diabetes as moderate or high were categorized as moderate/high risk for developing diabetes, and participants who perceived their risk as slight or almost no risk were categorized as slight or no risk for developing diabetes. To account for the influence of other independent variables, only variables found to be independently significantly associated with the dependent variable at the univariate level ($P < .05$) were entered together in a single multivariate logistic regression model. Only participants with complete data (n = 135) were entered into the sample for the logistic regression analyses. To look for possible selection bias, comparisons were made between participants in the analyzed sample and participants excluded due to incomplete data, using *t* tests and Fisher exact tests. Correlations between potential predictors were analyzed in a correlation matrix, prior to entering the multivariate logistical regression, to check for multicollinearity. The statistical software package, STATA (version 13.0; StataCorp, College Station, Texas), was used for the data analysis.

# Results

Characteristics of the participants who consented to participate in the study (N = 146) had a mean (SD) age of 39.5 (9.9) years, 74% were female, 82% were from Mexico or Guatemala, 61% had less than a high school graduate education, and 65% had a family income less than $15,000/year (see Table 1). Fourteen percent reported a history of gestational diabetes, 11% a history of prediabetes, and 35% a family history of diabetes. Eighty-one percent were overweight or obese (BMI ≥ 25 kg/m$^2$). Twenty-three percent had an ADA Type 2 Diabetes Risk Test score of 5 points or greater. Twelve percent had A1C levels consistent with

Table 1

Characteristics of Study Participants (N = 146)[a]

| Characteristic | Value |
|---|---|
| Age, mean (SD), y | 39.5 (9.9) |
| Female | 108 (74.0) |
| Country of origin | |
| Mexico | 60 (41.1) |
| Guatemala | 60 (41.1) |
| El Salvador | 15 (10.3) |
| Other Latin American country | 9 (6.2) |
| Missing data | 2 (1.4) |
| Educational attainment | |
| Never went to school or only went to kindergarten | 4 (2.7) |
| Grades 1 to 8 | 64 (43.8) |
| Grades 9 to 11 | 21 (14.4) |
| Grade 12 or GED diploma | 42 (28.8) |
| 1 to 3 years of university education | 13 (8.9) |
| 4 years or more of university education | 2 (1.4) |
| Yearly household income | |
| Less than $10,000 | 70 (47.9) |
| $10,000 to $15,000 | 25 (17.1) |
| $15,000 to $20,000 | 21 (14.4) |
| $20,000 to $25,000 | 12 (8.2) |
| $25,000 to $35,000 | 14 (9.6) |
| $35,000 to $50,000 | 3 (2.1) |
| Missing data | 1 (0.7) |
| Medical history | |
| History of gestational diabetes | 21 (14.4) |
| History of prediabetes | 16 (11.0) |
| Family history of diabetes (mother, father, sister, or brother) | 51 (34.9) |
| BMI[b] | |
| Normal (18.5-24.9 kg/m2) | 28 (19.2) |
| Overweight (25.0-29.9 kg/m2) | 61 (41.8) |
| Obese (30.0-39.9 kg/m2) | 52 (35.6) |
| Extremely obese (40.0 kg/m2 or greater) | 5 (3.4) |
| American Diabetes Association Type 2 Diabetes Risk Test | |
| Increased risk for type 2 diabetes (≥5 points) | 34 (23.3) |

*(continued)*

Table 1 (continued)

| | |
|---|---|
| A1C | |
| Less than 5.7% (39 mmol/mol) | 126 (86.3) |
| 5.7% (39 mmol/mol) to 6.4% (48 mmol/mol) | 17 (11.6) |
| 6.5% (48 mmol/mol) and greater | 3 (2.1) |
| Physical activity | |
| <150 min/week moderate- or vigorous-intensity physical activity | 69 (47.3) |
| Diet | |
| Fruit and vegetable intake, mean (SD) portions/day | 3.4 (2.0) |

BMI, body mass index; GED, General Educational Development.
[a]Values are presented as number (%) unless otherwise indicated.
[b]To adjust for measurement with shoes and clothes prior to calculation of BMI: 1 cm subtracted from height and 4 lbs subtracted from weight.

prediabetes and 2% consistent with undiagnosed diabetes. Forty-seven percent did not meet a level of physical activity recommended to prevent type 2 diabetes of 150 minutes weekly of aerobic activity of moderate intensity or greater. The mean (SD) number of portions of fruit and vegetables consumed per day was 3.4 (2.0).

The mean (SD) score of the Personal Disease Risk scale was 1.73 (0.67), indicating an overall perceived slight risk across the diseases and health problems. Table 2 displays the mean scores of each of the diseases and health problems in the scale ranked by perception of risk mean score. Diabetes was the disease/health condition with the greatest perception of risk mean score. Perception of risk mean scores for developing diabetes and other chronic diseases, including high blood pressure, arthritis, heart disease, and cancer, were greater than perception of risk mean scores for developing a number of chronic complications of diabetes. Also presented in Table 2 are the proportions of study participants who reported a perception of high risk and proportion of the sample that reported a perception of moderate or high risk. Sixteen percent of participants reported a perception of high risk for developing diabetes, and 31.5% had a perception of moderate or high risk.

The mean (SD) score of the Environmental Health Risk scale was 1.88 (0.79), indicating overall perceived slight risk to health across the potential health hazards assessed. The mean scores of each of the environmental hazards are displayed in rank order in Table 2. The environmental hazard with the highest perception of risk mean score was secondary cigarette smoke. The perception of risk mean scores of secondary cigarette smoke and other environmental chemicals and toxins, including household chemicals, air pollution, and pesticides, were greater than the perception of risk mean scores of a number of physical hazards to personal health, including driving/riding in an automobile, violent crime, and extreme weather. Secondary cigarette smoke was perceived as high risk to personal health by 31% of the participants and moderate or high risk by 46%.

The mean (SD) score of the Personal Control subscale was 3.34 (0.76), indicating a tendency toward greater perceived personal control over risk for development of diabetes. The mean (SD) score of the Worry subscale was 2.96 (0.80), indicating a slight to moderate concern regarding risk for developing diabetes. The mean (SD) score of the Optimistic Bias subscale was 2.96 (0.92), indicating a tendency among the participants to perceive their risk for developing diabetes as less than that of someone of the same age and sex. The mean (SD) score of the Diabetes Risk Knowledge test was 4.36 (2.18).

No statistically significant differences in assessed sociodemographics and health characteristics were found between the 135 participants with complete data used in this analysis and the 11 participants who were excluded because of missing data (results not shown).

Of the 135 participants included in the statistical analyses, 42 (31.1%) were found to have a perception of moderate/high risk for developing diabetes, and 93 (68.9%) were found to have a perception of lower risk. Table 3 shows that the probability of being in the group with a perception of moderate/high risk for developing diabetes was greater in adults with a history of prediabetes, a history of gestational diabetes, family history of

Table 2

Results of Spanish-Language Risk Perception Survey for Developing Diabetes Personal Disease Risk and Environmental Health Risk Scales (N = 146)[a]

| Variable | Have or Have Had Disease/ Health Condition, No. (%) | Perception of Risk, Mean | Perception of "High" Risk, No. (%) | Perception of "Moderate" or "High" Risk, No. (%) |
|---|---|---|---|---|
| **Personal Disease Risk scale** | | | | |
| Diabetes | 0 (0.00) | 2.08 | 24 (16.44) | 46 (31.51) |
| High blood pressure | 10 (6.85) | 1.88 | 13 (8.90) | 34 (23.29) |
| Arthritis | 8 (5.48) | 1.82 | 11 (7.53) | 32 (21.92) |
| Impotence (men only) | 0 (0.00) | 1.76 | 5 (3.42) | 8 (5.48) |
| Heart disease | 1 (0.68) | 1.75 | 12 (8.22) | 33 (22.60) |
| Cancer | 2 (1.37) | 1.67 | 11 (7.53) | 27 (18.49) |
| Blindness | 3 (2.05) | 1.56 | 10 (6.85) | 23 (15.75) |
| Osteoporosis | 1 (0.68) | 1.53 | 6 (4.11) | 19 (13.01) |
| Stroke | 1 (0.68) | 1.49 | 8 (5.48) | 18 (12.33) |
| Kidney failure | 5 (3.42) | 1.47 | 5 (3.42) | 17 (11.64) |
| Hearing loss | 5 (3.42) | 1.42 | 6 (4.11) | 14 (9.59) |
| Infections needing treatment by a doctor | 6 (4.11) | 1.38 | 7 (4.79) | 13 (8.90) |
| Asthma | 6 (4.11) | 1.34 | 5 (3.42) | 10 (6.85) |
| Foot amputation | 0 (0.00) | 1.19 | 3 (2.05) | 4 (2.74) |
| AIDS | 0 (0.00) | 1.10 | 1 (0.68) | 2 (1.37) |
| **Environmental Health Risk scale** | | | | |
| Secondary cigarette smoke | | 2.39 | 45 (30.82) | 67 (45.89) |
| Household chemicals | | 2.19 | 31 (21.23) | 55 (37.67) |
| Air pollution | | 2.02 | 26 (17.81) | 47 (32.19) |
| Pesticides | | 2.01 | 30 (20.55) | 48 (32.88) |
| Extreme weather (hot or cold) | | 1.81 | 16 (10.96) | 31 (21.23) |
| Medical x-rays/radiation | | 1.75 | 11 (7.53) | 31 (21.23) |
| Driving/riding in an automobile | | 1.70 | 13 (8.90) | 31 (21.23) |
| Violent crime | | 1.58 | 14 (9.59) | 26 (17.81) |
| "Street"/illegal drugs | | 1.49 | 16 (10.96) | 23 (15.75) |

[a]Means calculated based only on responses of participants who responded to item and indicated not having or having had the disease/health condition.

diabetes, a high school diploma (or equivalent), and a family income of ≥$15,000/year. Participants with a perception of moderate/high risk for developing diabetes were less optimistic about developing diabetes (more realistic), were more worried, perceived more personal disease risk, and perceived more comparative environmental risk. The score on the Personal Disease Risk scale was the variable most strongly associated with perception of risk for developing diabetes. The history of prediabetes variable was not allowed to continue into the

Table 3

Comparisons Between Participants With Perceptions of Lower vs Higher Risk for Developing Diabetes (N = 135)[a]

| Variable | Perception of Lower Risk for Developing Diabetes (n = 93) | Perception of Higher Risk for Developing Diabetes (n = 42) | Unadjusted OR | *P* Value |
|---|---|---|---|---|
| **Risk factors for developing diabetes** | | | | |
| Age, mean (SD), y | 38.73 (10.03) | 41.69 (9.54) | 1.03 | .111 |
| Male | 27 (29.03) | 7 (16.67) | 0.49 | .130 |
| History of prediabetes | 2 (2.15) | 11 (26.19) | 16.15 | <.001 |
| History of gestational diabetes | 7 (7.53) | 11 (26.19) | 4.36 | .005 |
| Family history of diabetes | 24 (25.81) | 21 (50.00) | 2.88 | .007 |
| History of high blood pressure | 7 (7.53) | 2 (4.76) | 0.61 | .554 |
| Insufficient physical activity[b] | 45 (48.39) | 20 (47.62) | 0.97 | .934 |
| BMI, mean (SD), kg/m$^2$ | 28.69 (4.20) | 29.55 (5.96) | 1.04 | .339 |
| **Indicators of risk for developing diabetes** | | | | |
| ADA risk score ≥5 | 19 (20.43) | 13 (30.95) | 1.75 | .186 |
| A1C consistent with prediabetes | 11 (11.83) | 4 (9.52) | 0.78 | .694 |
| **Sociodemographic variables** | | | | |
| High school graduate | 28 (30.11) | 24 (57.14) | 3.10 | .003 |
| Family income ≥$15,000/year | 28 (30.11) | 20 (47.62) | 2.11 | .051 |
| **Psychosocial factors (possible range 1 to 4), mean (SD)** | | | | |
| Personal control | 3.32 (0.74) | 3.34 (0.77) | 1.04 | .869 |
| Optimistic bias | 2.67 (0.86) | 2.23 (0.95) | 0.57 | .010 |
| Worry | 2.82 (0.83) | 3.17 (0.70) | 1.82 | .022 |
| Personal disease risk | 1.29 (0.34) | 2.04 (0.64) | 20.62 | <.001 |
| Environmental health risk | 1.76 (0.82) | 2.18 (0.70) | 1.91 | .006 |
| **Knowledge of risk factors for developing diabetes (possible range 0 to 11), mean (SD)** | | | | |
| Diabetes risk factor knowledge | 3.82 (2.11) | 5.36 (1.99) | 1.45 | <.001 |

ADA, American Diabetes Association; BMI, body mass index; OR, odds ratio.
[a]Values are presented as number (%) unless otherwise indicated.
[b]As defined by the Stanford Brief Activity Survey.

multivariate logistic regression model due to concerns that it would overwhelm the other predictors. Entering the remaining predictor variables with evidence of significance at the univariate analyses ($P < .05$) resulted in a multivariate logistic regression model with significant measures of fit (log-likelihood = 38.583; $\chi^2 = 90.231$, $P < .0001$; pseudo-$R^2 = 0.539$) (Table 4).

Based on the lower bounds of the confidence intervals in the multivariate logistic regression model as shown in Table 4, the probability of being in the group with a perception of moderate/high risk was at least 2.18 times greater if participants had a history of gestational diabetes and 1.2 times greater if participants had a high school diploma (or equivalent). For every 1-unit increase in the score of the Personal Disease Risk scale, participants were at least 10.71 times more likely to be in the group with a perception of moderate/high risk. For every 1-unit increase in score of the Worry subscale, participants were at least 1.16 times more likely to be in the group with a perception of moderate/high risk. For every 1-unit

Table 4

Multivariate Logistic Regression Model of Variables Predicting Perception of Higher Risk for Developing Diabetes (N = 135)

| Variable | Adjusted OR (95% CI) | *P* Value |
|---|---|---|
| **Risk factors for developing diabetes** | | |
| History of gestational diabetes | 10.95 (2.18-53.99) | .004 |
| Family history of diabetes | 2.07 (0.59-7.18) | .254 |
| **Sociodemographic variables** | | |
| High school graduate or more | 4.20 (1.20-14.66) | .024 |
| Family income ≥$15,000/year | 0.84 (0.24-2.94) | .790 |
| **Psychosocial factors** | | |
| Optimistic bias | 0.40 (0.20-0.82) | .011 |
| Worry | 2.86 (1.16-7.04) | .022 |
| Personal disease risk | 60.56 (10.71-342.58) | <.001 |
| Environmental health risk | 0.67 (0.25-1.76) | .413 |
| **Knowledge of risk factors for developing diabetes** | | |
| Diabetes risk factor knowledge | 1.21 (0.89-1.64) | .224 |

CI, confidence interval; OR, odds ratio.

decrease in score of the Optimistic Bias subscale, adults were at least 1.22 times more likely to be in the group with a perception of lower risk.

## Conclusions

In this study, a detailed description of perception of risk for developing diabetes and modifying factors in this Latino, Spanish-speaking, lower educational attainment population was presented. The study addresses a gap in an emerging field of type 2 diabetes primary prevention research, as comparable studies performed among practicing physicians,[14] primary care patients,[22] and women with a history of gestational diabetes[23] have been in non-Latino white and/or Asian, English-speaking, and higher educational attainment populations.

Findings of the study indicated that one-third (31.5%) of the participants surveyed perceived themselves to be at moderate/high risk for developing diabetes. While this finding differs from a study of women with a history of gestational diabetes in which more than half of the participants (56.7%) had perceptions of moderate/high risk for developing diabetes,[23] this finding did not differ markedly from findings in primary care patients (34.0%)[22] and practicing physicians (27.7%).[14]

Factors that predicted perception of moderate/high risk vs lower risk for developing diabetes in this study included having a history of gestational diabetes, being a high school graduate, having less optimistic bias (or a more realistic view of personal risk), having a greater degree of worry or concern, and having a perception of greater risk for developing other chronic diseases and health conditions. These predictors of perception of risk for developing diabetes may highlight factors that sensitize individuals to perception of potential risk for developing the disease and merit further study.

The level of perceived personal control did not differ greatly from that found in other populations. However, higher levels of optimistic bias and worry were found in the study sample. Of the 4 comparable studies, the lowest mean score on the Diabetes Risk Knowledge test was found in our study and the highest in the sample of practicing physicians.[14] It is conceivable that judgments of risk may be made differently in a Latino sample compared with the samples of other studies.[14,22,23] In other studies, perception of personal risk for developing

diseases and health conditions may be more in line with objective statistical risk data obtained in formal education. In this study sample, however, there may have been more reliance on judging risk based on personal experience and exposure to information gleaned from the media. This reliance on personal experience in judgment of risk may also account for the differences observed between this study sample and the sample of practicing physicians[14] in the ranking of risk for developing diabetes in comparison to other chronic diseases. Diabetes was the top-ranked disease and health condition in the Personal Disease Risk scale, whereas in practicing physicians, diabetes was ranked fifth after heart disease, high blood pressure, arthritis, and cancer.[14] Also, in the Environmental Health Risk scale, participants selected secondhand tobacco smoke as the environmental health hazard perceived as posing the greatest risk, whereas in practicing physicians, driving/riding in a car was ranked as posing the greatest risk to health.[14]

## Strengths and Limitations

This is the first study to describe perception of risk for developing diabetes and modifying factors using a Spanish-language version of the RPS-DD among foreign-born Spanish-speaking Latino US adults, a population characterized by factors linked to social disparities of diabetes-related health outcomes. Strengths of the study were that it was conducted entirely in Spanish in a homogeneous sample using validated instruments in settings well known to the participants. Fluent Spanish-speaking research staff members were available to answer questions and provide support in completing the research questionnaire. The results reveal important insight into perception of risk for developing diabetes in this vulnerable population of foreign-born Spanish-speaking Latino adults.

A limitation of the study was reliance on recruitment of volunteers willing to complete the questionnaire and undergo measurements of weight, height, and A1C, which may have resulted in a greater prevalence in the sample of adults concerned about their risk for developing diabetes, limiting the generalizability of the findings. In addition, the sample size was adequate but small. Statistical analysis was limited to only those participants with complete data. A larger sample may have allowed for a number of subgroup comparisons to understand the effect of sex, ADA Type 2 Diabetes Risk Test score, and the influence of other independent variables on perception of risk for developing diabetes. Also, potentially modifiable factors that are linked to social disparities and diabetes outcomes were not assessed, including food security and health insurance. Assessment of these factors may help explain the differences between the findings in this current study and other published studies. Food distribution events, where recruitment occurred, are often attended by families that lack sufficient means to eat balanced regular meals and sufficient quantities of food. Free clinics, another site where recruitment occurred, tend to serve adults who lack health insurance, a risk factor for receiving inadequate health screening and health education.

## Implications for Care and Public Health

A major focus of US public health type 2 diabetes primary prevention efforts is engagement of adults at high risk for developing diabetes in preventive lifestyle modification programs. Optimizing type 2 diabetes primary preventive initiatives in vulnerable populations is a priority in national public health efforts. Public health type 2 diabetes primary prevention efforts stand to benefit from the detailed description of perception of risk for developing diabetes and modifying factors in this underserved population and further research in this emerging area. More immediately, understanding perception of risk for developing diabetes and modifying factors in diverse populations may serve to inform patient-clinician interactions, which are seen as key opportunities for engaging individuals at high risk for developing diabetes in type 2 diabetes primary preventive lifestyle modification programs. Future studies are needed to further elicit the social, cultural, and economic factors that influence perception of risk for developing type 2 diabetes. Ultimately, the goal of this research is to develop interventions targeting risk perception to positively influence preventive health behaviors that can alter the course of development of type 2 diabetes.

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