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Physical activity among diabetic individuals according to diabetic treatment type

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by

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I would like to thank my advisor, Dr. Diane Wilson, for guiding me along this incredible process.

Abstract

Purpose: To evaluate the physical activity patterns of diabetic adults by the type of treatment they received

Method: The study used secondary data collected by the National Health and Nutrition Examination Survey (NHANES) from 2001 to 2006. NHANES is a continuous study which measures the health and nutritional status of non-institutionalized citizens in the United States. To be eligible for the study, participants had to be an adult 18 years or older who responded during the interview phase of the survey that they had diabetes. Participants with any missing data pertaining to the variables were excluded. After exclusions, the final size of the study population was 957. The type of treatment was defined as: insulin only, oral antidiabetic medication only, or neither. Physical activity was defined according to the guidelines set forth by the American Diabetes Association. A logistic model was used to assess the association between the type of treatment and regular physical activity. All data analyses were performed using SAS 9.1.

Results: Overall, only 28.2% of the study participants were involved in regular physical activity. With respect to the type of treatment they received, a majority of the participants (69.9%) took oral antidiabetic medication, while 23.1% used insulin. Only 7.1% didn't take antidiabetic medication or insulin. Most of the study participants were either overweight or obese (86.1%). In relation to diabetes treatment type, the frequency of taking oral antidiabetic medication among those who were diagnosed with diabetes when they were 40 years of age or older was greater (76.9%) than the frequency of insulin use (64.9%) . Among this segment of the population, 81.6% didn't use insulin or oral antidiabetic medication. Study participants who had diabetes for five years or less were more likely to take oral antidiabetic medication only, with 47.7% taking oral antidiabetic medication compared to 33.2% taking insulin. The crude odds ratio for insulin treatment and physical activity was 0.72 (CI, 0.32-1.61) while the crude odds ratio for treatment consisting of oral antidiabetic medication and physical activity was 0.61 (CI, 0.31-1.21). After adjusting for confounding, the odds of being physically active for patients on insulin treatment was 0.62 (CI, 0.28-1.39), and for those on oral antidiabetic medication the odds of being physically active was 0.53 (CI, 0.27-1.08), indicating that there was no statistical significance between either treatment group and physical activity participation.

Conclusions: Although not statistically significant, the prevalence of regular physical activity was highest (37.3%) among diabetic individuals who used neither insulin nor oral antidiabetic medication to control their diabetes, while 26.7% of participants who used oral antidiabetic drugs and 30% of participants who used insulin exercised regularly. However, the failure to participate in physical activity is a common problem among all diabetics, irrespective of group distinctions. Thus, all diabetics should be encouraged to participate in physical activity to reduce future complications.

Introduction

Diabetes is becoming a serious health burden in the United States. Approximately, 23.6 million people or 8% of the United States population have diabetes.[1,2] About a quarter of this segment of the population, or 5.7 million, are unaware of their disease status.[1,2] The estimated prevalence of individuals diagnosed with diabetes has escalated from 5.6 million in 1980 to 17.6 million in 2007.[3] The increase in the prevalence of diabetes during this 27-year period represents a 220% percent increase.

Diabetes is more common in specific segments of the population. Diabetes disproportionately affects certain minority populations. After adjusting for age, the prevalence of diabetes among adults 20 years or older is estimated to be 11.8% for blacks and 10.4% for Hispanics, compared to 6.6% for whites.[1,2] Diabetes is more common among those who are 40 years of age or older.[1,2] Most of the people living with diabetes have type 2 diabetes.[1,2] The increases in type 2 diabetes and obesity have occurred concurrently. The rise in obesity within the population has contributed to the increase in the prevalence of type 2 diabetes. [4-8] Obesity results in insulin resistance, which can hasten the development of type 2 diabetes. [9-10] The likelihood that an individual has diabetes or develops diabetes is proportional to BMI. [5,7,11] Obesity is also associated with hypertension and high cholesterol, which are comorbidities that typically accompany diabetes.[5,6,8]

The presence of diabetes in the population has contributed to rising costs, especially in the healthcare industry. The medical costs related to diabetes totaled $116 billion in 2007.[1] The medical expenses that persons with diabetes incurred during 2007 were 2.3 times higher than that of persons without diabetes.[1]

Persons with poorly-controlled diabetes can develop severe complications in the future. [1,12-14] Diabetics have a greater risk of developing and dying prematurely from cardiovascular disease, [1,15-16] with approximately 75% of all diabetic deaths due to cardiovascular disease.[13] Compared to persons without diabetes, individuals with diabetes have a two to four times greater risk of developing a stroke, and the death rate from heart disease is two to four times higher among diabetics.[1,17] Failure to control diabetes can result in blindness, kidney disease, nerve damage, and amputations.[1]

Good glycemic control can prevent future diabetes complications.[12-14] The American Diabetes Association (ADA) recommends that diabetics maintain a hemoglobin A1c level below 7% to have optimal glycemic control.[14] Diabetic individuals can achieve good glucose control if they practice self-management or self-care behaviors.[18-19] Self-management behaviors can include such activities as monitoring glucose levels and diet, exercising, performing foot examinations, and taking prescribed antidiabetic medications.[18-19]

Previous studies have shown physical activity to be beneficial in diabetes prevention and management. [5,14-16, 20-25] Physical activity can reduce the incidence of diabetes among groups who may or may not be at a greater risk of developing type 2 diabetes.[4, 20-21] Persons with impaired glucose tolerance were less likely to develop diabetes if they had achieved the goal of exercising more than four hours per week.[5] Overweight or obese participants who had high levels of physical activity had lower levels of plasma insulin than participants with normal BMI and low level of physical activity; however, the levels of fasting glucose and insulin resistance were comparable in both groups.[6]

Regular physical activity is an effective way to manage diabetes. Physical activity improves insulin sensitivity and glycemic control.[10,14-16, 22,25-26] A meta-analysis of 14 trials demonstrated that the mean HbA1c was 0.66% lower after interventions with an exercise component.[26] Physical activity can assist diabetics in achieving their optimal weight to manage their diabetes.[27]

Few if any studies have specifically explored the relationship between physical activity among diabetic individuals and the type of treatment they receive. Using U.S. population-based data, Nwasuruba et al. found that insulin users were more likely to participate in all four self-care behaviors—glucose testing, physical activity, fruit/vegetable consumption, and foot examination--than non-insulin users; however, participation in all four self-care behaviors was considerably low.[19] In contrast, a cross-sectional study using population-based data discovered that those individuals using insulin were less likely to participate in any physical activity.[25] The purpose of this study is to evaluate the physical activity patterns among diabetic individuals who take oral antidiabetic medication only, insulin only, or no medication to treat their diabetes. Specifically, the aim of this study is to explore whether diabetic participants who take either antidiabetic medication or insulin report different levels of participation in physical activity than those participants who take neither antidiabetic medication nor insulin to manage their diabetes. The secondary objective of this study is to determine whether physical activity varies by demographics (age, gender, and race), age at diagnosis, duration of diabetes, BMI, hypertension status, and cholesterol status.

Methods

Data Source

The study used secondary data collected during the 2001-2002, 2003-2004 and 2005-2006 cycles of the National Health and Nutrition Examination Survey (NHANES).[28] NHANES is a continuous survey that measures the health and nutritional status of non-institutionalized adults and children in the U.S. population.[28] NHANES is sponsored by the National Center for Health Statistics (NCHS) of the Centers for Disease Control and Prevention (CDC). The survey consists of two parts: a household interview and an examination in a mobile examination center (MEC).[28] Members of the study team administer interviews and physical examinations to gather health and nutritional data about survey participants. Trained, bilingual interviewers conduct interviews in the homes of all selected participants, but not all participants receive an examination.[28] The sample of residents selected to participate in the survey is representative of non-institutionalized adults and children in the United States. Persons who are 15 to 19 years old, 60 years of age and older, African-Americans, and Mexican Americans are oversampled to provide more accurate estimates for these groups.[28]

Study Sample

A total of 29,029 individuals participated during the survey years. Eligible participants were adults 18 years or older who reported that they had been diagnosed with diabetes at any time except during pregnancy. Children aged 17 years and younger, adults without diabetes, and individuals with any missing data were excluded from the study. Children aged 17 years and younger weren't eligible for the study because of the high probability that their parents influenced physical activity patterns. The final sample had a total of 957 eligible participants.

Independent Variable

The determinant of interest in the study was the type of diabetic treatment that the participant received. The study focused on three types of treatment: insulin only, oral antidiabetic medication only, or neither. Participants were classified as taking oral antidiabetic medication only if they responded that they were taking antidiabetic pills to lower their blood sugar, but not currently taking insulin. Diabetic participants who used insulin responded that they were taking insulin to lower their blood sugar, but not currently taking antidiabetic pills.

Dependent Variable

The measured outcome was physical activity participation. Physical activity was defined based on the American Diabetes Association's (ADA's) recommendations for physical activity to improve glycemic control, help maintain weight, and reduce cardiovascular risks in the adult diabetic population. The ADA recommends that diabetic individuals participate in at least 150 minutes per week of moderate aerobic physical activity or 90 minutes per week of vigorous aerobic physical activity.[23] The core questions used to determine physical activity were the following :

1) over the past 30 days, have you walked or bicycled as part of getting to and from work, or school, or to do errands?,

2) over the past 30 days, did you do any tasks in or around your home or yard for at least 10 minutes that required moderate or greater physical effort?,

3) over the past 30 days, did you do any vigorous activities for at least 10 minutes that caused heavy sweating, or large increases in breathing or heart rate?, and

4) over the past 30 days, did you do moderate activities for at least 10 minutes that cause only light sweating or a slight to moderate increase in breathing or heart rate?.

Participants fulfilled the physical activity requirement set forth by the ADA if they answered yes to at least one of the core questions and satisfied one of the following conditions:

1) walked or bicycled as part of getting to and from work, or school, or to do errands at least once a day, five times a week, or 20 times per month for at least 30 minutes during each episode,

2) performed activities in or around the home or yard at least 20 times per month for at least 30 minutes during each episode,

3) performed vigorous physical activities at least 12 times per month for at least 30 minutes during each episode, or

4) performed moderate physical activities at least 20 times per month for at least 30 minutes during each episode.

Participants who exercised not at all or not enough to satisfy recommendations were categorized into one group.

Confounding Variables

Potential confounding variables were age, race, gender, duration of disease, age of diagnosis, hypertension status, cholesterol status, and BMI. Age categories were 18-49 years and 50 years and older. Race/ethnicity was defined by the following categories: 1) Hispanic, 2) Non-Hispanic White, 3) Non-Hispanic Black, and 4) Other (including multiracial). The groups Mexican American and other Hispanic were merged to create the Hispanic category. Duration of disease was determined by subtracting age at diagnosis from age in years during screening. Duration of disease was stratified as five years or less and more than five years. Age of diagnosis was defined as: under 40

years of age and 40 years and older. Participants had hypertension and/or high cholesterol if they reported that they had been diagnosed with either condition during the interview. Participants were underweight/normal weight if their BMI were under 25, overweight if their BMI were 25-29, and obese if their BMI were 30 or greater.

Statistical Analyses

The frequencies and percentages of the general characteristics within the study population were calculated. The frequencies and percentages of the characteristics of the study population by diabetic treatment type were also calculated. Differences in treatment type across groups with respect to demographic and other characteristics of the study population were calculated using a chi-square statistic. A logistic regression model was used to evaluate the association between the type of treatment and physical activity. If potential confounders were found to change the crude odds ratios by 10%, the confounding variables were adjusted for in the logistic regression model. All statistical analyses were performed using SAS 9.1.

Results

The frequencies and weighted percentages of the characteristics of the study participants are presented in Table 1. Approximately 73.6% of the study population were 50 years of age and older. There were slightly more women (51.0%) than men (49.0%) in the study population. A majority of the participants were white (65.1%), while 15.6% and 12.2% were black and Hispanic respectively. About 86% of the participants were either overweight or obese. Approximately 74.4% of the study participants had been diagnosed with diabetes when they were 40 years of age or older. About 70% of the study population took oral antidiabetic drugs only to manage their diabetes, while

only 7.1% didn't take any antidiabetic drugs or insulin to manage their diabetes. More than half had hypertension (66%) and high cholesterol (64%) as comorbidities. Approximately 28.2% of the study population participated in regular physical activity as specified by the ADA.

The percentages of participants reporting regular physical activity by treatment group and total study population are shown in Figure 1. The percent of regular physical activity was highest among those participants who took neither insulin nor oral antidiabetic medication. About 37.3% of participants who took neither insulin nor oral antidiabetic medication participated in regular physical activity. In comparison, about 30% of participants who took insulin and 26.7% of participants who took oral antidiabetic drugs satisfied the requirements for regular physical activity. Overall, 28.2% of the total study population participated in regular physical activity.

The frequencies and percentages of the demographic and other characteristics of the study population by the treatment type are shown in Table 2. Across all three participant groups, gender representation was nearly equal with just under 50% for males and slightly over 50% for female. The prevalences of insulin use and oral antidiabetic medication use were similar in relation to hypertension, cholesterol status, and BMI. Just over 60% of participants taking insulin and those taking oral medication to treat diabetes reported having hypertension (63.4% and 65.8% respectively). Similarly, 60.3% of participants on insulin and 65.8% of participants on oral medication had been diagnosed with high cholesterol. More than 50% of participants taking insulin and those taking oral medication to treat diabetes were obese. Oral antidiabetic medication use was more prevalent than insulin use among individuals who were 50 years and older.

Approximately 76.2% of study participants on oral antidiabetic medication were 50 years of age or older, while about 65.3% of study participants on insulin belonged to this age category.

The differences among the treatment types across groups according to demographic and other characteristics are described in Table 3. There were significant differences in treatment type in regard to age of diagnosis and duration of diabetes, p-value= 0.0129 and p-value=0.0004 respectively. The percent of insulin use among participants who were diagnosed when they were younger than 40 years old was 31.7% compared to 20.1% for participants who were diagnosed when they were 40 years of age or older. This finding may be related to the fact that participants who are diagnosed with diabetes when they are younger than 40 years of age are maybe more likely to be diagnosed with type 1 diabetes, which requires insulin for treatment. The percent of oral antidiabetic medication use was greater when the study participants had diabetes for five years or less (73.5%) than when they had diabetes for more than five years (66.8%). Among participants who had diabetes for more than five years, insulin use became more common, with 28.2% using insulin compared to 16.9% of those having diabetes for five years or less.

Associations between the variables and regular physical activity are described in Table 4. The crude odds ratio for the association between treatment type and regular physical activity when the treatment was insulin only was 0.72 (CI, 0.32-1.61), while the association for oral antidiabetic medication was 0.61 (CI, 0.31-1.21). Participants who belonged to the racial/ethnic category of other were significantly more likely to participate in physical activity (OR=2.50; 1.31-4.76). Diabetic individuals who had the

comorbidity hypertension were significantly less likely to participate in regular physical activity (OR=0.54; CI, 0.37-0.77). Participants with high cholesterol were less likely to participate in regular physical activity; however, the finding wasn't significant (OR=0.86; CI, 0.56-1.33). Obese individuals were 48% less likely to participate in regular physical activity (OR=0.52; CI, 0.32-0.85). Although it was determined that none of the variables were confounding variables, the variables were included in the final logistic regression model to confirm that the variables weren't confounders. After adjusting for all study variables, there was no statistically significant association between taking insulin and physical activity (OR= 0.62; CI, 0.28-1.39) or taking oral antidiabetic drugs and physical activity (OR= 0.53; CI, 0.27-1.08). In adjusted analyses hypertension remained significant with 40% lower odds of participating in regular physical activity (OR=0.60; CI, 0.39-0.91) and the racial/ethnic category of other also remained significant (OR=2.25; CI, 1.27-3.99).

Discussion

It is relevant to identify segments of the diabetic population that are more susceptible to poor outcomes that can aggravate their disease or result in premature mortality. Diabetic individuals who don't regularly participate in physical activity are at risk of developing complications or dying prematurely.[15, 17, 26] This study explored whether physical activity patterns varied according to the type of treatment diabetics received to manage their diabetes. However, in this sample, we did not find significant differences in physical activity patterns in individuals who reported taking either insulin or oral antidiabetic medication compared to those not on medication. After adjusting for all variables, the association between treatment type and physical activity wasn't significant

with an odds ratio of 0.62 (CI, 0.28-1.39) for those individuals who took insulin and 0.53 (CI, 0.27-1.08) for those who took oral antidiabetic medication.

However, participants who reported having hypertension were significantly less likely to participate in physical activity in both crude and adjusted analyses. Even after adjusting for all the variables, participants who had hypertension in addition to diabetes were 40% less likely to participate in physical activity (OR=0.60; CI, 0.39-0.91). In addition, participants who belonged to the racial/ethnic group of other were 2.25 times more likely to participate in physical activity (OR=2.25; CI, 1.27-3.99).

Our results support other studies examining physical activity among diabetics. A study using data obtained from NHANES III found that participants who took insulin were more likely to report that they didn't participate in any physical activity when compared to those who used diet or oral medication to treat their diabetes.[25] Another study showed that diabetics taking insulin were 45% less likely to comply with physical exercise recommendations than those individuals who used oral antidiabetic medication or diet to manage their diabetes (OR=0.55; p-value=0.04).[29]

Physical activity is essential in diabetes management. Unfortunately, physical activity is infrequent among diabetics.[7,25] Typically, diabetics exercise less than the general population.[6] Approximately 72% of the participants in the current study had little or no physical activity. The percentage of diabetic individuals not physically active in this study was comparable to findings in other studies that measured physical activity among the diabetic population. A cross-sectional study using data from the 2003 Medical Expenditure Panel Survey found that 39% of the diabetic participants were physically active, while 58% of participants without diabetes were physically active.[7]

Another study reported that 38% of individuals with type 2 diabetes didn't exercise adequately according to recommendations, and 31% didn't participate in any physical activity.[25]

In comparison to other diabetes self-management behaviors, diabetic individuals are less receptive to incorporating physical activity into their daily routine. Diabetics find great difficulty in changing long-term behaviors such as poor participation in physical activity.[10] Gatt et. al. found that diabetics felt they possessed the greatest control in taking medication and the least control in performing physical activity and making dietary changes.[30] They further suggested that diabetic individuals were more willing to perform self-management behaviors that required less personal investment and drastic changes to lifestyle.[30] Diabetic individuals complied more readily with performing foot care and weighing regularly than participating in physical activity.[29] Only 24.3% of the diabetic patients complied with physical activity recommendations.[29]

Traditionally, diabetes treatment has been provided in a stepwise fashion.[12] Initially, the course of treatment is diet and exercise to manage diabetes.[10,12] As diabetes advances, diet and exercise are usually supplemented with oral antidiabetic medication and/or insulin.[10] When a physician adds insulin to a diabetic's treatment regimen, the assumption is that diet, exercise, and antidiabetic medications have failed to reduce hemoglobin levels sufficiently.[12] Insulin therapy is synonymous with failure with previous treatments and severity of the disease.[10]

Some are advocating another approach to manage diabetes more effectively. They suggest that those recently diagnosed with type 2 diabetes should begin treatment with insulin immediately to prevent the occurrence of diabetes complications.[12] A study of

subjects who had been recently diagnosed with type 2 diabetes discovered that individuals who started insulin soon after diagnosis had superior glycemic control and were more likely to avoid diabetes complications than individuals who followed the traditional, graduated pathway to manage their diabetes.[12] However, diabetic patients who adhered to diet and exercise had better glycemic control.[31] Thus, glycemic control in relation to diabetes management can't be achieved solely by taking medication. The realization is that physical activity and diet work in concert with medication in diabetes management. Optimal glycemic control isn't attainable if any of these hallmarks of diabetes management are absent.

A major strength of this study is the overall design of the survey. The method of sampling used by NHANES reduces selection bias, which allows for generalizability of the findings to the U.S. population. However, a few limitations are present in the study. The size of the study sample was relatively small compared to the NHANES total sample. Only 957 participants were eligible for the study. Due to the small sample size, the study may not have had the statistical power to detect a significant association between treatment type and physical activity. Another limitation is that physical activity survey items query only physical activity levels over the last 30 days, which may not be representative of patterns of activity over a longer period of time. In addition, physical activity is a self-reported measure. It may be difficult for most participants to accurately estimate the frequency and duration of physical activity in the past month. Because of this possibility, it is probable that some of the participants in the study were misclassified as participating in regular physical activity and vice versa. It is also likely that not all of the possible confounding variables were included in this study. Initially,

impaired functioning due to physical, mental, and emotional problems was considered as a possible confounding variable, but including this variable would have dramatically reduced the already minimal sample size.

Conclusion

Even if early insulin therapy is successful in improving outcomes for diabetics, the benefits of exercise shouldn't be underestimated. A study showed that individuals who were recently diagnosed with diabetes were more motivated to increase physical activity.[32] The concern is that the shift to early insulin treatment may counteract against the benefits of exercise in managing diabetes. Diabetic patients who begin early insulin treatment may forgo physical activity because they deem insulin therapy to be the only way to manage their diabetes. Physical activity is infrequent among all diabetics, with only 28.2% of the study participants taking part in regular physical activity. Regardless of the treatment method employed, health professionals still need to continually emphasize the importance of physical activity in addition to adherence to treatment plan to their diabetic patients.

Table 1 Prevalence of characteristics among individuals with diabetes

Variable	Unweighted N	Weighted %
Age		
18-49 years	184	26.4
50+ years	773	73.6
Sex		
Male	488	49.0
Female	469	51.0
Race		
Hispanic	252	12.2
Non-Hispanic White	402	65.1
Non-Hispanic Black	260	15.6
Other	43	7.1
Age of diagnosis		
Under 40 years	217	25.6
40+ years	740	74.4
Duration of diabetes		
5 years or less	395	45.3
Over 5 years	562	54.7
Hypertension		
Yes	584	66.0
No	373	34.0
High Cholesterol		
Yes	584	64.0
No	373	36.0
BMI		
Underweight/Normal Weight	153	13.9
Overweight	313	31.0
Obese	491	55.1
Treatment type		
Insulin only	225	23.1
Oral antidiabetic drugs only	679	69.9
Neither	53	7.1
Physical activity		
Yes	253	28.2
No (little or no physical activity)	704	71.8

Figure 1 Percent of participants reporting regular physical activity by treatment group and total study population

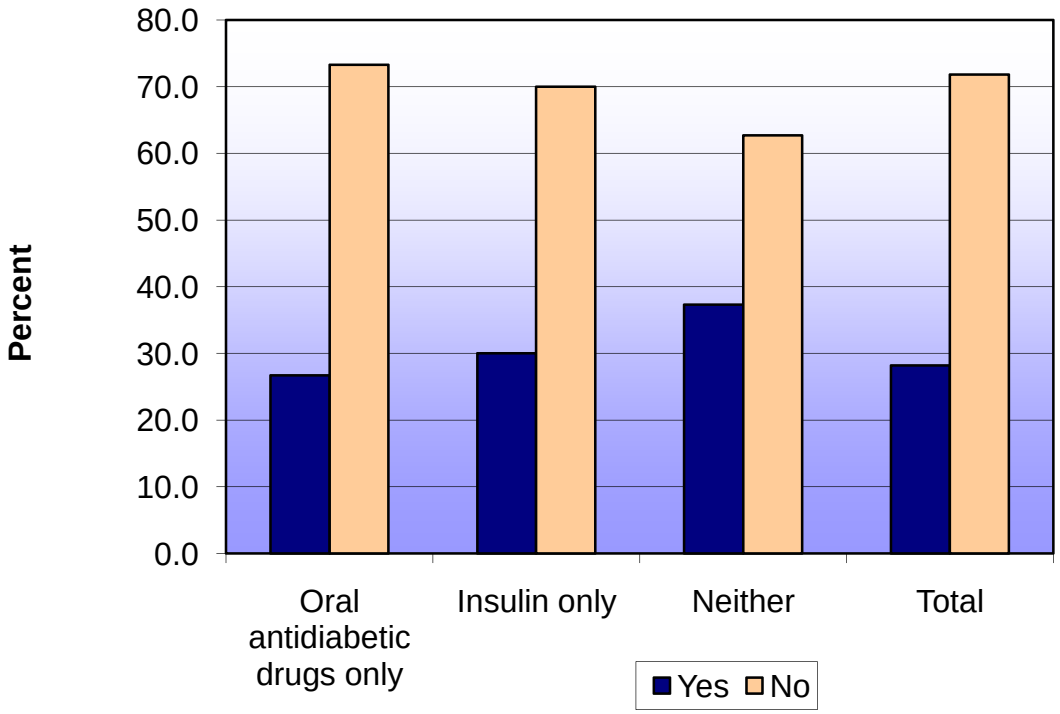

Table 2 Frequencies and percent of participants' characteristics by treatment type

Variable	Treatment type					
	Insulin only n=225		Oral antidiabetic drugs only n=679		Neither n=53	
	N	Weighted %	N	Weighted %	N	Weighted %
Age						
18-49 years	60	34.7	109	23.8	15	25.4
50+ years	165	65.3	570	76.2	38	74.6
Sex						
Male	111	48.7	348	49.2	29	47.5
Female	114	51.3	331	50.8	24	52.5
Race						
Hispanic	50	12.6	190	11.5	12	17.7
Non-Hispanic White	95	64.0	280	65.1	27	68.6
Non-Hispanic Black	69	17.8	177	15.1	14	13.7
Other	11	5.6	32	8.3	0	0.0
Age of diagnosis						
Under 40 years	73	35.1	133	23.1	11	18.4
40+ years	152	64.9	546	76.9	42	81.6
Duration of diabetes						
5 years or less	71	33.2	290	47.7	34	61.6
Over 5 years	154	66.8	389	52.3	19	38.4
Hypertension						
Yes	143	63.4	467	65.8	38	76.2
No	82	36.6	212	34.2	15	23.8
High Cholesterol						
Yes	130	60.3	423	65.8	31	58.7
No	95	39.7	256	34.2	22	41.3
BMI						
Underweight/Normal Weight	42	17.6	99	12.3	12	18.4
Overweight	71	29.8	227	31.0	15	34.8
Obese	112	52.6	353	56.8	26	46.8
Physical Activity						
Yes	63	30.0	172	26.7	18	37.3
No or little physical activity	162	70.0	507	73.3	35	62.7

Table 3 Differences among variable groups according to treatment type

Variable	Treatment type						p-value
	Insulin only n=225		Oral antidiabetic drugs only n=679		Neither n=53		
	N	%	N	%	N	%	
Age							
18-49 years	60	30.3	109	62.9	15	6.8	0.0580
50+ years	165	20.5	570	72.3	38	7.2	
Sex							
Male	111	23.0	348	70.2	29	6.9	0.9801
Female	114	23.2	331	69.6	24	7.3	
Race							
Hispanic	50	23.9	190	65.8	12	10.3	*
Non-Hispanic White	95	22.7	280	69.9	27	7.5	
Non-Hispanic Black	69	26.2	177	67.6	14	6.2	
Other	11	18.3	32	81.7	0	0.0	
Age of diagnosis							
Under 40 years	73	31.7	133	63.2	11	5.1	0.0129**
40+ years	152	20.1	546	72.1	42	7.8	
Duration of diabetes							
5 years or less	71	16.9	290	73.5	34	9.6	0.0004**
Over 5 years	154	28.2	389	66.8	19	5.0	
Hypertension							
Yes	143	22.1	467	69.7	38	8.2	0.3919
No	82	24.8	212	70.2	15	4.9	
High Cholesterol							
Yes	130	21.7	423	71.8	31	6.5	0.4043
No	95	25.5	256	66.4	22	8.1	
BMI							
Underweight/Normal Weight	42	29.2	99	61.5	12	9.4	0.3204
Overweight	71	22.2	227	69.8	15	8.0	
Obese	112	22.0	353	72.0	26	6.0	

*chi-square statistic couldn't be calculated due to insufficient number in one cell
**significant at p<0.05

Table 4 Crude and adjusted odds ratios for physical activity in relation to study variables

	Regular Physical Activity			
	Crude		Adjusted	
Variable	OR	CI	OR	CI
Age				
18-49 years	1.00		1.00	
50+ years	0.89	0.54-1.48	0.92	0.49-1.72
Sex				
Female	1.00		1.00	
Male	1.14	0.80-1.62	1.04	0.73-1.48
Race				
Non-Hispanic White	1.00		1.00	
Hispanic	1.14	0.60-2.17	0.95	0.50-1.83
Non-Hispanic Black	0.74	0.47-1.18	0.77	0.51-1.17
Other	**2.50**	**1.31-4.76**	**2.25**	**1.27-3.99**
Age of diagnosis				
Under 40 years	1.00		1.00	
40+ years	0.90	0.55-1.45	1.09	0.64-1.85
Duration of diabetes				
5 years or less	1.00		1.00	
Over 5 years	1.15	0.77-1.72	1.21	0.77-1.89
Hypertension				
Yes	**0.54**	**0.37-0.77**	**0.60**	**0.39-0.91**
No	1.00		1.00	
High Cholesterol				
Yes	0.86	0.56-1.33	0.97	0.64-1.48
No	1.00		1.00	
BMI				
Underweight/Normal Weight	1.00		1.00	
Overweight	0.84	0.50-1.40	1.05	0.63-1.72
Obese	**0.52**	**0.32-0.85**	0.69	0.44-1.09
Treatment type				
Insulin only	0.72	0.32-1.61	0.62	0.28-1.39
Oral antidiabetic drugs only	0.61	0.31-1.21	0.53	0.27-1.08
Neither	1.00		1.00	

*adjusted for all variables

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