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Trends in prevalence of cardiovascular risk factors from 2002 to 2012 among youth early in the course of type 1 and type 2 diabetes. The SEARCH for Diabetes in Youth Study

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Abstract

Background: Given diabetes is an important risk factor for cardiovascular disease (CVD), we examined temporal trends in CVD risk factors by comparing youth recently diagnosed with type 1 diabetes (T1D) and type 2 diabetes (T2D) from 2002 through 2012.

Methods: The SEARCH for Diabetes in Youth Study identified youth with diagnosed T1D (n = 3954) and T2D (n = 706) from 2002 to 2012. CVD risk factors were defined using the modified Adult Treatment Panel **III** criteria for metabolic syndrome: (a) hypertension; (b) high-density lipoprotein cholesterol ≤40 mg/dL; (c) triglycerides ≥110 mg/dL; and (d) waist circumference (WC) >90th percentile. Prevalence of CVD risk factors, stratified by diagnosis year and diabetes type, was reported. Univariate and multivariate logistic models and Poisson regression were fit to estimate the prevalence trends for CVD risk factors individually and in clusters (≥2 risk factors).

Results: The prevalence of ≥2 CVD risk factors was higher in youth with T2D than with T1D at each incident year, but the prevalence of ≥2 risk factors did not change across diagnosis years among T1D or T2D participants. The number of CVD risk factors did not change significantly in T1D participants, but increased at an annual rate of 1.38% in T2D participants. The prevalence of hypertension decreased in T1D participants, and high WC increased in T2D participants.

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Conclusion: The increase in number of CVD risk factors including large WC among youth with T2D suggests a need for early intervention to address these CVD risk factors. Further study is needed to examine longitudinal associations between diabetes and CVD.

Keywords

abdominal obesity; diabetes mellitus; dyslipidemia; hypertension; metabolic syndrome

1 | INTRODUCTION

Both type 1 diabetes (T1D) and type 2 diabetes (T2D) are independent risk factors for cardiovascular disease (CVD).[1–4] Metabolic syndrome is associated with increased risk with T2D and CVD. Traditionally in adults, metabolic syndrome has been described as having three or more CVD risk factors that include hypertension, altered glucose metabolism, dyslipidemia, and abdominal obesity.[5] In children and adolescents, there is lack of consensus around the definition of metabolic syndrome, in part, due to differences in these measures by sex, race/ethnicity, and pubertal status, and also given the lack of standard measures for some anthropometric features such as waist circumference.[5–7] However, a modified version of the National Cholesterol Education Program (NCEP) protocol is commonly utilized in the pediatric community.[8] Among youth, metabolic syndrome is defined by NCEP as the presence of any 3 of 5 particular risk factors: hyperglycemia, elevated blood pressure, low high-density lipoprotein cholesterol (HDL-C), hypertriglyceridemia, and surrogate of central adiposity.[8] In 2017, American Academy of Pediatrics (AAP) created a clinical report on metabolic syndrome and emphasized the need to focus on cardiometabolic risk factor clustering over individual risk factors.[9] Given this recommendation to focus on risk factor clustering, we chose to examine ≥2 CVD risk factors in this study.

There are several studies that have examined pediatric diabetes and cardiovascular risk factors. The SEARCH for Diabetes in Youth Study (SEARCH) previously examined the prevalence of CVD risk factors among children and adolescents with prevalent diabetes in 2001 and incident (recently diagnosed) diabetes in 2002.[10] The overall prevalence of ≥2 CVD risk factors was 14% in T1D youth and 92% in T2D youth. We sought to re-assess the prevalence and look at temporal trends in CVD risk factors among youth recently diagnosed with T1D or T2D between 2002 and 2012. The purpose of this study was to examine trends in CVD risk factors by comparing youth recently diagnosed with type 1 diabetes (T1D) and type 2 diabetes (T2D) from 2002 through 2012.

2 | METHODS

In 2002, SEARCH began recruitment of youth aged <20 years with recently diagnosed diabetes.[11] Cases were ascertained from geographically defined populations in Ohio, Colorado, South Carolina, and Washington, from Indian Health Service beneficiaries from four Native American populations, and enrollees in a managed health care plan in California. Institutional review boards for each site approved the study protocol. Youth who completed an initial participant survey and whose diabetes was not secondary to other conditions were invited to a SEARCH study visit.

Youth ages 3 to 19 years, recently diagnosed with T1D and T2D diabetes in 2002–2006, 2008, and 2012 were invited to complete an in-person visit. The average time from diagnosis of diabetes to the baseline study visit in T1D participants was 0.8 ± 0.6 years. The average time from diagnosis of diabetes to the baseline study visit in T2D participants was 1.0 ± 0.7 years. Specimen collection and anthropometric assessments were conducted by centrally trained research staff. Information on diabetes type was determined by the clinical provider.

Race and ethnicity were obtained by self-report and categorized as non-Hispanic white (NHW), non-Hispanic black (NHB), Hispanic, Asian or Pacific Islander, and Native American.

2.1 | Physical examination measurements

Height and weight were measured and body mass index (BMI) was calculated, as BMI = (weight in kilograms)/(height in meters)[2.12] Height was measured in centimeters using a stadiometer. Weight was measured in kilograms using an electronic scale. Normal weight was defined as BMI at 5th to less than 85th percentile. Overweight was defined as BMI at 85th to less than 95th percentile. Obese was defined as BMI at 95th percentile. Waist circumference (WC) was systematically measured using the National Health and Nutrition Examination Survey (NHANES) protocol. Specifically for each measurement, the measuring tape was positioned parallel to the floor with the participant standing, abdomen relaxed, arms at the sides, feet together and facing the observer with the waist exposed, and the measurement taken just above the uppermost lateral border of the right ilium at the mid-axillary line.[12–14] A fiberglass tape was used for the patients with a WC up to 150 cm and, for larger patients, a flexible steel tape was used. Height, weight, and WC were measured and recorded twice. A third measurement was done if the first and second measurements differed by 0.5 cm for height, 0.3 kg for weight, and 1.0 cm for WC. The average of the two or three measurements for each participant was calculated and used in this analysis.

Three blood pressure measurements were obtained during the in-person visit using a portable mercury manometer for visits from 2002 to 2005, then using an aneroid manometer from 2006 to 2012.[15] The average of the three measurements for systolic and diastolic blood pressure for each participant was used for analysis.

2.2 | Laboratory measures

Laboratory specimens were obtained if there was no episode of diabetic ketoacidosis within the prior month. Blood was drawn after at least 8 hours of fasting for measurement of lipids (total cholesterol [TC], low-density lipoprotein cholesterol [LDL-C], HDL-C, and triglycerides [TG]). Non-HDL-C was calculated by subtracting HDL-C from TC. Specimens were processed locally at the sites and then shipped within 24 hours to the central laboratory (Northwest Lipid Metabolism and Diabetes Research Laboratories, University of Washington, Seattle, Western Australia), where they were analyzed. Measurements of TC, HDL-C, and TG were performed enzymatically on a Hitachi 917 autoanalyzer (Boehringer Mannheim Diagnostics, Indianapolis, Indiana). LDL-C levels were calculated by the Friedewald equation for individuals with triglyceride levels less than 400 mg/dL[16] and by Lipid Research Clinics Beta Quantification[17] for those with TG levels at least 400 mg/dL.

2.3 | Diabetes type

Clinical diabetes type was defined as the diabetes type assigned by the health care professional around the time of diagnosis. This was obtained from medical records or physician reports and categorized as T1D or T2D.

2.4 | Definition of cardiovascular risk factor

For this study, CVD risk factors were defined by the *NCEP*-Adult Treatment Panel (*ATP III*) definition.[8] CVD risk factors were defined as follows: HDL-C ≤40 mg/dL, WC ≥90th percentile for age and sex, systolic or diastolic blood pressure ≥90th percentile for age, sex, and height or taking medication for hypertension,[15] and TG ≥110 mg/dL.

2.5 | Statistical analysis

All analyses were stratified by diabetes type. The prevalence of each CVD risk factor was estimated by incident year and for all incident years combined. Univariate and multivariate logistic models were fit to estimate the unadjusted and adjusted prevalence trends for each risk factor separately and for the presence of ≥2 CVD risk factors. Fisher exact test was performed to determine whether ≥2 CVD risk factors were present differently by age, race/ethnicity, BMI, and glycemic control. Individuals who met the American Diabetes Association (ADA) target (or for age <6 years, who had an HbA_{1c} [A1C] < 8.5%) were classified as having "good" control; those with A1C ≥9.5% regardless of age were classified as having "poor" control, and those with A1C values between the definition of "good" and "poor" control were classified as "intermediate" control. Poisson regression was used for determining if there was a significant change in the number of CVD risk factors and overall the prevalence trends with the number of CVD risk factors adjusting for age, sex, race/ethnicity, BMI, and diabetes duration. Chi square analysis was performed to examine effects of BMI on CVD risk factors. Statistical tests were performed at significance level of 5% with *P*-values computed assuming two-sided tests were applicable. Analyses were performed in SAS Version 9.4 (SAS Institute Inc., Cary, North Carolina).

3 | RESULTS

3.1 | Summary of T1D results

For all seven incident years combined, mean age of participants was 11.0 ± 4.1 years for T1D and diabetes duration at the time of the study visit was 0.8 ± 0.6 years (Table 1). The sex distribution in T1D was roughly equal (47.4% females vs 52.6% males). The T1D sample was largely NHW (73.0%), with the proportion of Hispanic or NHB youth being 13.0% and 11.3%, respectively. About 32.5% of youth with T1D were overweight or obese. Among the 3954 youth with T1D, the mean number of CVD risk factors was 0.4 ± 0.7; 7.0% of T1D participants had ≥2 CVD risk factors and 1.7% of T1D participants had ≥3 CVD risk factors. The two most common CVD risk factors in T1D participants were high WC and low HDL-C.

The prevalence of most CVD risk factors did not change over the incident years (Figure 1). The prevalence of low HDL-C ranged from 9.1% to 17.5%, high TG from 6.7% to 11.1%, and high WC from 13.7% to 16.8%. The prevalence of hypertension decreased from 12.3%

in 2002 to 5.7% in 2012, corresponding to an unadjusted average annual rate of decrease of 6.2% ($P = 0.003$). The prevalence of ≥2 CVD risk factors ranged from 6.1% to 9.0%; however, there was no evidence of a linear trend ($P = 0.25$).

The prevalence of ≥2 CVD risk factors increased with each age category (Table 2). There was a significant relationship between race/-ethnicity and ≥2 CVD risk factors in T1D participants ($P = 0.02$). There was no significant relationship between sex or glycemic control with prevalence of ≥2 CVD risk factors in T1D participants ($P = 0.05$, $P = 0.15$). There was a very strong and significant relationship between BMI and CVD risk factors: odds ratios (ORs) of having ≥2CVD risk factors were 22.6 [16.5, 30.9] and 4.5 [3.2, 6.5] for obese and overweight T1D youth, relative to normal weight T1D individuals.

There were no significant trends in the number of CVD risk factors over incident years among youth with T1D before ($P = 0.95$) or after adjustment for age, sex and race/ethnicity, BMI, and diabetes duration ($P = 0.24$) (Table 3).

3.2 | Summary of T2D results

For all seven incident years combined, mean age of participants was 15.5 ± 2.6 years for T2D, and diabetes duration was 1.0 ± 0.7 years (Table 1). The sample of youth with T2D was nearly two-thirds female (61.5% vs 38.5%). The proportion of NHW youth was 19%. About 93.6% of youth were overweight or obese. The mean number of CVD risk factors was 2.0 ± 1.1; 32.2% had ≥2 CVD risk factors and 31.7% had ≥3 CVD risk factors. The two most common CVD risk factors were high WC and low HDL-C. In addition, participants with T2D were more likely to have ≥2 CVD risk factors, relative to T1D participants (OR = 5.1 [4.8, 5.4], $P < 0.0001$).

Among youth with T2D, the prevalence of most CVD risk factors did not change over time, nor did the prevalence of ≥2 CVD risk factors (Figure 1). The prevalence of hypertension ranged from 27.0% to 44.4%, low HDL-C from 43.9% to 63.6%, and high TG from 43.9% to 56.9%. The only CVD risk factor for which prevalence changed over time was high WC, increasing from 71.0% to 88.4%, at an average annual rate of 12.8% (6.6%, 19.4%, $P < 0.0001$).

Like T1D participants, the prevalence of ≥2 CVD risk factors was higher among older compared to younger T2D participants (Table 2). There was a significant relationship between race/ethnicity and ≥2 CVD risk factors in T2D participants. In youth with T2D, the ORs of ≥2 CVD risk factors were 11.5 [5.4, 24.7] and 4.7 [1.9, 11.6] in youth with obesity and overweight, relative to normal weight youth with T2D.

There was no significant relationship between sex and glycemic control with prevalence of ≥2 CVD risk factors in T2D participants. Among youth with T2D, the unadjusted annual rate of increase in the number of CVD risk factor was 1.38% [0.11%, 2.65%] with *P*-value = 0.03 (Table 3). After adjustment for age, sex and race/ethnicity, the number of CVD risk factors increased among T2D participants at an annual rate of 1.56% (0.28%, 2.85%, *P*-value = 0.02) likely related to increased waist circumference. After adjustment for age,

race/-ethnicity, BMI, and diabetes duration, the rate of increase in number of CVD risk factors was not statistically significant ($P = 0.77$).

4 | DISCUSSION

The study sought to examine trends in CVD risk factors by comparing youth recently diagnosed with type 1 diabetes (T1D) and type 2 diabetes (T2D) from 2002 through 2012. Overall, the prevalence of ≥2 CVD was significantly higher among youth with T2D than with T1D at each time point (Figure 1), but the prevalence of ≥2 risk factors did not change significantly across cohorts over time among youth with either T1D or T2D. A key finding was the increasing prevalence of elevated WC among youth with T2D over time. This study found a decrease in the prevalence of hypertension among youth with TID (12.3% in 2002 to 5.7% in 2012, $P = 0.003$). The SEARCH protocol for measuring blood pressure changed during the study period, from mercury to aneroid sphygmomanometer. In a SEARCH sub-study during which participants had blood pressure measurements with mercury and aneroid devices at the same visit,[18] the results from the two devices were highly correlated, but with a slightly lower diastolic reading (−1.7 mm Hg) using the aneroid devices. However, the fact that we observed a difference in blood pressure (BP) over time only among the T1D participants suggests that the changes in BP over time are not attributable to change in measurement devices, but may have another cause. An NHANES study in US children and adolescents between 1999 and 2012 showed a similar pattern of a decline in hypertension.[19] This NHANES study reported daily intakes of total energy, total saturated fatty acids and caffeine decreased and polyunsaturated fatty acids and dietary fiber increased, changes that could at least in part explain the decline in prevalence of hypertension.[19]

In an earlier SEARCH report by Rodriguez et al, a higher prevalence of CVD risk factors in youth with T2D than with T1D was observed; that report was based on participants with prevalent diabetes in 2001 and incident cases in 2002.[10] The prevalence of CVD risk factors was higher in that study, with the prevalence of ≥2 CVD risk factors in subjects with T1D in the study by Rodriguez et al at 14% compared to 5.9%–8.8% in the subjects with T1D in this report. One possible explanation for this difference is the duration of diabetes among participants. Diabetes duration was significantly longer in the earlier SEARCH report as <10% of the participants had diabetes duration <1 year whereas in our study, about 60% had diabetes duration <1 year, and the mean diabetes duration was 0.9 vs 1.0 years in T1D vs T2D participants.

It is valuable to evaluate and treat metabolic syndrome or CVD risk factors that are already present or clinically evident at a young age.[20] Our observation that a substantial percentage of youth with recently diagnosed T1D and much more so T2D have ≥2 CVD risk factors highlights the need to screen for CVD risk factors shortly after diagnosis, particularly for youth with T2D. The prevalence of ≥2 CVD risk factors among youth with T2D was 8–10 times as high as among youth with T1D (60.3–71.9% vs 6.1–8.9%). This likely contributes to the higher prevalence of micro- and macrovascular complications in youth with T2D.[21] Given the associations between excess weight accumulation and CVD risk factors and the rising prevalence of high WC in youth with T2D, this study provides further evidence that a foundational treatment goal is to attain a healthier weight.

A strength of this study is that SEARCH is the largest and most diverse study cohort of youth with T1D and T2D in the United States. This allowed us to explore differences by race/ethnicity. Race/-ethnicity was statistically significantly related to having ≥2 CVD risk factors for both T1D and T2D participants. There are known interethnic differences in liver fat and abdominal fat partitioning in obese adolescents, with liver fat and intramyocellular fat were higher in Hispanics than NHW and NHB, and visceral fat was lower in non-Hispanic blacks and similar in NHW and Hispanics.[22] Visceral and liver fat are independent correlates with metabolic syndrome, diabetes, and CVD. However, in some cases the number of participants in some racial/ethnic groups, particularly by year, were too small to detect statistically significant differences.

One limitation of this report is that we describe temporal changes in prevalence in CVD risk factors between 2002 and 2012 among youth with diabetes diagnosed in those years, not longitudinal changes in individuals. This study was also limited by the data being collected at a single study visit, which may not accurately reflect the entire metabolic picture. The numbers of youth that are normal weight with T2DM are very small. With these number counts being small, we cautiously report that the higher prevalence of CVD risk factors among the incident T2D group are likely a consequence of a higher prevalence of obesity with 85.2% of youth with T2D being obese, relative to 14% among youth with T1D. Youth with T1D who were overweight or obese had a much higher percentage of CVD risk factors. We did not see a relationship between glycemic control and CVD risk factors in our study; however, this may well be due to the fact that this report describes observations at participants' initial study visit, at which time the mean diabetes duration is less than 1 year. Future studies are needed to examine the manner in which patterns of CVD risk factors impact CVD outcomes and mortality in youth longitudinally.

Mayer Davis et al reported that the individual components of metabolic syndrome and the metabolic syndrome itself can be used to describe CVD status in the pediatric diabetes population.[23] The Treatment Options for type 2 diabetes in Adolescents and Youth (TODAY) study was a randomized intervention trial in US youth with T2D, comparing different treatment interventions on glycemic control. Participants in the TODAY study were well characterized at baseline and follow up visits. The TODAY study reported hypertension in 11.6% of subjects at baseline and 33.8% over mean duration of 3.9 years.[24] Glycemic control and treatment arm had no association on the risk of hypertension over time.[24] In our study, the prevalence rates of hypertension (27%–44%) was higher than the baseline TODAY study data and compared more closely to the 3-year data from the TODAY study. The TODAY study reported high TG at baseline (≥150 mg/dL) in 21.0% of subjects at baseline and 23.3% of subjects at 36 months. Our study had a higher prevalence of high TG (43.9%–57%) compared to TODAY study. TODAY study reported low HDL-C in 67%–80.9% of subjects. Our study had a lower prevalence of low HDL-C (43.9%–63.5%) compared to TODAY study. The differences between groups may be due to the study population where our observational study included incident diabetes population with no exclusion based on A1C and the TODAY recruited subjects that had T2D for 2 years or less with A1C less than 8.0%.

To date, there are few longitudinal data looking at the impact of metabolic syndrome in childhood. AAP recommends use of the metabolic syndrome construct as an organizational framework to identify cardiovascular risk factors, focusing on cardiometabolic risk factor clustering over the individual risk factors.[9] Children may not meet all three criteria to make diagnosis of metabolic syndrome but pediatricians can treat each individual risk factor making up metabolic syndrome.

However, data from population studies in adults show that having multiple CVD risk factors and metabolic syndrome is associated with CVD mortality and all-cause mortality.[17,25] SEARCH has also examined CVD comorbidities among adolescents and young adults and found that comorbidities, such as arterial thickness and hypertension, were higher in T2D than in T1D.[19]

Another limitation of the study is the usage of diabetes type assigned by the health care professional around the time of diagnosis. This was obtained from medical records or physician reports and categorized as T1D or T2D. Healthcare providers may struggle with the categorization of diabetes with the increasing rates of overweight and obesity.

5 | CONCLUSION

Over the study period, the number of CVD risk factors in youth recently diagnosed with diabetes increased in youth with T2D but not in youth with T1D, and the prevalence of high WC also increased in T2D but not T1D. The prevalence of ≥2 CVD risk factors among youth early in the course of T1D and T2D did not change significantly between 2002 and 2012. However, the prevalence of having ≥2 CVD risk factors was higher among youth with T2D than T1D. Given the importance of adiposity on prevalence of CVD risk factors, achieving healthy weight status is an essential goal in diabetes management for youth with T1D and T2D.

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Abbreviations:

CI	confidence interval
CVD	cardiovascular disease
HDL-C	high-density lipoprotein cholesterol
LDL-C	low-density lipoprotein cholesterol
NHANES	National Health and Nutrition Examination Survey
SEARCH	SEARCH for Diabetes in Youth Study
T1D	type 1 diabetes
T2D	type 2 diabetes
TC	total cholesterol
TG	triglycerides
WC	waist circumference

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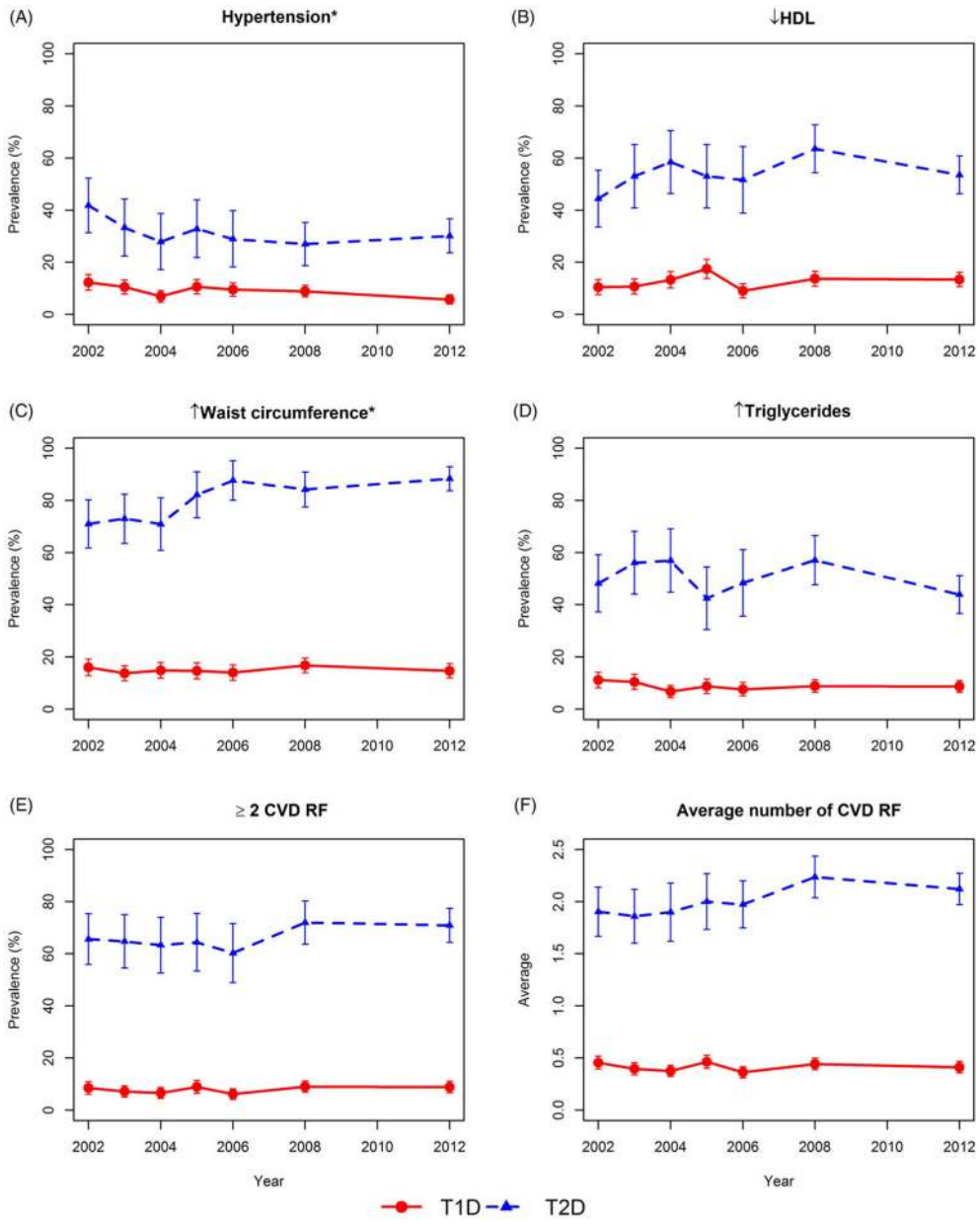

FIGURE 1.

Prevalence of individual and ≥2 CVD risk factors per year of incident diabetes from 2002 to 2012 by diabetes type. Y axis = % Prevalence; X axis = Year. *Significant at $P < 0.05$ (*$P = 0.003$ for T1D in A, $P = 0.17$ for T2D in A, $P = 0.16$ for T1D in B, $P = 0.37$ for T2D in B, $P = 0.33$ for T1D in C, $P = 0.21$ for T2D in C, $P = 0.80$ for T1D in D, *$P = <0.0001$ for T2D in D, $P = 0.25$ for T1D in E, $P = 0.11$ for T2D in E). A = Hypertension; B = ↓HDL-C;C = ↑WC; D = ↑TG; E = ≥2RF. Abbreviations: CVD, cardiovascular disease; HDL-C, high-density lipoprotein cholesterol; RF, risk factor; TG, triglycerides; WC, waist circumference

TABLE 1

Demographic characteristics of SEARCH study participants with diabetes incident in 2002–2006, 2008, 2012 that completed an in-person visit, by diabetes type

	Type 1 diabetes (n = 3954)	**Type 2 diabetes (n = 706) (n = 719)**
Age at SEARCH visit (Mean ± SD)	N (%)	
3–10 years (6.9 ± 2.0)	1609 (40.7)	
10–14 years (T1D:13.8 ±2.5)	2345 (59.3)	300 (42.5)
(T2D: 13.1 ± 1.3) 14–19 (17.4 ± 1.6)		406 (57.5)
Sex		
Female	1875 (47.4)	434 (61.5)
Male	2079 (52.6)	272 (38.5)
Race/Ethnicity		
Non-Hispanic White	2885 (73.0)	134 (19.0)
Non-Hispanic Black	449 (11.3)	301 (42.6)
Hispanic	516(13.0)	195 (27.6)
Native American	22 (0.6)	52 (7.4)
Asian/Pacific Islander	82 (2.1)	24 (3.4)
BMI categories		
Normal weight	2564 (67.5)	44 (6.5)
Overweight	703 (18.5)	56 (8.4)
Obese	530 (14.0)	568 (85.2)
Number of CVD risk factors	Mean ± SD	
	0.4 ± 0.7	2.0 ± 1.1

Abbreviations: BMI, body mass index; CVD, cardiovascular disease.

TABLE 2

Prevalence of ≥2CVD risk factors by age, sex, ethnicity, BMI, and glycemic control

	Two or more CVD risk factors							
	T1D				T2D			
	N	%	95% CI	*P*-value	N	%	95% CI	*P*-value
Age								
3–10	74	4.6	1.46, 1.79	<0.0001				
10–14	132	8.1			186	62.0	1.37, 1.71	0.02
14–19	107	15.0			287	70.7		
Sex								
Female	165	8.8	1.03, 1.24	0.05	282	65.0	1.06, 1.3	0.16
Male	148	7.1			191	70.2		
Ethnicity								
NHW	206	7.1		0.02	94	70.2		0.04
NHB	39	8.7	0.98, 0.132		185	61.5	0.67, 0.94	
H	59	11.4	1.17, 1.52		140	71.8	0.94, 1.2	
NA	1	4.6	1.2, 0.85		40	76.9	0.72, 2.26	
AP	9	9.8	0.77, 1.51		14	58.3	0.65, 1.31	
BMI								
NW	59	2.3		<0.0001	9	20.9		<0.0001
OW	68	9.7	2.17, 2.81		31	55.4	2.17, 2.84	
OB	184	34.7	5.08, 6.35		428	75.4	5.07, 6.41	
A1C								
GC	173	8.4		0.15	311	70.1		0.29
IC	80	8.2	0.86, 1.0		80	77.7	0.89, 1.13	
PC	48	11.2	1.10, 1.46		74	73.3	1.06, 1.43	

Note. Proportions are the number of people with at least two CVD risk factors over the number of people in the group. P value was compared for all levels of the variables.

Abbreviations: AP, Asian pacific islander; BMI, body mass index; CI, confidence interval; CVD, cardiovascular disease; GC, good control; H, Hispanic; IC, intermediate control; NA, native American; NHB, non-Hispanic black; NHW, non-Hispanic white; NW, normal weight; OB, obese; OW, overweight; PC poor control; T1D, type 1 diabetes; T2D, type 2 diabetes.

TABLE 3

Poisson regression models for rate of increase in number of CVD risk factors, by diabetes type

Diabetes type	Adjustment	Annual rate of increase	Lower 95% CI	Upper 95% CI	*P*-value
T1D	Unadjusted	−0.05	−1.55	1.48	0.95
	Age, sex, and race	−0.68	−2.17	0.82	0.37
	Age, sex, race, and BMI	−0.80	−2.12	0.53	0.24
	Age, sex, race, BMI, and diabetes duration	−0.80	−2.11	0.54	0.24
T2D	Unadjusted	1.38	0.11	2.65	0.03
	Age, sex, and race	1.56	0.28	2.85	0.02
	Age, sex, race, and BMI	0.11	−0.97	1.20	0.84
	Age, sex, race, BMI, and diabetes duration	0.17	−0.93	1.27	0.77

Note. Adjusted models for age, sex, race/ethnicity, BMI, and diabetes duration.

Abbreviations: BMI, body mass index; CI, confidence interval; CVD, cardiovascular disease.