

Research Article

The Effects of COVID-19 Pandemic Lock Down on Body Weight and Risk Score for Diabetes Among Healthcare Students

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KEYWORDS:

COVID-19 Pandemic

Diabetes Risk Score

Health Risks

Lockdowns

Type 2 Diabetes

ABSTRACT

Background:

The COVID-19 pandemic necessitated widespread lockdowns, significantly altering daily routines and activity levels. This study hypothesizes that such changes might have exacerbated the health risks associated with type 2 diabetes (T2D).

Objective:

Given the prevalence of T2D among U.S. adults and the centrality of weight gain as a risk factor, this research aims to explore the potential ramifications of the pandemic on T2D risk. Such findings are important for preparations against future outbreaks, which might amplify T2D onset rates.

Methods:

Affiliates from three U.S. Touro college campuses were surveyed to assess the pandemic's effects on dietary patterns, daily activity levels, and weight change. To gauge changes in T2D risk, a diabetes risk score was determined, comparing pre-pandemic levels to those observed during COVID-19 restrictions. The study used a survey research method and Qualtrics for data collection. The research proposal was approved by the University Institutional Review Board (M-0221).

Results:

Of the participants, 65.9% reported decreased activity levels, while 46.3% experienced weight gain. Notably, 64.2% of participants had an elevated risk score, signifying an increased vulnerability to T2D.

INTRODUCTION

Type 2 diabetes (T2D) is a growing health concern in the United States (US), affecting approximately one in ten Americans. The Centers for Disease Control and Prevention (CDC) has classified T2D as an epidemic due to its widespread impact.¹ Furthermore, 90% of those diagnosed with T2D were found to have a body mass index (BMI) equal to or greater than 25 kg/m², making excessive body weight a central risk factor for T2D.³

T2D is a complex and multifactorial disease,⁴ influenced by various factors, including weight management and physical activity.⁵ Managing weight gain and engaging in regular physical activity are crucial factors determining an individual's risk for developing T2D. Weight gain becomes even more significant for high-risk individuals due to age, family history, BMI, fat distribution, and ethnicity.⁶

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Table 1.
PARTICIPANT DEMOGRAPHICS

	California No. (%)	Nevada No. (%)	New York No. (%)	Total No. (%)
Total Respondents	281 (79.8%)	34 (9.66%)	37 (10.5%)	352
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Birth sex				
Female	186 (66.2%)	25 (73.5%)	24 (64.9%)	235 (66.8%)
Male	93 (33.1%)	9 (26.5%)	13 (35.1%)	115 (32.7%)
Prefer not to answer	2 (0.7%)	0	0	2 (0.6%)
Age Range				
18 - 29	216 (76.9%)	21 (61.8%)	30 (81.1%)	267 (75.9%)
30 - 39	37 (13.2%)	5 (14.7%)	7 (18.9%)	49 (13.9%)
40 - 49	11 (3.9%)	4 (11.8%)	0	15 (4.3%)
50 - 50	10 (3.6%)	2 (5.9%)	0	12 (3.4%)
60+	7 (2.5%)	2 (5.9%)	0	9 (2.6%)
Ethnicity				
Asian	135 (48.0%)	2 (5.9%)	10 (27.0%)	147 (41.8%)
Black	5 (1.8%)	0	2 (5.4%)	7 (2.0%)
White	94 (33.5%)	29 (85.3%)	22 (59.5%)	145 (41.2%)
Latino	16 (5.7%)	1 (2.9%)	0	17 (4.8%)
Other	20 (7.1%)	1 (2.9%)	2 (5.4%)	23 (6.5%)
Prefer not to Answer	11 (3.9%)	1 (2.9%)	1 (2.7%)	13 (3.7%)
Touro Affiliation				
Student	250 (89%)	26 (76.5%)	36 (97.3%)	312 (88.6%)
Faculty	21 (7.5%)	3 (8.8%)	0	24 (6.8%)
Staff	10 (3.6%)	5 (14.7%)	1 (2.7%)	16 (4.5%)
Weight				
Gained	121 (43.0%)	18 (52.9%)	24 (64.9%)	163 (46.3%)
Lost	64 (22.8%)	9 (26.5%)	5 (13.5%)	78 (22.2%)
No Change	96 (34.2%)	7 (20.6%)	8 (21.6%)	111 (31.5%)
Activity Level				
More Active	61 (21.7%)	7 (20.6%)	6 (16.2%)	74 (21.0%)
Less Active	184 (65.5%)	23 (67.6%)	25 (67.6%)	232 (65.9%)
No Change	36 (12.8%)	4 (11.8%)	6 (16.2%)	46 (13.1%)
Risk Score				
Increased	179 (63.7%)	22 (64.7%)	25 (67.5%)	226 (64.2%)
Decreased	62 (22.1%)	7 (20.6%)	6 (16.2%)	75 (21.3%)
No Change	40 (14.2%)	5 (14.7%)	6 (16.2%)	51 (14.5%)
Food Delivery Service Usage				
Used	126 (44.8%)	16 (47.1%)	18 (48.6%)	160 (45.5%)
Not Used	155 (55.2%)	18 (52.9%)	19 (51.4%)	192 (54.5%)

Prediabetes, a condition characterized by elevated blood sugar levels not yet classified as diabetes, is another concerning issue. One in three US adults has prediabetes, and a staggering 90% are unaware of their condition. This lack of awareness puts individuals at risk for progression to T2D.⁷ However, a timely diagnosis of prediabetes presents an opportunity for those with risk factors to delay or prevent the onset of T2D. Without intervention, approximately 70% of individuals with prediabetes will eventually develop T2D.⁸

In addition to weight management, physical activity is important for maintaining weight loss and glycemic control in people with T2D.⁹ Unfortunately, the COVID-19 pandemic and associated stay-at-home orders limited the options for physician activity, with nonessential services such as gyms closing down.¹⁰ A multinational study conducted by ECLB-COVID-19 revealed that these restrictions led to a significant decrease in all levels of physical activity and a substantial increase in sedentary behavior, with sitting time increasing by more than 28%.¹¹

The pandemic also affected universities with a nationwide transition to virtual learning. This shift in the learning environment resulted in more containment within people's living spaces, potentially affecting their health behavior and lifestyle choices. This study examined the effects of COVID-19 mandatory lockdowns on Touro students, faculty, and staff health behavior and lifestyle changes. The study's first objective was to determine if there was a difference in mean weight before the COVID-19 pandemic official lockdown began in March 2020 and approximately

a year into the lockdown. The study's second objective was to determine if the mean risk for prediabetes changed due to the changes in weight during the mentioned period. The study hypothesis is that there was a significant difference in both mean weight and risk score for diabetes. By understanding the impact of COVID-19 lockdowns on weight gain, physical activity, and the associated risk for prediabetes, this study can provide valuable insights into the potential consequences of pandemic-related restrictions on public health.

METHODS

Research Design and Study Setting

The study used a survey research method, and Qualtrics was used for data collection. The research proposal was approved by the University Institutional Review Board (M-0221).

Participants

Students, faculty, and staff of Touro University California (TUCA), Touro University Nevada (TUNV), and Touro College of Osteopathic Medicine New York (TCOMNY) were eligible to participate in this study.

Sample Size

The expected response rate was 18% across the three colleges. At a 95% confidence interval and 0.05 significance level, the sample size required to detect a specific effect size on weight change and diabetes risk score in the population was 325.

Survey

The principal investigator (PI) constructed a 20-item survey based on variables that increase the risk for diabetes, which were set forth by the American Diabetes Association (ADA) and the CDC. These included age, birth sex, height, weight, physical activity, ethnicity, and family history.

Statistical Analysis

IBM SPSS (version 28.0.1.0) was used throughout the study. Descriptive statistics were used to determine the frequency distribution of the data. Variables were compared using a t-test to find any statistical significance between pre-COVID-19 and during. A non-parametric (Spearman's rho) bivariate

TABLE 2. COMPARING MEANS					
	Mean	95% CI Lower	95% CI Upper	One- sided P	Two- sided P
Weight before COVID-19 vs. weight during COVID-19	-2.689	-3.787	-1.591	< 0.001	< 0.001
Risk score before COVID-19 vs. risk score during COVID-19	-0.517	-0.625	-0.409	< 0.001	< 0.001
Activity level before COVID-19 vs. activity level during COVID-19	-0.449	-0.535	-0.363	< 0.001	< 0.001
BMI before COVID-19 vs. BMI during COVID-19	-0.44564	-0.62350	-0.26777	< 0.001	< 0.001
Change in Risk Score for Respondents that Used vs. Did Not Use Delivery Service	0.221	0.005	0.437	0.022	0.045

Table 3. QUALITATIVE ANALYSIS OF CHANGE IN ACTIVITY			
Themes	Example 1	Example 2	Percentage
Active commute gone	"Working from home meant less walking around at work"	"Online classes led to no activity from start of class till finishes studying at end of day."	57.1%
Gym closures	"No longer went to the gym and had my personal trainer"	"Because my gym closed I was no longer going to the very vigorous 1 hour workouts. I still workout daily but sometimes it's only 20-30 minutes if I feel that's all I have. I would have always done 1 hour pre-covid"	42.0%
Too busy	"Working from home and starting a grad program meant not walking much of anywhere anymore. I was so busy; I had no time for alternative exercise."	"Studying and working prevents me from walking around or exercising especially during busy days"	16.1%
Covid-19 fear	"...with fear of getting COVID I stopped going to the gym regularly."	"...Not able to go out as much due to my age and risk level because of COVID-19"	3.90%
Loss of motivation	"No motivation"	"Couldn't work out at a gym so lost motivation to work out around people"	2.93%

correlation was done to find any relationships between variables. Points from age, birth sex, height, weight, physical activity, ethnicity, and family history were summed to give every participant a prediabetes risk score. The responses to the open-ended questions were analyzed for common themes.

Limitations

This study has several limitations. The instrument used in the survey was not a validated instrument. However, the major survey section was derived from the ADA risk score assessment. The other items added were variables identified from the literature review as factors affecting diabetes risk score. Another limitation is that the survey did not collect data on the history of hypertension, a known strong risk factor for diabetes. This study had an unbalanced recruitment of participants, which may limit the generalizability of the results outside of California. The last limitation is that participants were self-reporting their weight change, which can be an issue regarding honesty and the ability to self-assess.

Results

The survey was sent to 2109 individuals at the Touro colleges, and 352 individuals completed the survey (response rate of 16.7%). The response rate from each college was the following: TUC 301/1750 (17%), TUNV 38/89 (43%), and TCOMNY 40/270 (15%). Most respondents were from California (281, 79.8%), followed by 37 participants (10.5%) from New York and 34 (9.66%) from Nevada. Most respondents were female (66.8%) and students (88.6%). The respondents were distributed between Asians (41.8%), White (41.2%), Latino (4.8%), Black (2.0%), and Other/preferred not to answer (10.2%).

Table 1 describes the demographics of the study population and the descriptive analysis of the study variables.

A total of 163 (46.3%) participants reported gaining weight, 78 (22.2%) reported losing weight, and 111 (31.5%) reported no change in weight. While 64.9% (24/37) of New York participants gained weight, only 52.9% (18/34) gained weight in Nevada, and 43.0% (121/281) in California. The mean weight gain was 5.09 pounds (range = 0 – 40 lbs.), and the mean weight loss was 2.39 pounds (range = 0 – 30 lbs.). When the mean weight was compared before and during COVID-19, the difference (-2.689) was statistically significant at $p = 0.05$.

A total of 232 (65.9%) participants reported being less active, while 74 (21.0%) became more active, and 46 (13.1%) participants experienced no change in activity level. When participants were asked whether they attributed the change in activity level to the COVID-19 lockdowns, there was a strong statistically significant positive correlation between the two variables ($r = 0.765$, $p < 0.01$). When the difference in activity level before and during COVID-19 was analyzed, the difference (-0.449) was statistically significant.

A total of 226 (64.2%) participants had an increase in diabetes risk score, 75 (21.3%) participants had a decrease in risk score, and 51 (14.5%) participants had no change in their risk score. Again, more participants from New York (67.5%) (25/37) had an increase in risk score, followed by Nevada (64.7%) (22/34) and California (63.7%) (179/281). The mean risk score during the COVID-19 pandemic was 1.83, a 0.52 increase from the mean before the pandemic began.

When participants were asked about their perception of change in their risk score, there was a significant moderate positive correlation between the two variables ($r = 0.325$, $p < 0.01$).

Furthermore, there was a strong significant correlation between the change in risk score and the weight change ($r = 0.545$, $p < 0.01$). When the mean risk score was compared before and during COVID-19, there was a 0.517 statistically significant increase during lockdowns. When the change in risk score was compared between participants who used food delivery services (45.5%) and those who did not (53.9%), the former group had an additional 0.221 statistically significant increase in risk score. Table 2 provides details on this comparison of means.

Of the 232 participants who reported becoming less active during the pandemic, 205 explained their change in physical activity. A total of five themes were established based on their responses: losing active commute [57.1% (117/205)], gym closures [42.0% (86/205)], too busy [16.1% (33/205)], fear from COVID-19 [3.90% (8/206)], and loss of motivation [2.93% (6/205)]. Forty-four participants reported the reason as more than one theme (i.e., gym closures and loss of motivation). Table 3 provides details on this qualitative data.

DISCUSSION

The research objective was to determine if there was a change in weight or diabetes risk score before the pandemic and a year into the pandemic. Notably, significant changes in mean weight gain and increased diabetes risk scores were observed among participants during the COVID-19 lockdowns. This study is unique because it examined this relationship in a healthcare college in major cities in the U.S. Most participants were students (88.6%) completing a healthcare-related program at Touro. In other words, their future and current role in society is to promote healthy lifestyle habits that aim to prevent and treat ailments linked with weight gain.

Regarding physical activity, participants who reported being less active (65.9%) greatly attributed their change in physical activity to the at-home lockdowns. They either lost motivation, became too busy with their studies, no longer walked to, from, and around campus, or blamed gym closures. The pandemic and the response from health officials allowed very little time for people to adjust to the closures and limitations. Participants from TCOMNY gained the most weight when compared with TUNV and TUCA. Those individuals attended a college located in New York

City, a metropolitan area where walking is the main method of transportation. In a report by the CDC (Centers for Disease Control and Prevention), 6.9% of adults in New York biked or walked as a method of commuting, compared with California (3.8%) and Nevada (2.4%).¹² The pandemic forced the population to conform to the at-home restrictions, taking away active travel and impacting participants' physical activity, particularly from New York.

Participants who relied on food delivery services were found to have a significant increase in diabetes risk score compared to those who did not use food delivery services. This coincides with the notion that cooking meals at home is healthier than ordering food because the meals are typically made of fewer calories, and thus, weight gain is less likely to occur.¹³ In 2020, 17.3% of participants began using food delivery services, and 13.4% used it more often than in other years. Nearly one-third of our participants began falling for unhealthy eating habits led by food delivery services during the pandemic.

These changes in food consumption and activity levels in nearly a year of lockdowns may have catapulted the population into an earlier T2D diagnosis. Health officials must recognize the effects of staying at home and the long-term effects of an ongoing T2D epidemic. Furthermore, this pandemic lockdown may have increased chronic diseases such as cardiovascular disease, obesity, and cancer from decreased activity levels and weight gain.^{14,15} The participants in this study were largely healthcare students, thus having higher awareness about these risks than the normal population.

CONCLUSION

The at-home restrictions during the COVID-19 pandemic precipitated substantial lifestyle alterations nationwide, leading to unfavorable health behaviors and screening shifts. Participants from California, Nevada, and New York indicated a notable decline in physical activity, a surge in weight gain, and a heightened calculated risk for type 2 diabetes (T2D). While these restrictions were pivotal in mitigating the spread of COVID-19, they inadvertently induced secondary health repercussions, potentially amplifying the T2D risk among US adults. Public health officials must devise strategies that mitigate the pandemic's indirect impact on diabetes risk.

AUTHOR DISCLOSURES:

No relevant financial affiliations or conflicts of interest.

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