Impact of Covid-19 Pandemic on the Glycemic Control in a Cohort of Diabetic Patients from a Single Endocrine Practice in a Suburban Setting in Wisconsin

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Abstract

Objective: Assess the impact of the COVID-19 pandemic on a cohort of diabetic patients by comparing glycated hemoglobin (A1C) values and body mass index (BMI) before and a year into the pandemic.

Methods: Retrospective chart review (275 charts) from a single endocrinology practice. Paired t-tests were used for data analysis.

Results: A1C values improved one year into the pandemic as compared to right before the pandemic (P<0.009). Improvement was primarily seen in patient age group ≤ 60 (P= 0.008) and in those with inadequate glycemic control at baseline (initial A1C ≥7) (P=0.0001). Improvement was seen in both males and females. Change in BMI was not significant.

Conclusion: Overall, glycemic control showed improvement during the lockdown related to COVID-19 pandemic.

Keywords: Diabetes; Metabolism; COVID-19 Diabetes Management; COVID-19; Telehealth

Introduction

COVID-19 is a pandemic that affected all facets of life. Direct morbidity and mortality attributed to COVID-19 have been substantial; however, data is now emerging on the impact on other facets of healthcare including chronic disease management. The COVID-19 pandemic led many local governments in the United States to implement lockdown policies to limit the spread of this highly contagious virus. As a result, millions of people were limited within the confines of their homes, prompting drastic lifestyle changes to adapt to their new restrictions and economic instability. Work from home and stay-at-home policies changed daily routines such as social interactions, workouts, eating out, traveling, shopping, and recreation. The onset of the pandemic also led to significant disruption in the care of non-communicable diseases, as assessed by a WHO study [1]. Disruptions in healthcare caused by the pandemic affected diabetic patients' ability to obtain necessary blood sugar testing devices, access to oral medications and insulin to treat their diabetes putting them at risk for worsening glucose control. However, the lockdowns were also associated with changes in dining habits with more people cooking meals at home, less frequent social dining, potentially having more time to exercise, and media's focus on health and disease prevention. The improved

number of telehealth visits also helped mitigate the impact of the lack of in-person clinic appointments during the peak of the pandemic.

Studies looking at the impact of glycemic control at the onset of the pandemic have been mixed. At the beginning of the pandemic, glycemic control was seen to have worsened in the first 21 days of lockdown in one study [2]. A meta-analysis done in Asia evaluating glycosylated hemoglobin (A1C) in diabetics (Type 1 and Type 2) before and after a period of confinement during the pandemic showed improved glycemic control in Type 1 diabetics, but little effect on Type 2 diabetic patients [3].

Since these early studies, a number of studies from various parts of the world including Italy, India, Jeddah, Morocco [4-8] have reported a mixed impact of the COVID-19 pandemic on diabetes management, some showing improvement of overall glycemic control and others showing no improvement or actual deterioration in overall glycemic control. These discordant study result led us to conduct this single center study to determine if the COVID-19 pandemic was associated with a change in glycemic control among established diabetic patients in a Midwestern suburb who had easy access to health care prior to the pandemic.

Materials and Methods

This was a retrospective cohort study, single center, done at an Ascension suburban clinic outside of Milwaukee. All diabetic patients followed in the Ascension outpatient clinic who had an A1C and a body mass index (BMI) documented at the clinic during 3 months (Dec 2019-Feb 2020) prior to the start of the pandemic were eligible for the cohort. Prior to the pandemic, these patients were seen every 3-4 months at the clinic and acutely as needed. The clinic was closed for a month at the beginning of the pandemic (March-April 2020) and then gradually opened with a mix of in-person and telemedicine visits proceeding to primarily in-person visits by the end of 2020.

Deidentified data collected from each chart included age, gender, and race. Baseline A1C and BMI values were collected prior to the start of the pandemic (Dec 2019-Feb 2020), and then again one year later well into the pandemic (Dec 2020-Feb 2021). The cohort included 275 patients. Data from approximately 50% (n=165) of the cohort were also available at the end of 2021 (October-December 2021). Institutional Review Board approval was obtained prior to initiation of the study.

Statistical Methods

Exploratory analysis was performed to summarize continuous variables (mean value ± standard deviation) and categorical variables (frequency). Body mass index and A1C levels right before the pandemic were compared to those values a year into the pandemic using a paired Student's t-test. Significance was set at P<0.05 for all statistical analyses. All statistical analyses were carried out using SAS software (Version 9.4 of the SAS System for Windows. Copyright 2016 SAS Institute Inc. SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc., Cary, NC, USA).

Results

The mean age of the cohort of 275 patients was 58.2 ± 13.6 years; there were 140 female patients and 237/275 (86%) identified as Caucasian (Table 1).

Glycemic control as measured by change in A1C values was better one year into the pandemic as compared to right before the pandemic. A1C values improved significantly from just before the start of the pandemic to one year into the pandemic (7.7 ± 1.5 [mean ± standard deviation] vs 7.5 ± 1.5, P= 0.009). Improvement in the A1C approached statistical significance in the subcohort (n=165) of patients that were followed to the end of 2021. The A1C

Table 1: Patient Characteristics.

Total N	Age		Gender		Race			
275	Mean	Median	Male	Female	White	Black	Asian	Other
	58.2 ± 13.6	61	135	140	237	26	5	7

Table 2: Results.

Variable	N	Value (mean ± SD) (12/2019 - 2/2020)	Value (mean ± SD) (12/2020-2/2021)	Value (mean ± SD) 10/21-12/2021	P
A1C (overall)	275	7.7 ± 1.5	7.5 ± 1.5		0.009
	165	7.7 ± 1.5		7.6 ± 1.4	0.06
A1C in age group ≤ 60	136	8.1 ± 1.8	7.8 ± 1.7		0.008
A1C in age group > 60	139	7.3 ± 1.2	7.2 ± 1.3		0.52
A1C in baseline value < 7	102	6.4 ± 0.4	6.6 ± 0.8		0.02
A1C in baseline value ≥7	173	8.5 ± 1.5	8.1 ± 1.6		0.0001
A1C in Males	135	7.7 ± 1.5	7.5 ± 1.4		0.04
A1C in Females	140	7.7 ± 1.6	7.5 ± 1.7		0.099
BMI	170	33.8 ± 8.1	33.8 ± 8.5		0.96

was 7.6 ± 1.4 for the subcohort at the end of 2021 (P= 0.06).

The age of the patient appeared to modify the change in A1C levels with time (prior to pandemic vs 1 year into the pandemic). Subjects who were ≤60 years old showed an improvement in A1C levels from the prepandemic levels to one year into the pandemic (8.1 ± 1.8 vs 7.8± 1.7, P=0.008, n=136). Those individuals who were >60 years of age showed no such improvement in A1C levels (7.3 ± 1.2 vs 7.2 ± 1.3, P=0.52, n=139).

Patients with lower A1C at baseline (<7) improved less than those whose glycemic control at baseline was worse as measured by A1C. Of the 102 patients with baseline A1C levels <7, there was an increase in A1C one year into the pandemic (6.4 ± 0.4 vs 6.6 ± 0.8, P=0.02). Among the 173 patients with A1C ≥7 at baseline, mean A1C level improved from 8.5 ± 1.5 to 8.1 ± 1.6, P=0.0001.

Gender did not seem to change the association between time periods and A1C levels. Among the 140 female patients, A1C improved from 7.7 ± 1.6 to 7.5 ± 1.7 (P=0.10). Of the 135 male subjects, A1C levels dropped from 7.7 ± 1.5 prepandemic to 7.5 ± 1.4 in 2021 (P= 0.04).

Just 170 subjects had a BMI done prepandemic and one year into the pandemic. Mean BMI did not change from baseline BMI done prior to the pandemic (33.8 ± 8.1 vs 33.8 ± 8.5, P= 0.96) (Table 2).

Discussion

Data analysis showed that there was an improvement in the overall diabetes control one year into the pandemic as compared to the baseline control at the start of the pandemic as measured by changes in the A1C values during these time frames. The effect persisted to an extent into the end of the year 2021. Some other studies have shown similar results [9,10]. A likely explanation of these findings is better lifestyle management during the lockdown especially due to restriction of restaurant food and less eating out in general. However, no formal assessment of diet and change in physical activity was done; and the BMI surprisingly did not follow a similar trend.

Looking at the change in A1C based on initial glycemic control, more improvement was seen in individuals who began with inadequate control. This

is to be expected as individuals with good baseline control did not have much room for improvement.

A1C values showed statistically significant improvement for males but although showing some improvement, did not quite reach statistical significance in females.

Improvement in glycemic control was more pronounced in individuals under the age of 60 as compared to individuals over the age of 60. A possible explanation for this finding is that individuals who are typically busy at work were able to get more time to focus on their health and lifestyle due to the lockdown and the ability to work from home. On the other hand, for individuals who were older than 60 and more likely to be retired and staying at home already, there wasn't much difference in lifestyle due to the pandemic.

Analysis based on race was not performed as majority of the patients were white.

A limitation of the study includes that it is from a single practice location in a suburban setting where people had access to tele-health visits and were likely to be in a socio-economic class where some disruption of work would not cause financial barriers in obtaining medications. This may not be reflected in an inner-city population where access and comfort level with available technology may not be similar and there may be more financial barriers.

Further studies of similar nature may be helpful as we continue to grapple with an ongoing pandemic looking at additional variables like specific diet and exercise changes, mental health parameters and access or availability of telehealth visits.

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