

Diabetes Type II Patient's Lifestyle Related Behaviour during COVID 19 Pandemic lockdown period

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Abstract

Background: COVID-19 pandemic has taken our world by storm. Home confinement for extended periods inhibited people from going out, resulting in a sedentary lifestyle. Besides, boredom and stress during this period may trigger a tendency to overeat, especially comfort foods high in calories, less sleep and physical activity. All these lifestyle changes are modifiable risk factors for poor glycemic control and leads to poor management of diabetes. Thus, it is crucial for physicians to understand lifestyle-related behavior changes during the COVID-19 pandemic in diabetic patients. **Objectives:** The study aims to develop a questionnaire to analyze diabetes patient's lifestyle-related behavior during the COVID-19 pandemic. **Methods:** A total of 167 Diabetes patients enrolled in this survey. A questionnaire with 22 items were developed to analyze the lifestyle-related behavior of people with diabetes. Data collected from the survey in spreadsheet was analysed using SAS V9.4. **Results:** The responses were also grouped according to their HbA1c and blood sugar levels to understand. Almost equal distribution of males (56%) and females (44%), participated in the survey. We found that almost 75% of the participants reported a similar or a slight increase in intake of meals, snacks, fruits, vegetables, and a balanced diet. We also found that 36% of the participants gained weight and 30% of the participants increased their anxiety and stress levels. **Conclusion:** The developed questionnaire is valid and reliable to assess diabetes patient's lifestyle-related behavior during the COVID-19 pandemic. No significant weight gain or diet-related changes seen in about 75% of the participants.

Keywords: Type 2 Diabetes mellitus, life-style change during covid19 pandemic, questionnaire for DM patients, HbA1c ranges, FBS ranges.

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Introduction

COVID-19 pandemic has taken our world by storm. It resulted in life-changing challenges such as social distancing and confinement. While people are trying to get used to this "new normal," the government measures to combat the virus have brought a sudden and radical change in their diet and lifestyle[1].

For instance, home confinement for extended periods inhibited people from going out, resulting in a sedentary lifestyle. Besides, boredom and stress during this period may trigger a tendency to overeat, especially comfort foods high in calories. Disruptions in daily routine may also affect the quality of sleep and sleeping patterns[2].

All these lifestyle factors are modifiable risk factors for poor glycemic control and play a vital role in the development and management of diabetes[3,4].

Thus, it is crucial for physicians to understand lifestyle-related behaviour changes during the COVID-19 pandemic in diabetic patients. However, there is a lack of evidence for this presumption except for observations of past natural disasters mimicking limitations and difficulties of daily activities. Isolated studies have conflicting results about the effect of lockdown on glycemic control. There is also a lack of a defined questionnaire that includes major factors contributing to lifestyle-related behaviour changes.

With this objective, we aimed to design a questionnaire to assess the impact of the COVID-19 pandemic on lifestyle-related behaviour in patients with diabetes. The comparison was made with their physical activity and diet before the home confinement.

Aim and objective

1. The study aims to develop a questionnaire to analyze diabetes patient's lifestyle-related behaviour during the COVID-19 pandemic.

Materials and methods

Study Subjects

A total of 167 Diabetes patients enrolled in this survey. A questionnaire with 22 items were developed to analyze the lifestyle-related behaviour of people with diabetes. Data collected from the survey in spreadsheet was analyzed using SAS V9.4.

The statistical methods of this study were reviewed by Mr. Sunil P.J from Hinge Clinica Pvt Ltd. Hyderabad India.

Statistical analysis

Data collected from the survey in spreadsheet was analyzed using SAS V9.4. All categorical variables are summarized with counts and percentages n (%), and continuous variables are presented descriptively with n, mean and Standard deviation in Mean \pm SD (n) format. The intention of the study is to understand the basic summary and its response across the pre-defined recent HbA1c and Fasting Blood sugar levels. Baseline and Demographic characteristics, summary of COVID Questionnaire, for Recent HbA1c with HbA1c <7, 7-8 and > 8 categories are summarized and Recent Fasting blood sugar level with Blood sugar level \leq 100 and > 100 are summarized by response categories.

Results

Socio-demographic Summary

A total of 160 adults, with an almost equal distribution of males (56%) and females (44%), participated in the survey (Table 1). Their mean age was 52.51 ± 13.32 , and the majority of them did not have alcohol or smoke. Most participants were obese (47.8%), the mean BMI of participants being 24.99 ± 4.88 kg/m².

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Table 1: Baseline and Demographic characteristics

		All Patients (N=160)
Age	Mean±SD (n)	52.51±13.32 (140)
Gender		
Female	n (%)	70 (43.8%)
Male	n (%)	90 (56.3%)
Weight (kg)	Mean±SD (n)	72.97±16.26 (158)
Diagnosis with Diabetes (Years)#	Mean±SD (n)	10.17± 8.60 (146)
Recent HbA1c		
<7 Range	Mean±SD (n)	6.18± 0.58 (29)
7-8 Range	Mean±SD (n)	7.45± 0.32 (30)
>8 Range	Mean±SD (n)	9.44± 1.67 (25)
Recent Fasting Blood Sugar		
110 Range	Mean±SD (n)	92.88±10.88 (24)
=>110 Range	Mean±SD (n)	183.3±60.88 (117)
diabetes type		
Type 1	n (%)	11 (7.7%)
Type 2	n (%)	132 (92.3%)
Associated heart disease*		
Yes	n (%)	99 (61.9%)
No	n (%)	61 (38.1%)
Smoking Status		
Yes	n (%)	7 (4.5%)
1-2/day	n (%)	4 (57.1%)
3-5/day	n (%)	1 (14.3%)
>5/day	n (%)	2 (28.6%)
No	n (%)	148 (95.5%)
Alcohol Consumption		
Yes	n (%)	25 (16.3%)
Thrice a week	n (%)	5 (20.8%)
Twice a week	n (%)	1 (4.2%)
Once a week	n (%)	8 (33.3%)
Once/Twice a month	n (%)	4 (16.7%)
Once in 3 months	n (%)	3 (12.5%)
Once in 6 months	n (%)	3 (12.5%)
No	n (%)	128 (83.7%)

Note: n: Number of Patients, n (%): Counts and Percentage, SD: Standard Deviation, #: Indicate the number of years patients being diagnosing with diabetes, *: Include Hypertension, Dyslipidemia, Hypothyroid, Hyperthyroid, Ischemic Heart disease

Descriptive Summary

The questionnaire aimed to find the changes in lifestyle-related behaviour of diabetes patients before and during COVID.

Table 2: A summary of COVID Questionnaire

Item no	Question	(n)	Significantly increased	Slightly Increased	Grossly similar	Slightly decreased	Significantly decreased
Item_01	Have you gained weight during the lockdown?	152	19 (12.50%)	39 (25.66%)	72 (47.37%)	16 (10.53%)	6 (3.95%)
Item_02	How has your habit of snacking between meals and sweet (chocolate, candies, Indian sweets) consumption	149	3 (2.01%)	20 (13.42%)	96 (64.43%)	16 (10.74%)	14 (9.40%)
Item_03	How has your quantity/portions of meals and snacks changed?	152	5 (3.29%)	20 (13.16%)	106 (69.74%)	15 (9.87%)	6 (3.95%)
Item_04	How has your daily intake of fruits and vegetables changed?	153	10 (6.54%)	29 (18.95%)	107 (69.93%)	7 (4.58%)	0(0.0)
Item_05	How has your intake of a balanced diet (including healthy ingredients such as whole wheat, pulses, l	151	8 (5.30%)	26 (17.22%)	108 (71.52%)	9 (5.96%)	0(0.0)
Item_06	How has your consumption of junk food/fast food and fried food/sugars-sweetened beverages changed?	151	2 (1.32%)	12 (7.95%)	84 (55.63%)	26 (17.22%)	27 (17.88%)

Item no	Question	(n)	Significantly increased	Slightly Increased	Grossly similar	Slightly decreased	Significantly decreased
Item_07	How has your participation in aerobic exercise changed?	149	10 (6.71%)	18 (12.08%)	94 (63.09%)	17 (11.41%)	10 (6.71%)
Item_08	How do you think has your energy level changed during lockdown?	150	2 (1.33%)	21 (14.00%)	101 (67.33%)	21 (14.00%)	5 (3.33%)
Item_09	How has your intake of nutrition supplements to boost immunity changed?	144	4 (2.78%)	27 (18.75%)	106 (73.61%)	5 (3.47%)	2 (1.39%)
Item_10	How has the support of your family and friends in eating healthy changed?	148	12 (8.11%)	40 (27.03%)	93 (62.84%)	2 (1.35%)	1 (0.68%)
Item_11	How has your participation in leisure and household chores changed?	147	5 (3.40%)	28 (19.05%)	106 (72.11%)	6 (4.08%)	2 (1.36%)
Item_12	How has your sitting and screen time changed?	148	12 (8.11%)	27 (18.24%)	98 (66.22%)	11 (7.43%)	0(0.0)
Item_13	How have your hours of sleep and quality of sleep changed?	150	8 (5.33%)	19 (12.67%)	102 (68.00%)	18 (12.00%)	3 (2.00%)
Item_14	How have your stress and anxiety levels changed?	149	6 (4.03%)	28 (18.79%)	102 (68.46%)	11 (7.38%)	2 (1.34%)
Item_15	How has your smoking habits changed?	35	1 (2.86%)	4 (11.43%)	24 (68.57%)	3 (8.57%)	3 (8.57%)
Item_16	How has your alcohol consumption changed?	46	0(0.0)	3 (6.52%)	38 (82.61%)	3 (6.52%)	2 (4.35%)
Item_17	How is your financial stress during this lockdown?	147	10 (6.80%)	16 (10.88%)	107 (72.79%)	11 (7.48%)	3 (2.04%)
Item_18	Are you able to follow up with your doctor for medication?	148	4 (2.70%)	12 (8.11%)	106 (71.62%)	17 (11.49%)	9 (6.08%)
Item_19	Has the adjustment of insulin become difficult during lockdown?	55	1 (1.82%)	3 (5.45%)	46 (83.64%)	4 (7.27%)	1 (1.82%)
Item_20	Do you feel online consultation better than visiting the doctor?	126	5 (3.97%)	4 (3.17%)	96 (76.19%)	13 (10.32%)	8 (6.35%)
Item_21	How has the use of mobile app accessibility changed?	139	8 (5.76%)	17 (12.23%)	99 (71.22%)	9 (6.47%)	6 (4.32%)
Item_22	How do you think the new normal of visiting doctor will change?	140	5 (3.57%)	12 (8.57%)	105 (75.00%)	14 (10.00%)	4 (2.86%)

We found that almost 75% of the participants reported a similar or a slight increase in intake of meals, snacks, fruits, and vegetables, and a balanced diet. Only 15% of the participants had a rise in the habit of having snacks between meals or sugar consumption. The overall intake of junk food/fast food and fried food/sugars/sweetened beverages was either similar or decreased. About 36% of the participants gained weight, while 47% did not see a significant weight change. Besides, about 20%-30% of participants reported an increase in intake of nutrition supplements to boost immunity and increased family support for healthy eating. On the other hand, energy levels, participation in aerobic exercise, and involvement in household chores and leisure activities remained the same or were somewhat increased. However, we found a change in the sitting and screen time in about 25% of the participants.

The duration and quality of sleep were grossly similar to the pre-pandemic time in more than 70% of the participants. Lastly, stress and anxiety levels, financial stress, alcohol, and smoking habits were more or less similar as before.

Most of the participants did not find it difficult to manage the insulin dose and consult their doctor. More than 75% of the participants found online consultation better than visiting the doctor.

In table 3,4 and 5, divided that the participants based on their recent HbA1c levels.

Recent HbA1c <7 Range

In this group, more than 50% of the participants complained of gaining weight. They also had better support from family and friends in eating healthy. We also found an increase in anxiety and stress levels in about 30% of the participants.

Table 3: Recent HbA1c <7 Range

Item no	Question	(n)	Significantly increased	Slightly Increased	Grossly similar	Slightly decreased	Significantly decreased
Item_01	Have you gained weight during the lockdown?	152	19 (12.50%)	39 (25.66%)	72 (47.37%)	16 (10.53%)	6 (3.95%)

Item no	Question	(n)	Significantly increased	Slightly Increased	Grossly similar	Slightly decreased	Significantly decreased
Item_02	How has your habit of snacking between meals and sweet (chocolate, candies, Indian sweets) consumption	149	3 (2.01%)	20 (13.42%)	96 (64.43%)	16 (10.74%)	14 (9.40%)
Item_03	How has your quantity/portions of meals and snacks changed?	152	5 (3.29%)	20 (13.16%)	106 (69.74%)	15 (9.87%)	6 (3.95%)
Item_04	How has your daily intake of fruits and vegetables changed?	153	10 (6.54%)	29 (18.95%)	107 (69.93%)	7 (4.58%)	0(0.0)
Item_05	How has your intake of a balanced diet (including healthy ingredients such as whole wheat, pulses, 1	151	8 (5.30%)	26 (17.22%)	108 (71.52%)	9 (5.96%)	0(0.0)
Item_06	How has your consumption of junk food/fast food and fried food/sugars-sweetened beverages changed?	151	2 (1.32%)	12 (7.95%)	84 (55.63%)	26 (17.22%)	27 (17.88%)
Item_07	How has your participation in aerobic exercise changed?	149	10 (6.71%)	18 (12.08%)	94 (63.09%)	17 (11.41%)	10 (6.71%)
Item_08	How do you think has your energy level changed during lockdown?	150	2 (1.33%)	21 (14.00%)	101 (67.33%)	21 (14.00%)	5 (3.33%)
Item_09	How has your intake of nutrition supplements to boost immunity changed?	144	4 (2.78%)	27 (18.75%)	106 (73.61%)	5 (3.47%)	2 (1.39%)
Item_10	How has the support of your family and friends in eating healthy changed?	148	12 (8.11%)	40 (27.03%)	93 (62.84%)	2 (1.35%)	1 (0.68%)
Item_11	How has your participation in leisure and household chores changed?	147	5 (3.40%)	28 (19.05%)	106 (72.11%)	6 (4.08%)	2 (1.36%)
Item_12	How has your sitting and screen time changed?	148	12 (8.11%)	27 (18.24%)	98 (66.22%)	11 (7.43%)	0(0.0)
Item_13	How have your hours of sleep and quality of sleep changed?	150	8 (5.33%)	19 (12.67%)	102 (68.00%)	18 (12.00%)	3 (2.00%)
Item_14	How have your stress and anxiety levels changed?	149	6 (4.03%)	28 (18.79%)	102 (68.46%)	11 (7.38%)	2 (1.34%)
Item_15	How has your smoking habits changed?	35	1 (2.86%)	4 (11.43%)	24 (68.57%)	3 (8.57%)	3 (8.57%)
Item_16	How has your alcohol consumption changed?	46	0(0.0)	3 (6.52%)	38 (82.61%)	3 (6.52%)	2 (4.35%)
Item_17	How is your financial stress during this lockdown?	147	10 (6.80%)	16 (10.88%)	107 (72.79%)	11 (7.48%)	3 (2.04%)
Item_18	Are you able to follow up with your doctor for medication?	148	4 (2.70%)	12 (8.11%)	106 (71.62%)	17 (11.49%)	9 (6.08%)
Item_19	Has the adjustment of insulin become difficult during lockdown?	55	1 (1.82%)	3 (5.45%)	46 (83.64%)	4 (7.27%)	1 (1.82%)
Item_20	Do you feel online consultation better than visiting the doctor?	126	5 (3.97%)	4 (3.17%)	96 (76.19%)	13 (10.32%)	8 (6.35%)
Item_21	How has the use of mobile app accessibility changed?	139	8 (5.76%)	17 (12.23%)	99 (71.22%)	9 (6.47%)	6 (4.32%)
Item_22	How do you think the new normal of visiting doctor will change?	140	5 (3.57%)	12 (8.57%)	105 (75.00%)	14 (10.00%)	4 (2.86%)

Recent HbA1c 7-8

About 40% of the participants in this group gained weight during the home confinement, and the habit of taking snacks between the meals also

increased. However, the intake of fruits and vegetables also improved. Energy levels were grossly similar in 50% of the participants; however, the rest had mixed reviews. Some had increased energy levels, while others had lesser energy levels as compared to before. A similar response was seen in being able to follow up with the doctor.

Table 4: Recent HbA1c 7-8

Item no	Question	(n)	Significantly increased	Slightly Increased	Grossly similar	Slightly decreased	Significantly decreased
Item_01	Have you gained weight during the lockdown?	28	2 (7.14%)	11 (39.29%)	11 (39.29%)	3 (10.71%)	1 (3.57%)
Item_02	How has your habit of snacking between meals and sweet (chocolate, candies, Indian sweets) consumption	28	1 (3.57%)	9 (32.14%)	12 (42.86%)	3 (10.71%)	3 (10.71%)
Item_03	How has your quantity/portions of meals and snacks changed?	28	2 (7.14%)	4 (14.29%)	17 (60.71%)	3 (10.71%)	2 (7.14%)
Item_04	How has your daily intake of fruits and vegetables changed?	28	4 (14.29%)	5 (17.86%)	16 (57.14%)	3 (10.71%)	0 (0.0)
Item_05	How has your intake of a balanced diet (including healthy ingredients such as whole wheat, pulses, l	28	3 (10.71%)	4 (14.29%)	20 (71.43%)	1 (3.57%)	0 (0.0)
Item_06	How has your consumption of junk food/fast food and fried food/sugars-sweetened beverages changed?	29	1 (3.45%)	0 (0.0)	13 (44.83%)	7 (24.14%)	8 (27.59%)
Item_07	How has your participation in aerobic exercise changed?	29	3 (10.34%)	3 (10.34%)	16 (55.17%)	5 (17.24%)	2 (6.90%)
Item_08	How do you think has your energy level changed during lockdown?	29	2 (6.90%)	6 (20.69%)	14 (48.28%)	6 (20.69%)	1 (3.45%)
Item_09	How has your intake of nutrition supplements to boost immunity changed?	28	3 (10.71%)	4 (14.29%)	18 (64.29%)	2 (7.14%)	1 (3.57%)
Item_10	How has the support of your family and friends in eating healthy changed?	28	3 (10.71%)	7 (25.00%)	17 (60.71%)	0 (0.0)	1 (3.57%)
Item_11	How has your participation in leisure and household chores changed?	28	1 (3.57%)	4 (14.29%)	21 (75.00%)	1 (3.57%)	1 (3.57%)
Item_12	How has your sitting and screen time changed?	28	3 (10.71%)	4 (14.29%)	16 (57.14%)	5 (17.86%)	0 (0.0)
Item_13	How have your hours of sleep and quality of sleep changed?	28	1 (3.57%)	3 (10.71%)	19 (67.86%)	4 (14.29%)	1 (3.57%)
Item_14	How have your stress and anxiety levels changed?	28	0 (0.0)	8 (28.57%)	17 (60.71%)	2 (7.14%)	1 (3.57%)
Item_15	How has your smoking habits changed?	5	0 (0.0)	1 (20.00%)	3 (60.00%)	0 (0.0)	1 (20.00%)
Item_16	How has your alcohol consumption changed?	6	0 (0.0)	1 (16.67%)	4 (66.67%)	0 (0.0)	1 (16.67%)
Item_17	How is your financial stress during this lockdown?	28	0 (0.0)	6 (21.43%)	18 (64.29%)	3 (10.71%)	1 (3.57%)
Item_18	Are you able to follow up with your doctor for medication?	28	2 (7.14%)	3 (10.71%)	13 (46.43%)	6 (21.43%)	4 (14.29%)
Item_19	Has the adjustment of insulin become difficult during lockdown?	6	0 (0.0)	1 (16.67%)	5 (83.33%)	0 (0.0)	0 (0.0)
Item_20	Do you feel online consultation better than visiting the doctor?	22	0 (0.0)	0 (0.0)	18 (81.82%)	3 (13.64%)	1 (4.55%)
Item_21	How has the use of mobile app accessibility changed?	24	3 (12.50%)	2 (8.33%)	14 (58.33%)	4 (16.67%)	1 (4.17%)
Item_22	How do you think the new normal of visiting doctor will change?	28	2 (7.14%)	3 (10.71%)	17 (60.71%)	4 (14.29%)	2 (7.14%)

Recent HbA1c >8 Range

Only about 20% of the participants had gained weight. The rest of the parameters were grossly similar in about 70% of the people. However, we saw a slight increase in smoking in about 28% of the participants.

Table 5: Recent HbA1c >8 Range

Item no	Question	(n)	Significantly increased	Slightly Increased	Grossly similar	Slightly decreased	Significantly decreased
Item_01	Have you gained weight during the lockdown?	24	2 (8.33%)	4 (16.67%)	16 (66.67%)	0 (0.0)	2 (8.33%)
Item_02	How has your habit of snacking between meals and sweet (chocolate, candies, Indian sweets)	24	0 (0.0)	2 (8.33%)	19 (79.17%)	2 (8.33%)	1 (4.17%)
Item_03	How has your quantity/portions of meals and snacks changed?	25	0 (0.0)	3 (12.00%)	19 (76.00%)	2 (8.00%)	1 (4.00%)
Item_04	How has your daily intake of fruits and vegetables changed?	25	0 (0.0)	5 (20.00%)	20 (80.00%)	0 (0.0)	0 (0.0)
Item_05	How has your intake of a balanced diet (including healthy ingredients such as whole wheat,	25	1 (4.00%)	3 (12.00%)	18 (72.00%)	3 (12.00%)	0 (0.0)
Item_06	How has your consumption of junk food/fast food and fried food/sugars-sweetened beverages	25	0 (0.0)	2 (8.00%)	18 (72.00%)	4 (16.00%)	1 (4.00%)
Item_07	How has your participation in aerobic exercise changed?	25	1 (4.00%)	1 (4.00%)	15 (60.00%)	6 (24.00%)	2 (8.00%)
Item_08	How do you think has your energy level changed during lockdown?	25	0 (0.0)	2 (8.00%)	20 (80.00%)	3 (12.00%)	0 (0.0)
Item_09	How has your intake of nutrition supplements to boost immunity changed?	24	0 (0.0)	4 (16.67%)	18 (75.00%)	2 (8.33%)	0 (0.0)
Item_10	How has the support of your family and friends in eating healthy changed?	24	1 (4.17%)	8 (33.33%)	15 (62.50%)	0 (0.0)	0 (0.0)
Item_11	How has your participation in leisure and household chores changed?	24	0 (0.0)	5 (20.83%)	18 (75.00%)	1 (4.17%)	0 (0.0)
Item_12	How has your sitting and screen time changed?	23	2 (8.70%)	5 (21.74%)	15 (65.22%)	1 (4.35%)	0 (0.0)
Item_13	How have your hours of sleep and quality of sleep changed?	25	1 (4.00%)	5 (20.00%)	16 (64.00%)	3 (12.00%)	0 (0.0)
Item_14	How have your stress and anxiety levels changed?	25	0 (0.0)	3 (12.00%)	21 (84.00%)	1 (4.00%)	0 (0.0)
Item_15	How has your smoking habits changed?	7	0 (0.0)	2 (28.57%)	4 (57.14%)	1 (14.29%)	0 (0.0)
Item_16	How has your alcohol consumption changed?	9	0 (0.0)	2 (22.22%)	7 (77.78%)	0 (0.0)	0 (0.0)
Item_17	How is your financial stress during this lockdown?	25	0 (0.0)	3 (12.00%)	20 (80.00%)	2 (8.00%)	0 (0.0)
Item_18	Are you able to follow up with your doctor for medication?	24	0 (0.0)	2 (8.33%)	19 (79.17%)	3 (12.50%)	0 (0.0)
Item_19	Has the adjustment of insulin become difficult during lockdown?	10	0 (0.0)	0 (0.0)	10 (100.0%)	0 (0.0)	0 (0.0)
Item_20	Do you feel online consultation better than visiting the doctor?	22	2 (9.09%)	1 (4.55%)	17 (77.27%)	1 (4.55%)	1 (4.55%)
Item_21	How has the use of mobile app accessibility changed?	25	1 (4.00%)	6 (24.00%)	17 (68.00%)	1 (4.00%)	0 (0.0)
Item_22	How do you think the new normal of visiting doctor will change?	25	0 (0.0)	4 (16.00%)	17 (68.00%)	4 (16.00%)	0 (0.0)

We also divided the participants based on their fasting blood sugar levels (Table 6 and 7)

Recent blood sugar levels =110

We noticed weight gain in about 50% of the participants in this group. However, we saw that the balanced diet intake improved in almost 43% of the individuals. There was also an increase in participation in aerobic exercises. The sitting and screen time was higher in 25% of the participants. The habit of snacking between the meals and the quantity or portion of the meals was grossly similar in 50% of the participants; however, the rest had mixed reviews. Some had increased intake while others lesser intake as compared to before. The response was similar with regards to the smoking habit as well.

Table 6: Recent blood sugar levels = 110

Item no	Question	(n)	Significantly increased	Slightly Increased	Grossly similar	Slightly decreased	Significantly decreased
Item_01	Have you gained weight during the lockdown?	24	3 (12.50%)	9 (37.50%)	7 (29.17%)	3 (12.50%)	2 (8.33%)

Item no	Question	(n)	Significantly increased	Slightly Increased	Grossly similar	Slightly decreased	Significantly decreased
Item_02	How has your habit of snacking between meals and sweet (chocolate, candies, Indian sweets) consumption	21	1 (4.76%)	3 (14.29%)	11 (52.38%)	4 (19.05%)	2 (9.52%)
Item_03	How has your quantity/portions of meals and snacks changed?	24	2 (8.33%)	4 (16.67%)	13 (54.17%)	2 (8.33%)	3 (12.50%)
Item_04	How has your daily intake of fruits and vegetables changed?	15	4 (16.67%)	4 (16.67%)	15 (62.50%)	1 (4.17%)	0 (0.0)
Item_05	How has your intake of a balanced diet (including healthy ingredients such as whole wheat, pulses, l	23	2 (8.70%)	8 (34.78%)	11 (47.83%)	2 (8.70%)	0 (0.0)
Item_06	How has your consumption of junk food/fast food and fried food/sugars-sweetened beverages changed?	24	1 (4.17%)	0 (0.0)	13 (54.17%)	5 (20.83%)	5 (20.83%)
Item_07	How has your participation in aerobic exercise changed?	23	5 (21.74%)	5 (21.74%)	11 (47.83%)	1 (4.35%)	1 (4.35%)
Item_08	How do you think has your energy level changed during lockdown?	24	2 (8.33%)	4 (16.67%)	15 (62.50%)	2 (8.33%)	1 (4.17%)
Item_09	How has your intake of nutrition supplements to boost immunity changed?	22	1 (4.55%)	5 (22.73%)	16 (72.73%)	0 (0.0)	0 (0.0)
Item_10	How has the support of your family and friends in eating healthy changed?	23	3 (13.04%)	9 (39.13%)	10 (43.48%)	0 (0.0)	1 (4.35%)
Item_11	How has your participation in leisure and household chores changed?	22	0 (0.0)	2 (9.09%)	17 (77.27%)	1 (4.55%)	2 (9.09%)
Item_12	How has your sitting and screen time changed?	23	1 (4.35%)	5 (21.74%)	13 (56.52%)	4 (17.39%)	0 (0.0)
Item_13	How have your hours of sleep and quality of sleep changed?	22	1 (4.55%)	2 (9.09%)	15 (68.18%)	4 (18.18%)	0 (0.0)
Item_14	How have your stress and anxiety levels changed?	23	0 (0.0)	4 (17.39%)	17 (73.91%)	2 (8.70%)	0 (0.0)
Item_15	How has your smoking habits changed?	4	0 (0.0)	1 (25.00%)	2 (50.00%)	0 (0.0)	1 (25.00%)
Item_16	How has your alcohol consumption changed?	5	0 (0.0)	1 (20.00%)	3 (60.00%)	0 (0.0)	1 (20.00%)
Item_17	How is your financial stress during this lockdown?	22	2 (9.09%)	2 (9.09%)	16 (72.73%)	2 (9.09%)	0 (0.0)
Item_18	Are you able to follow up with your doctor for medication?	22	0 (0.0)	1 (4.55%)	18 (81.82%)	2 (9.09%)	1 (4.55%)
Item_19	Has the adjustment of insulin become difficult during lockdown?	5	0 (0.0)	1 (20.00%)	3 (60.00%)	0 (0.0)	1 (20.00%)
Item_20	Do you feel online consultation better than visiting the doctor?	17	0 (0.0)	0 (0.0)	13 (76.47%)	3 (17.65%)	1 (5.88%)
Item_21	How has the use of mobile app accessibility changed?	18	0 (0.0)	2 (11.11%)	14 (77.78%)	1 (5.56%)	1 (5.56%)
Item_22	How do you think the new normal of visiting doctor will change?	22	0 (0.0)	2 (9.09%)	15 (68.18%)	5 (22.73%)	0 (0.0)

Recent Fasting blood sugar levels >110 Range

About 25% of the participants in this group complained of gaining weight in the lockdown. But there was a decrease in consumption of junk food/fast food and fried food/sugars-sweetened beverages in 30% of the participants. The rest of the parameters were almost similar to pre-pandemic times.

Table 7: Recent Fasting blood sugar level >110 Range

Item no	Question	(n)	Significantly increased	Slightly Increased	Grossly similar	Slightly decreased	Significantly decreased
Item_01	Have you gained weight during the lockdown?	113	14 (12.39%)	26 (23.01%)	58 (51.33%)	12 (10.62%)	3 (2.65%)
Item_02	How has your habit of snacking between meals and sweet (chocolate, candies, Indian sweets) consumption	113	1 (0.88%)	14 (12.39%)	78 (69.03%)	10 (8.85%)	10 (8.85%)
Item_03	How has your quantity/portions of meals and snacks changed?	114	2 (1.75%)	12 (10.53%)	87 (76.32%)	10 (8.77%)	3 (2.63%)
Item_04	How has your daily intake of fruits and vegetables changed?	84	3 (2.63%)	22 (19.30%)	84 (73.68%)	5 (4.39%)	0 (0.0)
Item_05	How has your intake of a balanced diet (including healthy ingredients such as whole wheat, pulses, l	114	3 (2.63%)	13 (11.40%)	91 (79.82%)	7 (6.14%)	0 (0.0)
Item_06	How has your consumption of junk food/fast food and fried food/sugars-sweetened beverages changed?	112	0 (0.0)	10 (8.93%)	66 (58.93%)	16 (14.29%)	20 (17.86%)
Item_07	How has your participation in aerobic exercise changed?	112	4 (3.57%)	9 (8.04%)	77 (68.75%)	14 (12.50%)	8 (7.14%)
Item_08	How do you think has your energy level changed during lockdown?	113	0 (0.0)	14 (12.39%)	79 (69.91%)	16 (14.16%)	4 (3.54%)
Item_09	How has your intake of nutrition supplements to boost immunity changed?	109	3 (2.75%)	18 (16.51%)	81 (74.31%)	5 (4.59%)	2 (1.83%)
Item_10	How has the support of your family and friends in eating healthy changed?	111	7 (6.31%)	27 (24.32%)	75 (67.57%)	2 (1.80%)	0 (0.0)
Item_11	How has your participation in leisure and household chores changed?	111	4 (3.60%)	22 (19.82%)	80 (72.07%)	5 (4.50%)	0 (0.0)
Item_12	How has your sitting and screen time changed?	110	9 (8.18%)	22 (20.00%)	73 (66.36%)	6 (5.45%)	0 (0.0)
Item_13	How have your hours of sleep and quality of sleep changed?	113	5 (4.42%)	15 (13.27%)	77 (68.14%)	13 (11.50%)	3 (2.65%)
Item_14	How have your stress and anxiety levels changed?	111	4 (3.60%)	22 (19.82%)	75 (67.57%)	8 (7.21%)	2 (1.80%)
Item_15	How has your smoking habits changed?	25	0 (0.0)	2 (8.00%)	19 (76.00%)	2 (8.00%)	2 (8.00%)
Item_16	How has your alcohol consumption changed?	33	0 (0.0)	2 (6.06%)	30 (90.91%)	0 (0.0)	1 (3.03%)
Item_17	How is your financial stress during this lockdown?	110	6 (5.45%)	14 (12.73%)	83 (75.45%)	5 (4.55%)	2 (1.82%)
Item_18	Are you able to follow up with your doctor for medication?	112	3 (2.68%)	8 (7.14%)	80 (71.43%)	14 (12.50%)	7 (6.25%)
Item_19	Has the adjustment of insulin become difficult during lockdown?	44	1 (2.27%)	1 (2.27%)	38 (86.36%)	4 (9.09%)	0 (0.0)
Item_20	Do you feel online consultation better than visiting the doctor?	99	5 (5.05%)	1 (1.01%)	77 (77.78%)	10 (10.10%)	6 (6.06%)
Item_21	How has the use of mobile app accessibility changed?	108	8 (7.41%)	11 (10.19%)	76 (70.37%)	8 (7.41%)	5 (4.63%)
Item_22	How do you think the new normal of visiting doctor will change?	108	5 (4.63%)	8 (7.41%)	82 (75.93%)	9 (8.33%)	4 (3.70%)

Discussion

The COVID-19 pandemic has created a laser focus on combating the virus and preventing loss of lives. Authorities were forced to impose restrictions to implement a strict hygiene regime and a nationwide lockdown that brought a drastic change in our daily activities[5]. Limited availability of food items during the initial phase of the lockdown had put a strain on the food supply chain, resulting in food-related behavioural changes.

Besides, confinement at home, restrictions on visiting parks, and closure of gyms to maintain social distancing significantly reduced physical activity[6,7]. Most people were forced to work from home, further reducing movement, increasing boredom, and enhancing screen-time. Changes in work patterns could also alter sleeping cycle[8]. These lifestyle changes are responsible for poor glycaemic control and may even contribute to the development of diabetes[9].

India is deemed as the diabetes capital of the world, and its prevalence is on the rise[10,11]. Diabetes is a metabolic disorder caused by insulin deficiency or resistance. Insulin, a hormone produced by the pancreas, plays a vital role in managing blood glucose levels[12,13].

Factors such as obesity, sedentary lifestyle, and binge eating negatively affect sugar levels[14,15]. So, it may be possible that behavioural changes due to the COVID-19 pandemic may worsen the state of diabetic patients. For the reasons mentioned above, it is crucial to understand the intensity of impact caused by the pandemic on lifestyle-related behaviour, especially in people with diabetes.

This study is one of the very few studies conducted in India to curate a questionnaire using a standardized procedure to assess lifestyle-related behaviour of diabetic patients during the pandemic.

The questionnaire is short, crisp, and user- and time-friendly. It includes 22 questions covering significant aspects of lifestyle-related behaviour to assess the change in diet, physical activity, sleep cycle, habits, and management of their condition. Food-related items in the questionnaire (1-14) aim to analyze dietary habits by inquiring about the consumption of main meals, snacks, healthy foods such as fruits, vegetables, whole grains, and unhealthy foods such as junk and sugar-sweetened products. They also assess the intake of immunity-boosting foods, friends and family support in eating healthy, and interest in learning healthy recipes. Questions 15-17 are directed to understand

the individual's physical activity by assessing their involvement in aerobic exercise, household chores, and sitting or screen time. Moreover, questions about sleep quality and duration, alcohol and smoking habits, and stress and anxiety levels have also been included [18-22]. Lifestyle-related behavioural changes were seen in the past during natural disasters mimicking limitations and difficulties of daily activities. This resulted in a keen interest among researchers to study such behavioural changes during the COVID-19 pandemic. One such study was conducted in Poland [16]. However, the questionnaire focused only on the habits and dietary choices during the confinement. Besides, the validity and reliability of the tool are not entirely reliable. An Italian study also focused on the pandemic's impact on lifestyle changes, but certain aspects of their questionnaire are not applicable for the Indian population [17]. Many other studies conducted either lacked the holistic approach or were not suitable for Indian standards [18-25]. That being the case, we developed a questionnaire applicable to our Indian population and took a holistic approach to understand behavioural changes in people with diabetes. Besides, the questionnaire is crisp, short, easy to comprehend, and takes no more than 5-7 minutes to answer. As it can help with a quick assessment, it is beneficial, especially during pandemic situations. The study will help our people keep a check on healthy routine and aid physicians and policymakers to take measures for preventing unhealthy behaviours.

In this study, no significant weight gain or diet-related changes were seen in about 75% of the participants. It was also seen that individual with better glycemic control reported weight gain. However, they also took care of the same by improving their diet and nutrition. The results are in line with other studies.

Conclusion

In summary, the study offers an excellent tool to assess lifestyle-related behavioural changes with acceptable validity and reliability during COVID-19 pandemic, especially in people with diabetes. The scale can help physicians understand the trend and offer necessary precautions to prevent the rise of unhealthy habits responsible for poor glycemic control. The tool may also help policymakers to take steps in improving the lifestyle during the pandemic.

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