

The impact of lockdowns and travel restrictions COVID 19 pandemics on glycaemic control of diabetic patients followed up at a tertiary care center from Northern Sri Lanka

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Abstract

Background:

Nationwide lockdown due to COVID pandemic held in Sri Lanka last year for about six months (February – July 2020) due to the COVID-19 pandemic. Patients with chronic illness like diabetes mellitus have faced difficulties and their routine care was compromised. The impact on diabetic care and determining factors during that lockdown period have not yet been examined.

Objectives:

The primary objective of this study is to assess the glycemic control of patients who are following tertiary care diabetic center in Teaching Hospital Jaffna. Other objectives are the factors that could influence the sugar control during the lockdown period and describe any significant relationships.

Design & setting:

A cross-sectional database study analyzing 280 questionnaires from patients aged 16 and the above, who annually visiting to a designated diabetic clinic center, Teaching Hospital, Jaffna from north part of Sri Lanka. (i.e.: various places in Jaffna District, Sri Lanka). Patients whoever had two values of serum HbA1C which must be both pre and post lockdown values, recruited to this study. Serum HbA1C is a marker of an average value of blood glucose level during last three months.

Methodology:

An interviewer administrative questionnaire-based data collection performed under several categories: include demographic pattern, details of diabetes, medication, diet and physical activity and body weight changes during the lockdown period. we assessed the temporal trends between changes of HbA1C and weight over one year.

Results:

Among 280 patients of diabetes mellitus, female patients were 197 (70.4%), and majority of patients were in age of 60 and more (55%). Ethnically Tamils were predominant as 278 (99.3%). Regarding diabetes, 277 patients had type 2 diabetes (98.9%), and number of patients with oral drugs only was 249 (88.9%). Drug compliance reduced during lockdown period significantly ($p < 0.001$). Changes in mean HbA1c values between pre and post lockdown periods were significant ($t=6.061$, $p < 0.001$) but that of mean weight changes did not ($t=1.786$, $p=0.075$). Most patients received drugs adequately (276, 98.6%) and majority of patients obtained medications from government sector (235+10, 93.9%). Most patients did not feel any psychological distress (204, 72.8%) or financially threaten (192, 68.5%) due to lockdown period. Difference of HbA1c values (pre-lockdown minus post-lockdown) positively correlated with the diet and physical activity during lockdown period but not with drug compliance, psychological distress and financial restrictions.

Conclusions:

The government health sector did an excellent service, had been continuously providing medications during the lockdown period as majority of patients had received drugs. Statistically significant changes have been observed in post-lockdown values of HbA1c compared to pre-lockdown HbA1c values. This HbA1c change is positively correlate with the changes in diet and physical activity during lockdown period which is statistically significant. The observed changes in weight were not significant as statistically. Drug compliance, psychological stress, and financial status did not influence the changes of HbA1c during lockdown period.

Keywords: HbA1c, Diabetes mellitus, Pre-lockdown period, Post-lockdown period

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Introduction

Title

The impact of lockdowns and travel restrictions COVID 19 pandemics on glycaemic control of diabetic patients followed up at a tertiary care center from Northern Sri Lanka.

Background

The COVID-19 pandemic creates a challenge in the provision of health care for patients with non-communicable diseases like diabetes. In many countries, during this pandemic, the health care system collapsed from primary care to tertiary care levels, especially during the lockdown period. Patients with diabetes mellitus like any other patients, have been facing difficulties to receive their health care services^[1,2]. Studies have shown that there is a decline in blood sugar control among patients with diabetes mellitus due to current health and economic impact^[3]. In Sri Lanka, there are lack of data about the impact on diabetes care due to lockdown period.

Justification

Almost every country on the global map is a victim of the current covid-19 pandemic, Sri Lanka is not an exception. Patients had been facing difficulties during this pandemic time, especially during the nationwide lockdown period^[4]. Even though there are various facilities available to patients, the resource distribution is not equal to all parts of the world or even within the country^[5]. Patients with diabetes mellitus were difficult to maintain their health status at optimum due to various factors such as attending medical clinics and getting medications through the posted services. Admissions to medical wards were significantly reduced during the lockdown period due to reluctance among the

patients^[6,7]. People lost their jobs and they had to face severe mental distress during that period. The consequences of these multiple impacts were reflected in the following clinic visits which were held soon after the lifting of lockdown.

Few research articles that have been published and many are ongoing about the impact on health regarding diabetes during the COVID19 pandemic worldwide. They have clearly shown the importance of blood sugar control^[8,9]. Few research studies have been done so far about the impact on the care of diabetes mellitus during this period to show that it attacked the control of blood sugar^[3,10].

It is a cross-sectional, quantitative, observational, and descriptive study. In this study, we have retrospectively collected the data of patients with diabetes mellitus for the corresponding months of the previous years to analyze the change of diabetes control during the lockdown period. We use HbA1c as a standard measure of blood sugar control and, we obtained levels of HbA1c for the nonrestrictive period (2019 and 2020) and during the lockdown period in 2020. HbA1c test is a widely acceptable serum test to find out the average blood glucose level across the last three months.

Objectives

General Objectives.

Assess the impact of glycemic control of patients with diabetes mellitus who are following clinic at diabetic center in Teaching Hospital, Jaffna following the COVID 19 nationwide lockdown period.

Specific Objectives.

1. To determine the association between the diabetes control and the nationwide lockdown status.
2. To determine the factors associated with the diabetes control.

Literature Review

Search strategy

This literature review is carried out with the aim of obtaining best available evidence to formulate the methodology of this research. This review is organized under the sections of search strategy, diabetic care in COVID 19 pandemic and methodological issues. The section on methodological issues reviews under the subsections of study design, study settings, study period, study population, sample size, sampling method, data collection instruments, data collection techniques, data entry and data analysis.

Literature search was carried out using electronic search. Electronic search was made in PubMed, Google Scholar, Sri Lanka journals online and research from indexed journals. The search terms included COVID 19, primary care, diabetes mellitus, non-communicable disease, and lockdown. Organizational websites such as WHO was also searched. Key words and MeSH terms were used without any limitation on time and country. Mendeley was used as the paper management system.

History of diabetic care

Knowledge of diabetic care has been evolved continually for the last few decades since the discovery of insulin. Although various advancements achieved in the field of diabetic care, still fundamental measures^[11] are needed to maintain the blood sugar control, such as regular medication, exercise, food habits and psychological wellbeing^[11]. Continuous diabetic care emphasizes regular clinic visits and screening for microvascular and macrovascular complications. This normal routine care was affected by nationwide lockdowns and travel restrictions that happened from March 2020 to June 2020 due to the COVID 19 pandemic^[12].

International studies on diabetic care during COVID -19 pandemic

Although there are fewer publications about diabetes care and COVID19 from Sri Lanka, some overseas papers have described the impact of lockdown on diabetic care. In China, during the lockdown period, patients had been requested not to visit clinics for consecutive three months^[13]. Patients got instructions over the phone for symptoms of hyperglycemia and other medical emergencies^[14]. Diabetes specialists gave free

consultations through the internet as well as over the phone. They had issued guidelines for patients with diabetes mellitus^[15-17].

In India, the health sector has faced difficulties, such as preventing complications and managing diseases. People gained extra weight as they consumed sugary meals and not engaging exercise and were non-adherent to medications^[17,18]. According to their data, weight gain occurred about 19% and about 42% reduction of average exercise time. Also, fruit and sugary consumption were increased by about 23% and according to their study more than 80% of people addressed mental stress over the period.

Sri Lankan studies on diabetic control during lockdown of COVID -19 pandemic

Currently there are no published papers shown the actual impact on glycemic control during COVID19 nationwide lockdown period in Sri Lanka.

Methodology

Study design

This study aimed to analyze impact of diabetic control during the nationwide lockdown period 2020 and determine the factors and establishment the relationships among patients with diabetes who are visiting a specialized diabetic center annually. Therefore a population based cross-sectional, quantitative, observational, and descriptive study was selected. Cross sectional analytical studies have been used to study associated factors of many conditions such as body weight changes and drug compliance.

Study setting

This study was conducted at Specialized Diabetic Center, Teaching Hospital, Jaffna.

Study Period

Ten months period starting from November 1st, 2020, to August 31st, 2021.

Study population

Adult patients, age 16 and above, followed up at diabetic center at Teaching Hospital Jaffna for annual routine checkup for their diabetes status and progression. These patients have their usual clinic for their diabetic care either Teaching Hospital Jaffna or their relevant local clinic/ district general hospitals.

Sample size calculation

There are no similar studies published from Sri Lanka. Our sample size is 280. We faced few challenges as the restriction in clinic visits due to ongoing COVID pandemic and frequent travel and lockdown restrictions.

Sampling Technique.

We collect the details of patients who have given written informed consent prior to enrollment. On an average we expected 10 patients a day to visit the diabetic center and it would give us around 240 patients in a month while excluding weekends and public holidays. However due to travel restrictions and continuing the covid pandemic, we did not get the expected number of patients. On average we collected 4-5 patients per day.

Inclusion criteria

1. Adult patients who are at age 16 and above, currently attending diabetic center, Teaching Hospital, Jaffna.
2. Patients who are on a regular clinic follow up before and after the lockdown period.
3. Patients who had been infected with covid19 but not admitted to hospital & patients who were self quarantine during the lock down period.

Exclusion criteria

1. Patients who had lost their clinic follow up prior to lockdown
2. Patients who do not give consent
3. Patients who were admitted to hospital for any illness which leads to erratic diabetic control.

Study instrument

An interviewer-administered questionnaire and data sheet is used for data collection. Consent and information sheets have been translated into Tamil and back translated into English with two different translators to see the accuracy of translation.

And HbA1c measurements were taken from patient's clinic records.

Data analysis

Data are expressed as the mean \pm standard deviation for continuous variables and the number (percentage) for categorical variables. Differences between the baseline and the follow-up HbA1c were

both analysed with the paired-samples T-test. All tests were two-sided and $p < 0.05$ will be defined as statistically significant. A p value of less than or equal to 0.05 was considered as significant. Descriptive analysis was carried out to understand the pattern of distribution of individual variables. This helped in deciding the appropriate parametric and non-parametric statistical tests.

Table 1 : Demographic pattern of study population.

Demographic factors	Frequency	Percent
Age		
<=49	52	18.6
50-59	74	26.4
60-69	96	34.3
>=69	58	20.7
Total	280	100
Sex		
female	197	70.4
male	83	29.6
Total	280	100
Ethnicity		
Tamils	278	99.3
Sinhalese	1	0.4
Muslims	1	0.4
Total	280	100
Occupation		
Government	19	6.8
No occupation	191	68.2
private	11	3.9
self-employment	59	21.1
Total	280	100

Table 2 : Description of availability of medications during lockdown period.

Availability of medication	Frequency	Percent
Easy availability of medications		
Yes	276	98.6
No	4	1.4
Total	280	100
Adequacy of medications		
Yes	277	98.9
No	3	1.1
Total	280	100
Medications available from		
Government sector	235	83.9
Private	15	5.4
Both	30	10.7
Total	280	100

Table 3 : Comparison of drug control before and during the lockdown periods.

Factors on diabetic control	Frequency	Percent	Frequency	Percent
	Pre-lockdown period		Lockdown period	
Drug compliance				
Yes	276	98.6	272	97.1
No	4	1.4	8	2.9
Total	280	100	280	100

Table 4 : Personal factors changes during lockdown period. Participants are asked to express their responses as Yes or NO compared to pre-lockdown COVID pandemic. No numeric scales or ratings did not used in this questionnaire.

Personal factors during lockdown	Frequency	Percent
Physical activity		
Yes	148	52.9
No	132	47.1
Total	280	100
Diet control		
Yes	193	69
No	87	31
Total	280	100
Stressful environment		
Yes	76	27.1
No	204	72.9
Total	280	100
Financial concerns		
Yes	88	31.4
No	192	68.6
Total	280	100

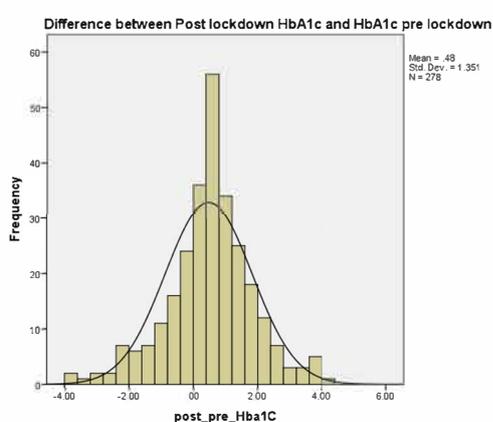


Figure 1: Difference between post lockdown HbA1c and pre lockdown HbA1c. (Post lockdown HbA1c value minus pre lockdown HbA1c value)Cases and Controls.

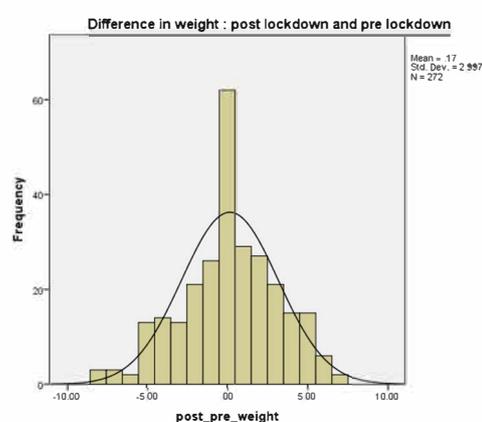


Figure 2: Distribution of changes in weight, Post: Pre weight: Extreme values were excluded on both side: >10 & < -10.

The difference between the changes in drug compliance is statistically significant which is proven by Fisher's Exact test ($p < 0.001$). (Table 3)

Among 280 individuals, majority are Tamils (278) and one from Sinhala community and one from Muslim community. In north part of Sri Lanka, majority of population comprised of Tamil community. In our study population most individuals are older and more than 50 years of age (81.4%). Youngest person is 16-year-old and the eldest one is 82-year-old. Female population is predominant in our study population (70.4%, $n=197$). Considering employment status, majority are unemployed (68.2%, $n=191$). This could be explained as our study population comprised predominantly of females and old age. Most patients used personal transport vehicle (45.7%, $n=128$) and most popular one is Motor Bike (30.4%, $n=85$) for routine clinic visits before the COVID pandemic.

Most patients have Type 2 diabetes (98.9%, $n=277/280$). This is probably due to the age distribution of our study population. Among the study population, majority of them took oral medications for diabetes mellitus (88.9%, $n=249/280$) compared to either insulin only or insulin with oral medications. Considering availability of medications, Vast number of patients had adequate amount of medications ($n=277/280$) and easily got medications without difficulty from both government and private sectors. ($n=276/280$). 235 (83.9%) patients got medications exclusively from government sector.

During nationwide lockdown period, about 98.6% ($n=276$) patients were able to get medications easily (table 4.2) and 98.9% ($n=277$) of patients said they got adequate medications. Majority of patients (83.9%, $n=235$) got medications from government sector such as via postal services and government clinic centres. Only 5.4% ($n=15$) patients bought medications from private pharmacies and private medical shops.

Drug compliance slightly decreased during lockdown period (97.1%, $n=272$), compared to pre lockdown state (98.6%, $n=276$). This could be due to unavailability and no adequate of medications as described above. The reduction of drug compliance is statistically significant. During lockdown period, 52.9% (148/280) persons engaged some form of physical activity like household works etc. (no professional training or sports or gym) compared to 47.1% persons who did not engage any form of physical activity. 69% (193/280) of population had

diet favor to diabetic control compared to 31% (87/280) of study population who did not have diet control in terms of diabetic control. Amongst 87 persons, majority of them (57 individuals) revealed no specific cause to not to adhere diabetic related diet. Number of patients who felt stressful environment during that lockdown period, were about 28.1% (76/280). Regarding financial concerns, 68.6% (192/280) of study population did not have concerns about financial problems/ shortages. Although we did find the specific financial support for each person in this study, there could be a possible explanation is that most of them were women and old age who may depend on other family members.

During lockdown period only half of study population engaged some form of physical activity (table 4.4) (52.9%, $n=148$) at home. But none of them did any form of professional type such as gym or programmed type exercise. We did not measure the duration of physical activity per day. Most of the participants did not feel any stressful environment (72.9%, $n=204$) and did not have any special financial concerns (68.6%, $n=192$) due to COVID lockdown. But we did not use any specific scales to measure the stressful feelings, or we did not use any objective measure to find out the financial burden/ limitations.

Among 87 patients who did not adhere diet control, 11.5% ($n=10$) of them did not have access to buy food for diabetic friendly items. 20 patients could not find their diet related food items. Majority of them (65.5%, $n=57$) did not have valid reason for not adhering diet control during lockdown period. In this study, we did not ask detailed questions about the quality or quantity of their food. It was a patient's perspective of their diet habit.

Regarding HbA1c difference between pre lock down and lockdown period, mean pre-lockdown HbA1C value is 7.90 (SD 1.763) and minimum value is 4 and maximum value is 15. Mean value of post-lockdown HbA1C, is 8.40 (SD 1.698) and minimum value is 5 and maximum is 13. This histogram (figure 4.1) shows the frequency of difference between HbA1C values from Post lockdown to Pre lockdown values. According to above graph and table, most post lockdown HbA1C values are comparatively higher than pre lockdown values. Only 30.7% ($n=86/280$) post lockdown HbA1C values were same or smaller than pre lockdown values. We did pair sample T-Test to determine the significance between mean values of HbA1c. Because we noted that mean HbA1c value in post lockdown period (7.90) is greater than pre lockdown period (8.40). There is a significant difference between the mean values of pre and post

lockdown values of HbA1c ($t = -6.061$, $df = 279$, $p = <0.001$).

Mean body weight in pre lockdown period is 62.52 kg (SD 12.722) and minimum value is 28 Kg and maximum is 115 kg, considering post lockdown values, mean weight is 62.90 kg (SD 12.831) and minimum value is 35 kg and maximum is 115 Kg. 22.1% (n= 61) persons did not have body weight changes through lockdown period. 34.4 % (n= 95) of study population did lose their body weight over the lockdown period. majority of them 43.5 % (n= 124) gain body weight over the lockdown period (figure 4.2). We did pair sample T-Test to determine the significance between the two mean values of weights in both pre lockdown and post lockdown periods. There was no significance in terms of weight changes in pre lockdown period compared to post lockdown period ($t = 1.786$, $df = 279$, $p = 0.075$).

Discussion

Our study population mainly consists Sri Lankan Tamils as they are from northern part of Sri Lanka and most people are above age 40 and most are unemployed. Majority of our study population in northern region received adequate medications during lockdown period nearly as pre-lockdown period. Most patients are having type 2 diabetes mellitus and most of them are on oral hypoglycaemic medications. This could be due to the effective medicine delivery system implemented by government health care system. However, drug compliance is reduced significantly and which is statistically significant.

Considering HbA1c changes, mean value of post lockdown period was greater than pre lockdown mean values and the change is statistically significant ($p < 0.001$). Reduction of drug compliance and the lack of physical activity could be the factors. However, interestingly, financial and psychological factors less likely did not influence the outcome. We measured the weight changes compared to pre lockdown period and that was statistically not significant ($p = 0.075$). This mean body weight increment could be related to lack of physical exercise despite majority of them admitted having good diet control.

Conclusion

The main purpose of this study was to identify the impact on diabetic control and related factors during COVID 19 nationwide travel restrictions in 2020. We found that, that travel restrictions made negative

impact on drug compliance as well as diabetic control despite the adequate drug delivery and diet habits during that period. We also found that, there were no significant financial and psychological factors influenced the outcome.

Recommendation

We recommend that, this kind of research must be conducted in other parts of Sri Lanka to compare the results. We only considered two HbA1c values within a year gap. This study would be more accurate if we had considered few more HbA1c values within a year period. Some part of the study did not include detailed data for example, diet pattern, physical activity and feeling stressful etc. due to limiting the exposure between interviewer and patients in clinic settings. A follow up study to find the changes in HbA1c during the extended period of post lockdown would be an appropriate study.

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