

Coronavirus lockdown effect on type 1 diabetes management on children wearing insulin pump equipped with continuous glucose monitoring system - Athanasios Christoforidis - Aristotle University, Greece

Athanasios Christoforidis

Abstract

At the dawn of 2020, central China faced the outbreak of a highly transmittable, novel strain of the coronavirus, causing severe illness that was subsequently named SARS-CoV-2 [1]. The coronavirus disease 19 (COVID-19) is characterized by severe acute respiratory syndrome and has a high mortality rate especially among the elderly and people with serious

Greece imposed the closure of all educational institutions on the 10th of March after only 89 confirmed cases of COVID-19 and a full lockdown two weeks later, much earlier than many of its European neighbors. So far, these quick reflexes have been effective as the number of COVID-19 cases and deaths have been one of the lowest in Europe, nonetheless, there is a long way ahead.

The lockdown and the subsequent social distancing practices, which, in some cases, meant complete isolation, has caused a major change in people's daily living routines. Emerging evidence supports that people have become less physically active and frequently consume a nutritionally unbalanced diet [5]. People with chronic health conditions might have limited access to the healthcare system and even to health supplies and equipment. For children and

adolescents with type 1 diabetes mellitus (T1DM) all these factors may lead to impaired glycemic control as physical activity, healthy eating and even a steady daily routine contribute substantially in a more effective diabetes management [6,7]. We invited children with type 1 diabetes, followed in our pediatric diabetes outpatient clinic and wearing a Medtronic Mini-Med 640G Insulin pump accompanied with Enlite™ Sensor and Guardian™ 2 Link transmitter to upload their data on the CareLink System one month since the initiation of the coronavirus lockdown. The study was performed in accordance with the Helsinki Declaration of 1975 and was approved by the Scientific and Administrative Council of Hippokratium General Hospital of Thessaloniki. Children and their caregivers were informed for the nature and the purpose of the study and a verbal consent was obtained for every participant. Exclusion criteria included: i) Recent diagnosis of T1DM (less than 6 months), ii) chronic or acute medical condition or medication that would be likely to interfere with glucose metabolism for 2 weeks prior and 2 weeks after the study period, iii) less than 3 months experience with the pump and the sensor iv) sensor duration for the study period of less than 75%, v) incomplete or missing data, or inability to upload data using the CareLink system and v) unwillingness to participate underlying medical conditions irrespectively of age [2]. By the 11th of March and as more than 110

Athanasios Christoforidis
Aristotle University, Thessaloniki, Greece E-mail: christoforidis@auth.gr

countries have reported numerous cases of COVID-19, WHO declared this outbreak as a pandemic [3]. As of the 13th of March, Europe was the active center of the pandemic and shortly after, all European countries began reporting confirmed cases and deaths. One after the other, most European countries have implemented various degrees of lockdowns to counter the spread of the coronavirus outbreak. Thirty-four children (16 boys, 47,06%) with T1DM were finally enrolled in the statistical analysis. Their decimal mean age at the time of the study was 11.37 ± 4.45 years, ranging from 2.52 to 18.59 years. Following data stratification in the two studied periods, a few significant differences arose. Mean glucose values obtained with sensor did not differ between the two studied periods (168.76 ± 21.87 mg/dl before lockdown versus 170.26

± 22.79 during lockdown, $p = 0.466$). Blood glucose readings were significantly fewer during the lockdown period (7.91 ± 3.45 mg/dl versus 7.41 ± 3.27 mg/dl, $p = 0.001$) and glucose levels obtained by blood measurements had a significantly higher Coefficient of Variation (CV) in the pre-lockdown period ($39.52 \pm 5.67\%$ versus $37.40 \pm 5.97\%$, $p = 0.011$). However, lockdown period did not significantly affect glycemic control as mean time in range (TIR) did not differ significantly between the two periods ($60.71 \pm 13.23\%$ versus $60.50 \pm 14.75\%$, $p = 0.872$). With regards to insulin requirements, no significant difference was recorded regarding the total daily dose of insulin in the two periods (36.24 ± 25.17 U versus 35.80 ± 23.32 U, $p = 0.739$). There was a trend of a higher percentage of basal rates during the lockdown period ($35.82 \pm 8.20\%$ versus $37.21 \pm 8.63\%$, $p = 0.074$) but again without reaching statistical significance. Similarly, no difference was recorded regarding the reported carbohydrates during the lockdown period and the preceding 3-weeks period (195.29 ± 106.90 versus 198.06 ± 109.13 , $p = 0.966$). However, the meal schedule has changed dramatically during the lockdown period. Our data showed that glycemic

control during the coronavirus lockdown period can be adequately achieved and be comparable to the pre-lockdown period in children with type 1 diabetes mellitus wearing insulin pump equipped with sensor. Our results are in accordance with those reported in 2 emerging studies showing no difference in glycemic control during coronavirus lockdown period in both adults [9] and adolescents [10] with T1DM on hybrid closed loop system. Interestingly, Bonora et al have just shown improved metabolic control in adult patients with T1DM that have stopped working, in contrast, no difference in glycemic control was reported in those that continue to work during the lockdown period [11].

Although the reported amount of carbohydrates consumed did not differ significantly between the two

periods in our data, meal timing has drastically moved to a looser routine with frequent late-night eating and a significantly increased percentage of consuming the first meal of the day later than 10.00 a.m. In a large, recent study on adult population with T1DM, skipping breakfast was associated with lower odds of reaching good glycemic control and higher mean blood glucose values [12]. Regarding physical activity, in a recent study assessing the health and wellbeing of normal Chinese adults living and working after one month of restrictions to contain the COVID-19 outbreak results showed that for those who exercise regularly and over 2.5 h per day, life satisfaction was negatively associated with the level of restrictive measures [5]. On the other hand, individuals who exercise less than half an hour a day, life satisfaction was significantly positively associated with the level of restrictive measures in more severely affected locations, reflecting a better justification or rationalization of their inactive lifestyles [5]. In patients with T1DM, regular physical activity associates with several positive physical health effects including improvement of

cardiovascular function and blood lipid profile as well
as enhancement in psychological well-being

This work is partly presented at 52th Annual Congress on Neu