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MINIREVIEWS

Multiple influences of the COVID-19 pandemic on children with diabetes: Changes in epidemiology, metabolic control and medical care

Stefano Zucchini, Andrea Scozzarella, Giulio Maltoni

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Abstract

The coronavirus disease 2019 (COVID-19) pandemic has heavily affected health worldwide, with the various forms of diabetes in children experiencing changes at various levels, including epidemiology, diabetic ketoacidosis rates and medical care. Type 1 diabetes showed an apparent increase in incidence, possibly owing to a direct damage of the virus to the β-cell. Diabetic ketoacidosis also increased in association with the general fear of referring patients to the hospital. Most children with diabetes (both type 1 and type 2) did not show a worsening in metabolic control during the first lockdown, possibly owing to a more controlled diet by their parents. Glucose sensor and hybrid closed loop pump technology proved to be effective in all patients with type 1 diabetes during the pandemic, especially because the downloading of data allowed for the practice of tele-medicine. Telemedicine has in fact grown around the world and National Health Systems have started to consider it as a routine activity in clinical practice. The present review encompasses all the aspects related to the effects of the pandemic on the different forms of diabetes in children.

Key Words: Diabetes; COVID-19; Children; Diabetic ketoacidosis; Telemedicine

Core Tip: Children with diabetes were significantly affected by the pandemic. There was a significant incidence increase of type-2 diabetes whereas conflicting results were found in type-1 diabetes. Metabolic control was not affected in the two types of the disease, whereas diabetic ketoacidosis incidence increased significantly, Telemedicine was very helpful in the period of social restrictions and significantly developed during the pandemic.

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INTRODUCTION

In 2020, humanity went through one of the most dangerous pandemics in human history, as the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus spread worldwide, causing national lockdowns, national health systems to overload, as well as continuous uncertainties. By October 11th 2022, 620 million confirmed cases and more than 6.54 million deaths had been reported globally[1]. After the first outbreak in China, Italy was one of the first countries to be significantly affected by the pandemic[2]. The healthcare crisis forced all countries worldwide to adopt emergency measures labeled as social restrictions, such as working remotely, wearing facemasks as protection, avoiding close social contacts.

Patients with most forms of diabetes may be considered a vulnerable population and were often negatively affected by the pandemic. Adult patients with type 2 diabetes (T2D), for example, experienced higher rates of hospitalization and more deaths, since obesity, hypertension and diabetes itself are known to be risk factors for severe SARS-CoV-2-related pneumonia[3,4]. Furthermore, the forced reduction in physical activities caused a significant increase in obesity rates at all ages, making the whole population more prone to develop T2D[5]. The limited availability of the emergency departments and of the national healthcare systems in general was associated with an increase in the acute and chronic complications of diabetes[6,7].

Moving to the pediatric population, SARS-CoV-2 infections have affected patients' health and care in many ways. A change in epidemiology occurred, affecting both T1D and T2D patients for various reasons, different rates of diabetic ketoacidosis (DKA) were described and there may have been a worsening of metabolic control in both T1D and T2D patients. Treatment mainstay for patients with T1D, for example, requires a fine-tuned balance between insulin doses on the one hand and food intake, glucose concentrations, and daily activities on the other. Finally, the general emergency forced the national healthcare services to adapt and, as expected, telemedicine health care was implemented around the world.

The present review encompasses the various changes that may have affected children with diabetes in the past two years, ranging from the epidemiology of both T1D and T2D, to the occurrence of DKA, the changes in metabolic control and general well-being and finally the development of telemedicine.

EPIDEMIOLOGY OF TYPE 1 DIABETES

T1D, the most prevalent form of diabetes in children, is an autoimmune disease whose trigger is currently under debate and may be different from patient to patient[8]. Nevertheless, virus infections have long been considered elicitors of autoimmune response in genetically susceptible patients, rather than the direct killer of the β-cells[9,10]. However, the possibility that viruses may directly damage β-cells has never been totally excluded; with past viruses they have also been isolated in pancreatic tissues from diabetic patients[11,12]. Since the outbreak of the pandemic, it has been stated that SARS-CoV-2 binds to angiotensin-converting enzyme 2 (ACE2) receptors in the pancreas, possibly damaging islet cells and reducing insulin release[13], the description of viral infiltration in pancreatic autopsies in patients deceased owing to SARS-CoV-2 infections raised great concern[14,15]. On the other hand, it has been proven that SARS-CoV-2 enters other cells of the endocrine system, such as the thyroid and the gonads, as the ACE2 receptor is also expressed in these tissues[16]. The selective destruction of the β-cells was initially seen as a contributing factor in the worsening of metabolic control of many diabetic patients during the SARS-CoV-2 infection: In other words, the severe DKA that were observed during and after the infection in adult diabetic patients was supposed to be a clinical indicator of a lack of insulin due to β-cell loss or malfunction[17,18]. As reported in recent clinical studies[19,20], the initial question was whether the virus directly penetrates β-cells, potentially leading to endocrine dysregulation and in the end to autoantibody-negative T1D. Alternatively, SARS-CoV-2 infections may be a

precipitating factor of T1D clinical onset. Luckily, in July 2021, the national data coming from the German Diabetes Prospective Follow-up Registry (DPV) was published, which found no evidence that the pandemic was causing a significant increase in the number of new autoantibody-negative cases of T1D in children, adolescents and young adults[21]. According to the authors, the direct diabetogenic effects of the virus seemed highly unlikely. No other data coming from registry studies has been published thus far, therefore the phenomenon is currently under investigation.

As for incidence, the published studies have thus far yielded conflicting results (Table 1). The initial studies led in Italy, which experienced an early spread of the infection, seemed to confirm an increase in overall incidence in children: Mameli *et al*[22] described, in fact, an incidence increase in the Lombardy region above all during the second wave of the infection, while Schiaffini *et al*[23] reported a 22%-35% increase in the Lazio region. During the first wave at the beginning of 2020, most children were forced to stay at home and were marginally affected by the pandemic[24], making the influence of the SARS-CoV-2 virus on T1D incidence highly unlikely. This was again confirmed by the DPV registry[25], which found a non-significant increase in incidence between the years 2019 and 2020 (22.2 *vs* 23.4/100000 0-14 years). Opposite findings were published by the CDC in the US Morbidity and Mortality Weekly Report, which showed an increased risk of pediatric diabetes with the SARS-CoV-2 infection[26]. Heavy criticism was immediately raised based on the results[27], including the possible mixture of T1D and T2D cases, the lack of data on insured children (1/3rd of all United States children) and others. A more accurate analysis on possible relations between the SARS-CoV-2 infection and T1D incidence was published by Scottish authors[28]. They studied the cause-effect link between infection and T1D onset by also considering the time distance between the 2 phenomena and found no significant association, despite an apparent increase in incidence. Like the DPV studies, they concluded that the SARS-CoV-2 infection itself was not the cause of this increase. A more conclusive result was reached by the Sweet consortium[29], which analyzed data from 17280 cases of T1D diagnosed between 2018 and 2021 from 92 worldwide centers and focused on seasonality. They failed to prove strong direct virus-related effects, and only described a change in seasonality reflecting the spread of the pandemic: A delay in the usual winter peak in Northern Europe and North America, in fact, and a stronger peak during the summer and autumn months were described.

The conclusion of the ISPAD guidelines on epidemiology helps summarize this debated issue[30]: An increased incidence of pediatric T1D onset occurring at the same time as the pandemic has been reported in Germany and the United States, which may be due to a concurrent illness precipitating the clinical diagnosis of T1D rather than a change in the risk of developing T1D, as this often take years. Therefore, one must wait more years before drawing definitive conclusions on the matter.

EPIDEMIOLOGY OF TYPE 2 DIABETES

The magnitude of the pandemic's effects on the incidence of diabetes was stronger for T2D than for T1D. The main reason for this is that both adults and adolescents suffering from obesity gained weight while social restrictions were in force[5,31], causing a bidirectional impact between the two pathological conditions. Obesity is a known predisposing factor of T2D, and about three quarters of children with T2D are obese[32]. Furthermore, the possible role of a direct damage of the β-cells by the virus ought to be considered as a precipitating factor also for T2D.

The more precise data on T2D incidence comes from the countries where T2D is frequent, for example the United States (Table 1). As an example, its incidence increased in Florida from 14.6/100000 pre-pandemic to 16.9/100000 in the first quarter of 2020[33]. There was a 293% increase in Illinois[34] and a 225% increase in Wisconsin[35] compared to the pre-pandemic mean. As expected, the increase was greater among certain racial and ethnic subgroups, particularly among the Hispanic and Black population. The cause-effect mechanism between the two diseases is even more difficult to establish compared to T1D, since the precise start of T2D is often uncertain and it is impossible to know whether the SARS-CoV-2 infection occurred prior to a patient's presentation and ultimately increased their risk of diabetes.

However, the recent meta-analysis by Lai *et al*[36] seems to provide conclusive data on the subject, by collecting data of 8 consistent studies which found a general increased relative risk of T2D equal to 1.78. Unsurprisingly, the subcategory of patients aged 0-18 years showed a similar increased risk (RR 1.74). Although their conclusion was that the SARS-CoV-2 infection was associated with an increased risk of overall diabetes, the authors themselves wisely reported that the conclusions drawn at the moment may change over time as the pandemic continues, the virus mutates, and treatment strategies improve.

DIABETIC KETOACIDOSIS

Above all during the first wave of the pandemic, the necessary initiatives such as social distancing and limitations of non-essential services limited the access to healthcare services. Furthermore, people were reluctant to go to the hospital lest they contract the infection or struggle to obtain medical advice. These

Table 1 Conflicting results of type 1 diabetes and type 2 diabetes incidence in the studies examined led in different countries

Ref.	Region	Increased incidence	Period of observation	Diabetes type	Patient source	Results
Mameli *et al* [22], 2022	Lombardy (Italy)	Yes and no	March-December 2020	1	Local network	Incidence 16.0/100000 higher in the 3 previous years but not *vs* 2019
Schiaffini *et al* [23], 2022	Lazio (Italy)	Yes	2020-2021	1	Local cohort	Peak of incidence in the last 4 months of 2021, above all in children < 12 yr
Tittel *et al*[25], 2020	Germany	No	13 March-13 May 2020	1	DPV registry	Incidence 23.4/100000 not different from prediction
Barrett *et al* [26], 2022	United States	Yes	March 2020-February 2021 (IQVA) and June 2021 (HealthVerity)	1 and 2	MMWR (CDC)	Hazard Ratio 2.66 (IQVA) and 1.31 (Health Verity)
McKeigue *et al* [28], 2022	Scotland	Yes and no	March 2020-November 2021	1	Scottish registry	Incidence 2020-2021 was 20% higher than the 7-yr average, but no association with COVID infection
Reschke *et al* [29], 2022	Worldwide (47 countries)	No	2018-2021	1	Sweet registry	Change in seasonality only in the Northern hemisphere (no winter peak)
Guo *et al*[33], 2022	Florida (United States)	Yes	January 2017-June 2021	1 and 2	Local network	Increased incidence for both T1D and T2D from May 2021
DeLacey *et al* [34], 2022	Illinois (United States)	Yes	May 1st 2020-April 30th 2021	2	Local cohort	Increase of 293% (490% in Hispanic and Black patients) *vs* pre-pandemic
Ansar *et al* [35], 2022	Wisconsin (United States)	Yes	March 2020-December 2021	1 and 2	Local cohort	T1D incidence increased by 69%, T2D incidence by 225%

T1D: Type 1 diabetes; T2D: Type 1 diabetes.

unforeseen consequences delayed medical care in people, especially those with non-SARS-CoV-2 diseases, such as children with type T1D, with potential damaging effects. The early detection T1D symptoms is pivotal for a prompt diagnosis and prevention of DKA. As feared, various studies from countries hit by the first wave of the pandemic showed an increase in DKA in patients with T1D. Table 2 shows the studies dealing with DKA incidence. Gera *et al*[37] described that the increased incidence of DKA during the early phase of the pandemic in Ohio (March-June 2020) was ultimately due to the higher proportion of secondary DKA compared to the same period in 2019 (secondary DKA 84% *vs* 52%). Rabbone *et al*[38] published a national survey on the changes in new diabetes diagnoses and its acute complications in Italy from February to April 2020. The authors found fewer new cases of T1D compared to those in 2019 (as social distancing resulted in a low exposure to viruses), but with a higher rate of severe DKA (44.0% *vs* 36.1%), as an expression of a delayed diagnosis. No changes in the incidence of secondary DKA were found. Goldman *et al*[39] reported data from a national collaboration in Israel on the evaluation of DKA during the first wave of the pandemic: The DKA incidence was significantly higher than in 2019, 2018 and 2017 (58.0% *vs* 38.9%, 40.5% and 44.2% respectively), especially owing to severe forms in patients aged 6-11 years (19.9% *vs* 13.3%, 9.2% and 9.2% respectively). Another national survey in the United Kingdom[40] confirmed that the proportion of DKA at diabetes onset was higher than previously reported before COVID-19, above all for the cases of severe DKA (51% *vs* 28%). All these reports from countries hit since the very first months of the pandemic linked the increase in DKA cases to diagnostic delays due to inability to contact or access healthcare providers and/or fear of contracting the infection in a hospital/medical setting. A meta-analysis of observational studies[41] confirmed that the risks of DKA and severe DKA were 35% and 76% higher in the during-pandemic group compared to the prior-pandemic group, respectively. The delay in seeking medical attention and care was suggested as causative by various studies hypothesizing a longer duration of symptoms.

However, other studies reported that the duration of symptoms during the pandemic were comparable to the duration prior to the pandemic, speculating that the delay in diagnosing was not the only reason behind an increased risk of DKA[42,43]. A subsequent meta-analysis by Rahmati *et al*[44] was performed to compare the relative risk of T1D and DKA among pediatric patients with T1D between the pre-pandemic and pandemic periods. Compared with the pre-pandemic period, the number of worldwide pediatric new-onset T1D, DKA, and severe DKA during the first year of the pandemic increased by 9.5%, 25.0%, and 19.5%, respectively.

A reduction in the frequency of DKA would have been expected if its increase were only due to parental fear of contracting the virus and the containment measures that reduced access to healthcare services. However, some authors reported that the increase of DKA at diabetes onset or in children with established diabetes was not documented only during the first wave of pandemic.

Table 2 Increase of the rate of diabetic ketoacidosis in patients with type 1 diabetes during the pandemic in studies led in different countries

Ref.	Country	COVID-19 period	No. patients	DKA (%)	Severe DKA (%)	Pre-COVID-19 period	No. patients	DKA (%)	Severe DKA (%)
Gera *et al*[37], 2021	Ohio (United States)	1 Mar-30 Jun, 2020	64	73[1]	45[a]	1 March-30 Jun, 2019	64	47[1]	23[a]
Rabbone *et al*[38], 2020	Italy	20 Feb-14 Apr, 2020	160	41.3	16.9[1]	20 Feb-14 Apr, 2019	208	38.1	14.9[1]
Goldman *et al*[39], 2022	Israel	15 Mar-30 June, 2020	146	58.2[a]	19.9	15 Mar-30 Jun, 2017 15 Mar-30 Jun, 2018-15 Mar-30 Jun, 2019	120; 131; 113	44.2[a], 40.5[a], 38.9[a]	9.2[a], 9.2[a], 13.3[a]
Ng *et al*[40], 2020	United Kingdom	1 Mar-30 Jun, 2020	88	51	28	/	/	/	/
HO *et al*[42], 2021	Canada	17 Mar-31 Aug, 2020	107	68.2[a]	27.1[a]	17 Mar-31 Aug, 2019	114	45.6[a]	13.2[a]
Unsworth *et al*[43], 2020	United Kingdom	23 Mar-4 Jun, 2020	33	72.7	36.3	/	/	/	/
Cherubini *et al*[45], 2022	Italy	1 Jan-31 Dec, 2020	1169	39.6[a,2]	14.2[a,2]	2017-2019	3068	35.7[a]	10.4[a]

[a]*P* value < 0.05.
[1]*P* 0.03 for proportion of diabetic ketoacidosis (DKA) patients with severe DKA.
[2]In the text data are subdivided by periods of restrictions during COVID-19 pandemic.
DKA: Diabetic ketoacidosis; T1D: Type 1 diabetes; T2D: Type 1 diabetes.

In fact, Cherubini *et al*[45] found a concerning increase in DKA and severe DKA in children newly diagnosed with T1D during the pandemic in 2020 compared with the three previous years (DKA rate 35.7% in 2017-2019 *vs* 39.6% in 2020, and severe DKA rate 10.4% in 2017-2019 *vs* 14.2% in 2020). The authors concluded that the reason behind the increased frequency of DKA was a delay in diabetes diagnosis, albeit not fully understood considering all the time periods in 2020.

Moving to the other form of diabetes, some studies focused on the impact of the pandemic on the clinical presentation also at T2D onset. In fact, T2D accounts for a significant proportion of diabetes onsets, especially in certain populations at risk, and T2D can sometimes occur with DKA as first presentation[46]. Chao *et al*[47] reported a retrospective single-center medical record of pediatric subjects presenting new-onset of T2D between March and August of 2018 to 2020. They found that the prevalence of DKA increased from less than 10% in 2018–2019 to 20% in 2020. Like in the previous cited studies, they concluded that orders imposed because of the pandemic may have delayed the diagnoses as patients and families were afraid of seeking medical care until the clinical presentation was extremely severe. In another study on the incidence and clinical presentation of T2D in youths during the pandemic, Marks *et al*[48] found that incident cases of youths with T2D increased by 182%, consistent with the cases of DKA (5.8% *vs* 23.4%). The authors found no cases of hyperglycemic hyperosmolar syndrome (HHS). However, hyperosmolar DKA, defined by the same glucose and plasma osmolality values of HHS with a pH ≤ 7.25 or bicarbonate ≤ 15.00 mmol/L, showed a significant increase in the study period.

METABOLIC CONTROL

Quite surprisingly, pediatric patients with both T1D and T2D did not show, as a whole, a worsening in metabolic control during the pandemic. Both forms may have been negatively affected by the pandemic for different reasons.

Starting from the most prevalent form in children, *i.e.*, T1D, the ideal glucose pattern in normal daily life is obtained through the fine-tuned balance between the correct insulin dose and food intake, glucose concentrations, and physical activity. Therefore, all these adjustments may have been undermined both by changes to one's daily routine and by the typical psychological stress of that time. A first study published by Di Dalmazi *et al*[49], which included both children and adults with T1D and wearing a glucose sensor, showed that in children, significantly lower glucose SD and time below range were detected after lockdown, whereas in adolescents metrics were comparable before and during lockdown. Adult patients obtained the same positive results as children. The limitation of having enrolled a well-selected cohort of patients was highlighted, *i.e.*, those under continuous glucose monitoring (CGM) monitoring with sensor use of > 70% during the study period. In fact, the adolescents showed mean

HbA1c levels of 6.8%, consistent with the levels of motivated patients. Subsequent studies conducted in Italy focused on the same subject during the first lockdown and yielded similar results[50-54].

The recent meta-analysis by Han *et al*[55], which collected data of 2106 pediatric patients including the afore-mentioned studies, confirmed that, as a whole and compared with the pre-lockdown period, glucose had significantly decreased both during and after lockdown. Furthermore, the improvement was also found for many metrics, *i.e.*, time in range, time above range, time below range and coefficient of variation during and post-lockdown.

To a certain extent, T2D is a more aggressive disease in children than T1D, both in terms of compliance to treatment, comorbidities and complication rates. Furthermore, depression is not rare in adolescents with T2D and the social isolation caused by lockdown may have had detrimental effects on the degree of obesity and metabolic control of these patients. In the first study conducted in Malaysia and published in 2021[56] metabolic control had worsened (HbA1c increased from 8.5% to 9.9%) only in the 30 patients with T2D (not in those with T1D). Despite this preliminary data, most studies published subsequently fortunately reported an unchanged metabolic pattern. There is an agreement between the two recent study by Schmitt *et al*[57] and the data collection from the Italian study group of pediatric diabetology[58]: The first was conducted in Alabama (United States) and found no changes in HbA1c levels in 642 patients, the second reached similar conclusions in 61 patients. The obesity rates of the two studies [body mass index (BMI) around + 3 SDS in the United States and + 2 in Italy] did not change before and after lockdown. Similarly to what happened with children with T1D, the lack of changes in clinical and metabolic data may be explained by the increased attention of parents towards their children during the lockdown period. The Pittsburgh study by Vajravelu *et al*[59] simultaneously evaluated both glucose (HbA1c) and BMI z-score (BMIZ) trajectories through the pandemic, to identify high-risk subgroups of adolescents with both T1D (1322 patients) and T2D (59 patients). They found that the pandemic was not associated with an increase in BMIZ, but rather a decrease during the lockdown period that coincided with worsening glycemic control in the T1D patients in the high-risk group (initial poor control). In addition, for both T1D and T2D patients, there were significant racial and socio-economic disparities in the combined glucose and BMIZ trajectories from pre-pandemic to the pandemic period, with black youths belonging to low-income classes being more penalized. On the other hand, T2D is a more heterogeneous diseases compared to T1D, and its course is heavily influenced by genetic and social factors.

TELEMEDICINE

The World Health Organization defines telemedicine as a tool for providing healthcare services through the use of electronic information technologies and telecommunication, including direct patient care, health education and population health management[60]. Over the years, the digitalization of healthcare experienced a wide range of changes, with various studies showing that telemedicine is an effective method to prevent DKA in adolescents as well as an effective tool to treat diabetes[61-63]. Telemedicine became a necessary measure of infection prevention, given the drastic reduction of all health services. Therefore, one of the few advantages of the pandemic was the major acceleration in the modernization process of telemedicine, which experienced a widespread implementation[61,64].

Diabetes is one of the fields in medicine in which technology has brought in the past year a rapid development of the relevant technology. This is also driven by the use of tools such as continuous subcutaneous insulin infusion (CSII) and CGM, connected to online data-sharing platforms, which allow for remote interaction between doctor and patient[65]. The pandemic gave the opportunity to successfully overhaul children and adult outpatient clinics by using telemedicine and video consultations[66,67]. A further confirmation of its usefulness is given by the fact that instead of routine lifestyle changes, various studies reported that during lockdown T1D patients did not show a deterioration in metabolic control[49-54].

Table 3 summarizes the positive results on metabolic control and patient satisfaction obtained with telemedicine in various studies, both in patients with T1D and with T2D. The study by Russo *et al*[68] led in T2D patients showed that the group followed through telemedicine had a greater probability of displaying not only a better glycemic profile but also better metabolic parameters than the group followed with a face-to-face approach. Similarly, patients with T1D also seemed very satisfied with telemedicine during the pandemic, as reported in other studies[69,70]. In the first study[69], the results showed that not only T1D patients but also caregivers showed a high degree of satisfaction with telemedicine, an adequate degree of attention from healthcare professionals through this new assistance modality and, last but not least, everyone felt quite comfortable during their televisits. Furthermore, the same study showed that patients treated with CSII were more satisfied with the quality of the service than those treated with MDI. Moreover, as reported in the review of Chan *et al*[71], patients thus felt safer, as the professionals could constantly monitor their data.

The results obtained in the Italian survey on the impact of COVID-19 and the use of telemedicine[61] are significant, because although before the pandemic telemedicine was expanding in the monitoring of patients with diabetes[72], it was often carried out on a voluntary basis, without tracking and con-

Table 3 Positive outcome on metabolic control and on patient satisfaction obtained with telemedicine during the pandemic in the studies examined

Ref.	Type of patients	Parameters evaluated	Outcome
Schiaffini *et al*[52], 2020	School and preschool age children with T1D	Time in range using hybrid closed loop pump	Improved
Russo *et al*[68], 2022	Adults with T2D	Glycemic profile and metabolic control	Improved
Bassi *et al*[69], 2022	Children with T1D and caregivers	Degree of satisfaction of telemedicine	High rates of satisfaction
Agbali *et al*[70], 2021	Children and adults with both T1D and T2D	Satisfaction and utilization of telemedicine	High rates of satisfaction
Chan *et al*[71], 2021	Children and adults with both T1D and T2D	HbA1c and quality of care	Improved metabolic control and quality of care
Bonora *et al*[73], 2021	Adults with T1D	Metabolic control through Flash Glucose Monitoring	Improved metabolic control

T1D: Type 1 diabetes; T2D: Type 1 diabetes.

sequently on a non-refundable basis[50].

Telemedicine also shows limitations: Firstly, the uploading of glucose monitoring data itself and HbA1c point of care data are a limitation for those who lack the required equipment. Furthermore, the physical examination that includes the measurement of weight and blood pressure is obviously missing, and also major micro-macrovascular complications cannot be monitored. This ought to be taken into account for the future implementation of telemedicine programs[73]. A further limitation is equity. In Italy and in many other countries not everyone has the same sources of information, such as an internet connection and quality digital devices[74]. Lastly, the cultural barrier and lack of mediation services may be an obstacle for speakers of a foreign language. Although telemedicine is an excellent support tool for diabetic patients, it must be integrated in a structured way into the daily care of diabetic patients.

CONCLUSION

The pandemic has also significantly affected children and adolescents with both forms of diabetes, determining a change in epidemiology, DKA rates and medical care. The implementation of telemedicine is probably the only positive consequence of the pandemic: Social inequalities must therefore be tackled, adequate training for physicians with appropriate knowledge and skills must be provided, and infrastructure in the age of technological development must be enhanced.

FOOTNOTES

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