

Type 1 and Covid-19: Diagnosis, Clinical Care, and Health Outcomes during the Pandemic

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KEYWORDS

- COVID-19 telehealth • Type 1 diabetes disparities • Diabetes technology pandemic
- Remote monitoring health care delivery

KEY POINTS

- The coronavirus disease 2019 (COVID-19) pandemic permanently transformed clinical care models for people living with type 1 diabetes, primarily by accelerating the use of telemedicine.
- Remote patient monitoring and virtual health care allowed people with diabetes to maintain contact with health care providers without traveling to the office.
- Diabetes technology was associated with improved health outcomes in people with type 1 diabetes during the pandemic.
- Pre-existing health care disparities, including differences in diabetes technology use and access to telemedicine, persisted during the COVID-19 pandemic and were associated with worse health outcomes.
- Health care systems must work to create more flexible and equitable health care delivery models, to prepare for future pandemics and environmental disasters.
- While there is no strong evidence directly linking severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infection with type 1 diabetes pathogenesis, pandemic-associated behaviors may have contributed to changes in the patterns of type 1 diabetes diagnosis.

BACKGROUND

When the World Health Organization declared coronavirus disease 2019 (COVID-19) a pandemic on March 11, 2020, the Centers for Disease Control identified people with diabetes as "high risk" for severe illness. Morbidity and mortality were

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higher for people with diabetes who identified as non-Hispanic Black (NHB) or Hispanic, highlighting existing health care disparities.¹ Health care services, including in-person appointments with diabetes providers and educators, as well as routine health screenings were put on hold. Access to essential medications and supplies was often interrupted. Limited access to health care facilities, reduced in-person appointments, and delays in necessary treatments often required people with diabetes to modify their diabetes care routines, sometimes rationing medication and supplies. In this review, we discuss the effects of the pandemic on people with type 1 diabetes, as well as the response of the health care system and how it transitioned rapidly to the use of telemedicine to provide virtual diabetes care during the pandemic.

DISCUSSION

Coronavirus Disease 2019

In early 2020, severe acute respiratory syndrome coronavirus-2(SARS-CoV-2) infection was associated with a high fatality rate. Initial publications reported increased hospitalization rates and mortality were associated with several factors, including advanced age, diabetes, hypertension, and renal failure.²⁻⁴ These diagnoses are often comorbid and identifying the risk associated with each individual diagnosis is difficult. Subsequent studies evaluated outcomes in people with type 1 diabetes separately from people with type 2 diabetes, better characterizing the risk of COVID-related severe illness in each group.⁵ This figure demonstrates the excess mortality that occurred in people with both type 1 and type 2 diabetes in England in early 2020 (Fig. 1). Most excess deaths were related to documented SARS-CoV-2 infection. However, excess mortality in the absence of documented infection was also seen, possibly related to delays in seeking medical care for non-COVID illness during the pandemic.⁵ Later studies further characterized risk factors for hospitalization and mortality in people with type 1 diabetes, including age, hemoglobin A1c level, and lack of diabetes technology use.⁶⁻⁹

The initial stay at home orders abruptly limited in-person health care in March 2020. This hastened the widespread adoption of telemedicine, with insurance companies paying for televisits, even across state lines in the United States, during the pandemic. One large pediatric diabetes center described that only 0.1% of diabetes visits were seen by telemedicine, versus 93.5% of visits during the pandemic¹⁰; this rapid shift was seen in other diabetes clinics,¹¹ with some proposing that the pediatric diabetes centers were advantaged because of more prevalent use of technology in the younger generation.^{12,13}

Different measures of glycemia were often necessary during the pandemic. Due to decreased in-person visits, continuous glucose monitoring (CGM) measures and at-home hemoglobin A1c kits were frequently used in place of lab or point-of-care A1c levels. Some researchers predicted there would be more dysglycemia due to sedentary behavior, changes in dietary choices, and higher levels of stress.¹⁴

A meta-analysis of observational studies during stay at home showed that stable or even improved time in range (TIR) during stay at home occurred in more than two-thirds of their cohort (17 studies for a total of 3,441 individuals), inclusive of both individuals on multiple daily insulin (MDI) or continuous subcutaneous insulin infusion (CSII),¹⁴ which was echoed by another large metaanalysis.¹⁵

Diabetes care is particularly well suited for remote patient monitoring, with goals of care including a review of glucose levels and patterns, adjustment of medication doses, discussion of physical activity and food choices, and mental health.

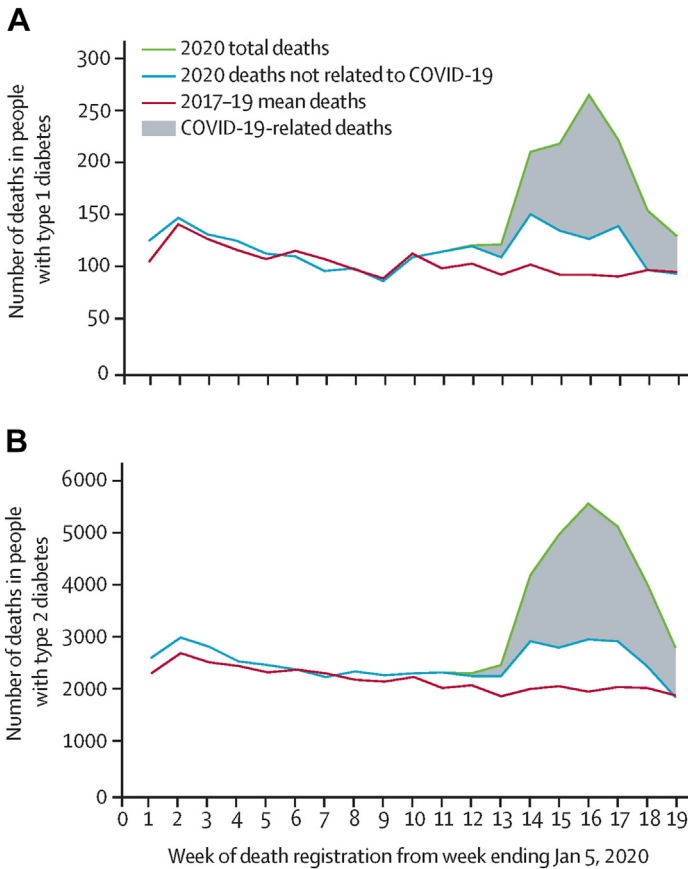


Fig. 1. Weekly numbers of deaths registered from week 1 to week 19 in people with type 1 (A) and type 2 (B) diabetes in England, 2017–19 and 2020. (From N. Holman, P. Knighton, P. Kar, J. O’Keefe, M. Curley, A. Weaver, and colleagues *The Lancet Diabetes & Endocrinology* 2020 Vol. 8 Issue 10 Pages 823–833; with permission.)⁵

Diabetes technology with cloud-based data sharing allows for the review of glucose levels and insulin delivery. Telehealth allowed people with diabetes to discuss dose adjustments, lifestyle, and mental health concerns with their diabetes team members, often after reviewing the data from their diabetes devices without any in-person visits (Fig. 2).

During the COVID-19 pandemic, diabetes technology was critical in improving diabetes outcomes for people unable to access traditional health care services. The use of CGM systems specifically was associated with improved outcomes during the pandemic.⁹ Telemedicine also played a vital role in maintaining continuity of care, allowing individuals to consult with health care providers remotely, receive advice on diabetes management, and receive prescriptions without physical visits.¹⁶ Diabetes technology has also facilitated remote education and support programs, empowering individuals to improve their self-care skills and enhance their diabetes management. By leveraging these innovative solutions, individuals with diabetes were able to proactively manage their condition, leading to glucose levels closer to

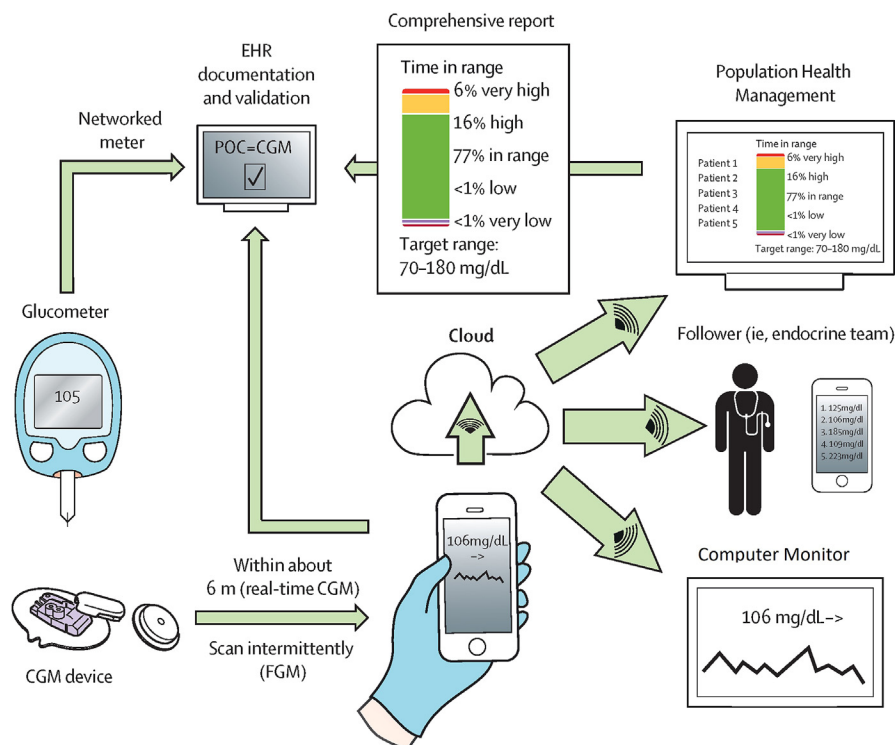


Fig. 2. Remote glucose management during the coronavirus disease 2019 (COVID-19) pandemic. (Adapted from [F. J. Pasquel, M. C. Lansang, K. Dhatariya and G. E. Umplierrez. The Lancet Diabetes & Endocrinology 2021 Vol. 9 Issue 3 Pages 174–188]; with permission)⁷⁰

target, reduced risk of complications, and improved overall diabetes outcomes during the COVID-19 pandemic.¹⁷

The pandemic was associated with increased symptoms of stress, anxiety, and other mental health concerns, which can adversely affect diabetes management. Health care providers and organizations attempted to adapt and offer support by providing online resources, virtual education programs, and remote monitoring technologies. Going forward, prioritizing diabetes care and addressing the pandemic's long-term effects will be crucial to supporting people living with diabetes.

Several studies examined the relationship between COVID-19-related stress and blood glucose levels. Two studies showed that stress and loss or furlough from work were predictors of lower TIR, with Bonora and colleagues reporting that improvements in TIR and time above range (TAR) were restricted to people who stayed at home during the stay-at-home orders, while those still experiencing stress of on-site working (essential workers) saw no change.^{18,19} Though there was an overall improvement in CGM metrics in a large study of adults with type 1 diabetes in Scotland, socioeconomic deprivation (a measure of multiple domains such as employment, access to services, and housing) was associated with a lower TIR.²⁰

Diabetes Technology and Telehealth

CGMs have enabled people with diabetes to remotely share blood glucose data with their diabetes teams. A 2017 review and meta-analysis of 38 randomized controlled

trials found a mean A1C reduction of 0.18% with telemedicine and no effect on lipids, quality of life, or adverse diabetes events (demonstrating non-inferiority).²¹ This small change in A1C was reported in several other studies before the pandemic.^{22,23}

Before 2020, telemedicine was utilized in diabetes care but was mostly limited to rural areas, where people had to travel several hours to reach a specialist. Though a small number of studies pointed to positive results from telemedicine for type 1 diabetes,^{24–26} its more widespread adoption was limited due to provider attitudes toward telemedicine, lack of access to technology for people with diabetes, inadequate health care infrastructure to support telemedicine, and lack of insurance reimbursement for telemedicine visits.

It is interesting to examine the small amount of data on telemedicine and diabetes available pre-pandemic, mainly in rural areas, where virtual visits were undertaken not due to a pandemic but to decrease the burden of travel. Wood and colleagues's group²⁴ published results of a telemedicine pilot at the Barbara Davis Center in Colorado from 2012 to 2014, designed to provide care to youth with type 1 diabetes in Wyoming, after identifying that even with access to outreach clinics closer to the families, youth often failed to attend the quarterly visits. It was one of the first published studies to examine the use of telemedicine in type 1 diabetes in youth. It found high satisfaction levels, increased number of visits per year, but no significant change between A1C levels at baseline and 1-year. Absenteeism has been estimated to cost over 3 billion dollars per/year for adults with diabetes, including missed work days for appointments.²⁷ Another study looking at veterans with type 1 diabetes conducted between 2014 and 2016 found that telemedicine visits were associated with time and cost savings, higher adherence rates to appointments, and a trend to lower A1C (0.6% decrease).²⁵ Perhaps the most novel design for an endocrine telemedicine program started in 2013 at the University of Nebraska, which serves 9 rural community hospitals.²⁶ Synchronous office visits occurred via secure video conferencing with the diabetes provider located at the academic medical center and the person with diabetes located in a clinical examination room at a rural community hospital. A certified diabetes care and education specialist (CDCES) employed by the local hospital was usually also present, and this practice continued during the pandemic with precautions in place.

Diabetes Technology and Telehealth During Coronavirus Disease 2019

The switch to telemedicine during the pandemic offered a way to monitor glucose data and assist people remotely. A worldwide study done by The International Society of Pediatric and Adolescent Diabetes (ISPAD)²⁸ that surveyed 215 diabetes centers in 75 countries (with the majority of providers from the United Kingdom, United States, and India) found that in-person visits continued in only 16.5% of the centers from April to May 2020, with the majority switching to telephone consults initially. The ISPAD ran another cross-sectional study analyzing surveys on telemedicine from 33 countries later in the pandemic (October 2020 to April 2021) and found that the proportion of people with diabetes receiving telemedicine visits increased from less than 10% to over 50% worldwide, triggered by changes in local regulations of data protection and privacy for telemedicine as well as insurance reimbursement.²⁹ At that point, most telemedicine visits used video call software instead of phone calls. The most utilized data-sharing platforms were Medtronic CareLink, Abbott LibreView, and Dexcom Clarity. Finally, a study by the Type 1 Diabetes Exchange Quality Improvement Collaborative (T1DX-QI)³⁰ surveyed 21 clinics in the United States about their telemedicine practices and found that the proportion of telemedicine visits before the pandemic was less than 1%, rising to an average of 95.2% in April 2020 and that by August 2020, after stay-at-home orders were relaxed, the proportion of telemedicine visits

decreased to an average of 45% across T1DX-1 sites. Zoom was the most popular platform used for visits.

The most frequently used measures of glycemia in pandemic studies were CGM metrics. In Italian adults with type 1 diabetes, increased TIR, reduced glucose variability, reduced hyperglycemia, and reduced severe hypoglycemia were found during the stay-at-home order. The authors hypothesized that this was the result of a more regular lifestyle, more reproducible mealtimes, and more time for self-care and sleep.³¹ A similar study, looking at children, found a similar increase in TIR and a reduction in mean glucose and TAR in the first 3 months of stay at home.³² Interestingly, a small Italian study of pre-school and school-aged children with type 1 diabetes using CGM and semi-automated insulin delivery systems with Tandem Basal IQ directly after stay at home found that boluses were increased. They noted a statistically significant higher median value of TIR and decreased TAR.³³ Other studies found maintenance of glycemic measures comparing before and after the stay-at-home orders with more dysglycemia in young children.³⁴

In a study of Italian children and adolescents receiving telemedicine visits during the stay-at-home order, median TIR increased, TAR decreased, and Time Below Range (TBR) decreased, with a trend toward decreased median glucose management indicator (GMI), which estimates HgA1C, without any changes in the total daily dose of insulin. There was a more significant effect in pre-pubertal youth compared to those who had started puberty.³⁵ Telemedicine had no effect on hemoglobin A1c in another small Italian study, though there was a statistically significant decrease in hemoglobin A1c during the stay-at-home period, virtual visits had no modulating effect.³⁶ Of note, CGM data were not assessed in this study so changes in TIR, TAR, and TBR could not be assessed. Finally, a study in Finland found that measures of glycemia in children with type 1 diabetes did not deteriorate during the stay-at-home period. They also found that children using non-hybrid-closed-loop pumps spent more TIR, but interestingly no change was observed in children using hybrid closed loop (HCL) pumps.³⁷ Another study comparing conventional and new technology³⁸ found that TIR significantly increased from the first to the second virtual visit and that this increase was more marked among people with a baseline GMI of $\geq 7.5\%$.

The longest pediatric study of glucose metrics during the pandemic observed youth for 1 year and found that average glucose, glucose variability, and GMI were all significantly lower during the pandemic, with nearly 1 in 5 youth achieving the equivalent A1C goal of less than 7% versus 1 in 10 youth pre-pandemic.¹⁰ Moreover, there were more frequent telemedicine visits than in-person visits before the pandemic, likely because of the easier access. The authors did note that the Tandem hybrid closed-loop system became available 1 month before the stay-at-home period and could have contributed to these improvements. In fact, another study demonstrated improved glycemic metrics during this period without telemedicine intervention.³³

During the pandemic, a 6-week stay-at-home order in Saudi Arabia did not change glycemic measures among people with type 1 diabetes without telemedicine intervention. However, those with 1 televisit had an increase in TIR of 9% and a reduction in (time above range) TAR by 13%.³⁹ Another study of adults in Italy found that in the month following a structured telephone visit, mean glucose, TIR, and TAR also improved, regardless of MDI or CSII use.⁴⁰

Even virtual pump starts were effective, with a similar increase in TIR and improvement in GMI, with some people reporting superior outcomes with virtual pump training compared to in-person training, in addition to high satisfaction in pump users.^{41,42} Teleophthalmology, which had already demonstrated efficacy, increased during the pandemic allowing people to have virtual visits to monitor for progression of retinal disease.⁴³

Health care Disparities and Coronavirus Disease 2019

The COVID-19 pandemic highlighted pre-existing inequalities in health care outcomes. People belonging to racial and ethnic minority groups, people with limited health care resources, and people who were socioeconomically disadvantaged were disproportionately impacted by the pandemic. They faced systemic barriers that interfered with their access to quality health care, including diabetes care. The pandemic intensified disparities by exacerbating challenges in social determinants of health, such as poverty, food insecurity, inadequate housing, and limited access to health care facilities.

People from disadvantaged backgrounds may have faced more challenges obtaining COVID-19 testing, timely medical advice, and diabetes management resources.⁴⁴ Although telemedicine allowed remote consultations and monitoring, not everyone had access to the necessary technology. Inequities in diabetes device use and internet and computer access determined whether telemedicine was accessible.

The pandemic has emphasized the urgent need for targeted interventions and equitable health care policies to address these disparities, improve access to diabetes care, and ensure that marginalized communities receive the necessary support and resources to manage their health effectively.

Youth and Adult User Perceptions of Telehealth

An international survey of 90 countries during the pandemic reported that 86% of people with diabetes found remote appointments helpful, and 75% wished to have remote appointments in the future.⁴⁵ Interestingly, age and level of education did not appear to influence the perception of telemedicine, but higher hemoglobin A1c affected perception negatively, especially in boys and men. While the perception of telemedicine was likely influenced by the pandemic itself (ie, worry about risk of in-person encounters), people who utilized telemedicine before the pandemic reported high satisfaction during the pandemic period as well, with 1 study noting that 42% of respondents reported that if their local telemedicine clinic were not an option, they would not have traveled hours to seek specialty care.²⁶

Provider Perceptions of Telehealth

Most practitioners felt confident using digital tools, and general satisfaction was high. Only 17.3% of responders considered technology for telemedicine visits too complex to manage in clinical practice. They rated their skills "adequate" or "expert" in downloading data from glucose meters (93%), pumps (86%), and sensors (86%); analysis of glucose meter data (97%), pump data (92%), sensor data (95%), and platforms for data analysis (84%).²⁹ Through its survey, the ISPAD identified and categorized ways to improve the use of telemedicine (**Box 1**).

Incidence of Type 1 Diabetes and Coronavirus Disease 2019

Many practitioners anecdotally noted an increase in new diabetes diagnoses following the height of the pandemic. Based on pre-pandemic temporal trends in Europe, an annual increase of 3% to 4% in the incidence rate of type 1 diabetes was typical.⁴⁶ While several European studies—Scottish, Romanian, Danish, and German—as well as US studies^{47–50} identified an increased incidence of T1D during the COVID-19 pandemic compared to pre-pandemic years, a larger, international, multicenter diabetes registry, SWEET (Pediatric and Adolescent diabetes: Working to create Centers of Reference)⁵¹ found that the increased number of T1D cases in 2020 and 2021 was similar to the trend observed in 2018 and 2019 without significant upward

Box 1

Highlights from International Society of Pediatric and Adolescent Diabetes survey of health care providers on ways to improve the use of telemedicine.

Improve technical aspects

A single integrated platform to download all devices

A platform that includes the possibility for video-consultations

A platform with the possibility to share screen to analyze downloads together with the patient

An integrated platform for the visit itself, for pumps, glucometers and sensors uploads and review, for screening questionnaires, for sharing of anthropometrics and blood test results

Automatic download of the data without the need for patient to do it

Interoperability among devices

Availability of a single video-platform recognized and protected by privacy policies

Possibility of using Wapp for video-calls

Improve training and education for caregivers

Quick tutorials for platforms use available for all diabetes caregivers (doctors, nurses, dieticians, psychologists)

Support available from industries for caregivers to use platforms

Easier connection tools to download, send information, and keep in contact

Better equipment available for caregivers to use telemedicine

Training for data interpretation

Increase experience within the team

Possibility to share experiences with other teams

More time available for analyzing patients' data

Better and quicker internet connection in the hospital/office

Multiple computer screens to allow for charting concurrently with the video portion of the tele-consultation

Better electronic health records platforms available in the hospital and integrated with patients' data download platforms

IT available in the team

Time reserved to telemedicine

More administrative staff dedicated to managing data downloads prior to tele-consultations, to ensure the connection to the platforms prior to Consultations, to integrate video-calls, phone-visits, mails and in person visits, to schedule the tele-consultations

More nurses on the team

Improve training and education for patients and families

Multi-language resources available for patients

Pre-existing standard forms for patients to be completed before the tele-consultation including all health records (eg, weight and blood pressure)

Pre-existing tests to check the patient's knowledge on several diabetes aspects made available in the platforms

Specific and easy to understand instructions about data download systems and platforms use

Better trainings from companies for families to understand how to download data

Short videos of diabetes self-care prior to consultation and discussing them with families during consultation

Short therapeutic education sessions focused on the current main problem of the patient made available in the platform

Improve regulatory, policy, and reimbursement

Adequate reimbursement

Adequate privacy rules to connect all the data of a patient in a single server

Improve specific government policies

Reduction of costs

High-speed internet made available for all patients with diabetes from the health care system

(Adapted from [Giani, E, Dovic, K, Dos Santos, TJ, et al. Telemedicine and COVID-19 pandemic: The perfect storm to mark a change in diabetes care. Results from a world-wide cross-sectional web-based survey. Pediatr Diabetes. 2021; 22(8):1115- 1119.]; with permission)

or downward deviation, indicating no short-term influence of the COVID-19 pandemic or SARS-CoV-2. Similarly, reports from Saudia Arabia and Italy found no increase in the incidence of type 1 diabetes.^{52,53} The typical seasonality of type 1 diabetes (more frequent during the winter season) was delayed, with the peak occurring in the summer and autumn months. While the seasonal incidence in Europe returned to pre-pandemic patterns in 2021, North America continued to report more summer cases in 2021.⁵¹

While there is controversy about the relationship of SARS-CoV-2 infection with the incidence of type 1 diabetes following the pandemic, studies have failed to find a direct association with SARS-CoV-2 infection based on antibody and/or polymerase chain reaction testing.^{47,54–57} A large study from Colorado and Bavaria found the prevalence of high-affinity islet autoantibodies was similar in youth with and without a history of SARS-CoV-2 infection,⁵⁸ and another found no evidence of an increase in new cases of autoantibody-negative T1D in children, adolescents, and young adults.⁵⁹ In vitro studies have also showed that the infection is largely non-cytopathic and not found to favor pancreatic beta cells, challenging the idea that SARS-CoV-2 infection precipitates new-onset diabetes by directly affecting beta cells.⁶⁰

While a direct effect of SARS-CoV-2 infection on the pathogenesis of type 1 diabetes has not been demonstrated, there may be pandemic-associated changes that may have had an impact. It is well known that autoimmunity and progressive B-cell function typically begin long before clinical diagnosis of T1D; the lockdown is likely to have substantially reduced the microbial exposure in children with typical respiratory and gastrointestinal illnesses.^{57,59} The temporal association of lockdown with type 1 diagnosis lends credibility to the biodiversity hypothesis. While the hygiene hypothesis cites an inverse trend between the occurrence of infectious disease in early life and the occurrence of autoimmune disease, the biodiversity hypothesis extends this further, stating that decreased biodiversity of exposure increases the risk of immune-mediated disease.⁵⁹ Though common infections in early childhood have been shown to be risk factors for development of T1DM in children,^{61,62} perhaps the abrupt change in socialization, contacts, and sanitization resulted in a dramatic decrease in biodiversity in children.⁵⁹ It is also possible that the social isolation and psychological stress from the pandemic and school closures could explain this uptick, as psychological stress has been linked to pathogenesis and onset of disease.^{63,64} Finally, delay in diagnosis, as opposed to a real delay in disease onset may have contributed to this shift, as families may have hesitated to seek medical care, as reflected in the higher incidence of diabetic ketoacidosis (DKA) in diagnosis directly following the peak of the pandemic.⁵¹

SUMMARY

In summary, although a global worsening in metabolic parameters secondary to a dramatic reduction in access to medical services and laboratory testing was expected during COVID-19, surprisingly, most studies published throughout the pandemic demonstrated significant improvements in glucose metrics in adults and children.⁶⁵ Despite fewer organized sports and the more sedentary lifestyle that most individuals had during the pandemic's peak, it is possible that increased parental oversight, flexibility in schedules, and reductions in competing activities may have enhanced diabetes self-care.¹⁰

During the COVID-19 pandemic, diabetes technology was critical in improving diabetes outcomes for people unable to access traditional health care services. The use of CGM systems was associated with improved outcomes during the pandemic.⁹

Telemedicine also played a vital role in maintaining continuity of care, allowing individuals to consult with health care providers remotely, receive advice on diabetes management, and receive prescriptions without physical visits. Diabetes technology also facilitated remote education and support programs, supporting self-care skills during a challenging period during the COVID-19 pandemic.

In addition to increased age and increased hemoglobin A1c level, disparities in diabetes technology access and use, along with other social determinants of health, were risk factors for severe illness during the COVID-19 pandemic.

Those who had to go to work during the height of the pandemic or who had an unstable socioeconomic situation did not see this benefit.^{18–20} Many studies, however, included only CGM users to assess glycemia in the absence of laboratory measurements, and this likely represents a more advantaged group of individuals. Excluding non-CGM users limits the generalizability of the findings, given recognized disparities in diabetes technology use.¹⁰ Several researchers also pointed out that data have predominantly come from larger, well-resourced diabetes programs with populations that have good access to health care and technology, and the data cannot be extrapolated to under-resourced centers or developing countries.¹⁵

Thus, though telemedicine is an attractive option for diabetes care, the potential limitations of telemedicine use must be acknowledged. Telemedicine is not always feasible, especially in under-resourced countries where consistent internet connections, necessary equipment, and technical knowledge may not be available. While the adoption of telemedicine for type 1 diabetes care was rapid across the United States and most of Europe, lack of access to technology and the unequal payer coverage of video and telephone visits exacerbated disparities in diabetes care even in well-resourced countries.^{66,67} The health outcomes reported for people with type 1 diabetes during the COVID-19 pandemic highlight the need for health care systems to develop flexible and more equitable methods of health care delivery.^{68,69}

There appeared to be at least a transient increase in the incidence of type 1 diabetes in many countries following the peak of the COVID-19 pandemic. While there is no strong evidence directly linking SARS-CoV-2 infection with type 1 diabetes pathogenesis, pandemic-associated behaviors may have contributed to changes in the patterns of type 1 diabetes diagnosis.

CLINICS CARE POINTS

- Risk factors for serious illness during the COVID-19 pandemic (either diabetes related or COVID-related illnesses) for people with type 1 diabetes were increased age, increased hemoglobin A1c level, and decreased use of CGMs.
- People with type 1 diabetes who had access to, and utilized, diabetes technology and telemedicine during the COVID-19 pandemic had better health outcomes.
- People with type 1 diabetes who identified as non-Hispanic Black or Black had higher hemoglobin A1c levels, less CGM use, and worse health outcomes during the COVID-19 pandemic than their non-Hispanic White peers.
- Disparities in health outcomes included increased risk for hospitalization and DKA in children and increased risk of hospitalization and mortality in adults.
- While there is no strong evidence directly linking SARS-CoV-2 infection with type 1 diabetes pathogenesis, pandemic-associated behaviors may have contributed to changes in the patterns of type 1 diabetes diagnosis.

DISCLOSURE

The authors have no commercial or financial conflicts of interest.

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