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Impact of Covid 19 On Diabetes Mellitus and Life Style Modifications and Prevention

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Abstract

The COVID-19 pandemic has had profound and multifaceted effects on individuals with diabetes mellitus, influencing disease risk, glycaemic control, complications, and long-term metabolic outcomes. SARS-CoV-2 infection is associated with higher acute morbidity and mortality in people with pre-existing diabetes, and growing evidence suggests an increased incidence of new-onset hyperglycaemia and diabetes after infection. Pandemic control measures (lockdowns, service disruptions, and social restrictions) altered lifestyle behaviours—physical activity, diet, sleep and stress—leading in many cohorts to deterioration in cardiometabolic risk factors and, in some groups, worse glycaemic control. Conversely, some studies reported improved self-management among certain subpopulations, reflecting heterogeneity of impact. Mechanistically, the interaction between COVID-19 and diabetes appears to involve systemic inflammation, stress-related hyperglycaemia, corticosteroid exposure during treatment, and possible direct or indirect effects of SARS-CoV-2 on pancreatic β-cells. These biological pathways, combined with healthcare access disruptions, contributed to increased acute complications (including diabetic ketoacidosis) and may have raised the risk of persistent post-COVID metabolic dysfunction. This article synthesizes current evidence on the impact of COVID-19 on diabetes, examines lifestyle modifications during the pandemic and their effects, and outlines practical prevention and management strategies at individual, clinical and public-health levels. Emphasis is placed on restoring and strengthening diabetes services, promoting adaptive lifestyle interventions, vaccination and infection prevention, early recognition of dysglycaemia after COVID-19, and research priorities to better characterize long-term outcomes. Integrated care and targeted public-health measures are essential to mitigate the dual burden of COVID-19 and diabetes and to improve resilience of diabetes care systems for future crises. The Lancet+2Frontiers+2

Keywords: COVID-19, diabetes mellitus, glycaemic control, lifestyle modification, prevention

Introduction

Since the emergence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in late 2019, the global pandemic has reshaped health systems and daily life. Individuals living with diabetes mellitus—both type 1 and type 2—were quickly identified as a vulnerable population for severe COVID-19 outcomes, including higher rates of hospitalization, intensive care admission, and mortality. Beyond acute infection, the pandemic also disrupted routine diabetes care, altered lifestyle behaviours that affect glycaemia, and raised questions about whether SARS-CoV-2 can precipitate new-onset diabetes or worsen long-term metabolic health. Understanding these multi-layered impacts is crucial for framing clinical responses and public-health strategies that reduce immediate risks and prevent lasting harms. This article reviews the evidence on the interaction between COVID-19 and diabetes, analyzes lifestyle changes during the pandemic and their effects on glycaemic control, and proposes prevention and management strategies to address both short- and long-term challenges. The Lancet+1

Epidemiology: COVID-19 outcomes and diabetes Early in the pandemic, observational data from multiple countries demonstrated that people with pre-existing diabetes experienced more severe COVID-19 illness and higher mortality compared with those without diabetes. Multiple large cohort analyses and meta-analyses reported that diabetes increases the risk of hospitalization, severe disease and death—risks amplified by poor glycaemic control and comorbid cardiovascular or renal disease. Furthermore, population studies and registries indicate an elevated incidence of new-onset hyperglycaemia and diabetes diagnoses in the

months after SARS-CoV-2 infection, compared with matched controls who had other respiratory infections or no infection. While precise attributable risks vary across studies and depend on follow-up duration, the aggregate evidence supports a bidirectional relationship: diabetes predisposes to worse COVID-19 outcomes, and COVID-19 increases the likelihood of metabolic dysregulation. The Lancet+1

Biological mechanisms linking COVID-19 and glucose dysregulation

Several mechanisms have been proposed to explain how COVID-19 interacts with glucose metabolism:

1. Inflammatory and stress response: Severe infection triggers systemic inflammation and counterregulatory stress hormones (cortisol, catecholamines), which promote insulin resistance and hepatic glucose production, producing acute hyperglycaemia even in people without prior diabetes.
2. Direct pancreatic effects: Some studies suggest that SARS-CoV-2 may infect pancreatic cells or provoke immune-mediated β-cell injury, potentially reducing insulin secretion. Evidence remains mixed and is an active area of research; however, case series and mechanistic work indicate plausible direct and indirect effects on β-cell function.
3. Iatrogenic factors: Use of systemic corticosteroids (now standard for many hospitalized COVID-19 patients requiring oxygen) can cause marked hyperglycaemia and precipitate diabetic complications.
4. Microvascular and thrombotic injury: COVID-19-associated endothelial dysfunction and microthrombosis may exacerbate diabetic microvascular disease and contribute to organ dysfunction that complicates metabolic control.
5. Unmasking of pre-existing risk: Infection and the associated healthcare encounter may reveal pre-existing but undiagnosed diabetes by exposing underlying dysglycaemia.

These mechanisms, often acting together, explain why individuals may present with severe hyperglycaemia, diabetic ketoacidosis (DKA), or newly diagnosed diabetes during and after COVID-19 episodes. Frontiers+1

Pandemic-related disruptions in diabetes care Healthcare systems worldwide faced unparalleled strain during pandemic peaks. Routine outpatient services, screening programs, and elective procedures were deferred; many patients lost access to scheduled clinic visits, laboratory testing (HbA1c, lipids), retinal screening and foot care. Telemedicine expanded rapidly and mitigated some access barriers, but disparities in digital access limited its reach among older adults, low-income groups, and those in resource-poor settings. Interruptions in medication supplies and difficulties obtaining insulin, oral agents, or monitoring supplies were reported in some regions. Collectively, these disruptions may have contributed to delayed adjustments in therapy and unrecognized deterioration in glycaemic control for many people with diabetes. The Lancet+1

Lifestyle changes during lockdowns and their effects on glycaemia

Lockdowns, social distancing and economic disruption altered lifestyle factors that strongly influence metabolic health:

• Physical activity: Restrictions on outdoor movement and closure of gyms reduced overall physical activity for many people, decreasing insulin sensitivity and contributing to weight gain.

• Diet and snacking: Stress, boredom and food supply changes led to more frequent consumption of energy-dense, nutrient-poor foods for some individuals, increasing caloric intake and worsening glycaemic metrics.

• Sleep and mental health: Increased anxiety, depression and sleep disturbance—commonly reported during lockdowns—adversely affect glucose regulation and self-care behaviours.

• Alcohol and tobacco use: Changes in substance use patterns were heterogeneous; some increased consumption, further worsening metabolic risk.

Empirical studies report variable effects on glycaemic control. Several observational cohorts showed deterioration in HbA1c and weight during and after lockdowns, especially in patients with type 2 diabetes and those with poorer baseline control. Other studies—particularly among well-supported patients with type 1 diabetes—reported improved glycaemic metrics during lockdown, likely due to structured routines, more time for self-care, and closer parental supervision in younger patients. The heterogeneity underscores that population-level averages mask important subgroup differences determined by socio-economic status, access to care, baseline self-management skills, and support systems. PMC+1

Acute complications and hospital presentations

Clinicians observed increased presentations of severe hyperglycaemia and DKA in some settings during early pandemic waves, partly due to delayed care seeking, infection-related metabolic stress, or corticosteroid exposure. Reported increases in DKA were especially notable among people with type 1 diabetes and in newly diagnosed cases presenting at hospitals. Timely recognition and management of acute metabolic complications remained critical, but overwhelmed emergency services and fears of infection likely caused delays in presentation, sometimes worsening outcomes. ScienceDirect+1

Post-COVID metabolic sequelae and long COVID considerations

Emerging longitudinal data link prior SARS-CoV-2 infection with an increased risk of new-onset diabetes and persistent metabolic abnormalities several months after acute illness. The magnitude of risk varies across studies but appears to be present even after mild infections in some cohorts. Additionally, poor baseline glycaemic control in people with diabetes has been associated with a greater likelihood of prolonged symptoms after COVID-19 (Long COVID). Understanding whether post-infection diabetes is transient stress hyperglycaemia or a lasting diagnosis remains important for clinical follow-up and surveillance. Early screening of glucose parameters in convalescent care pathways is therefore advisable, particularly for high-risk individuals. Axios+1

Prevention strategies: infection prevention and vaccination

Reducing the risk of SARS-CoV-2 infection is a first-line strategy for lowering the pandemic's impact on people with diabetes. Vaccination against COVID-19 is strongly recommended for individuals with diabetes, as it reduces the risk of severe disease, hospitalization and death. Practitioners and public-health programs should prioritize vaccine outreach, ensure equitable access, and provide clear guidance about booster doses for high-risk patients. In addition, standard infection prevention measures (masking in high-transmission settings, hand hygiene, and isolation when exposed or symptomatic) remain relevant for immune-compromised patients or during high community transmission. Vaccination and infection prevention are foundational to lowering COVID-19-related metabolic complications. Diabetes Journals+1

Clinical management adaptations during the pandemic

Providers and health systems adopted several strategies to maintain safe and effective diabetes care:

• Telemedicine and remote monitoring: Virtual consultations, remote glucose data sharing and phone triage helped maintain continuity of care and medication adjustments for many patients. Telehealth should be optimized with training, clear protocols, and solutions for patients lacking digital access.

• Home monitoring and self-management: Encouraging regular self-monitoring of blood glucose, home blood pressure monitoring, and sick-day rules education improved early detection of deterioration. Supply chain resilience for insulin and testing supplies is critical.

• Medication review and corticosteroid management: Careful glucose monitoring with corticosteroid use, early insulin initiation for severe hyperglycaemia, and post-discharge follow-up are important to prevent complications.

• Multidisciplinary coordination: Integrating diabetes education, mental health support and

nutrition counseling into remote care models improved outcomes when available.
These adaptations demonstrated resilience and highlighted opportunities to redesign chronic care for improved accessibility beyond the pandemic. MDPI+1
Lifestyle modification and public-health interventions to mitigate impact To counter the negative lifestyle effects of the pandemic, interventions should be pragmatic, culturally appropriate and scalable:

1. Physical activity promotion: Home-based exercise programs, step-count goals, and community initiatives to safely reopen outdoor spaces can restore activity levels. Digital platforms offering guided routines can help but must be paired with measures to reduce the digital divide.
2. Nutrition and weight management: Public-health messaging should encourage affordable, healthy food choices, portion control, and reducing processed food consumption. Tele-nutritional counseling and community food programs can support vulnerable households.
3. Mental health support: Screening for anxiety and depression in diabetes clinics and offering tele-psychological services improves self-care capacity. Stress-reduction techniques (mindfulness, structured routines) benefit glycaemic control.
4. Sleep hygiene: Education on sleep routines and managing insomnia contributes to metabolic regulation.
5. Targeted programs for high-risk groups: Older adults, low-income populations, and ethnic minorities often experienced disproportionate pandemic burden; tailored outreach, medication support, and facilitation of virtual care can reduce inequities.

Evidence suggests that structured lifestyle interventions delivered remotely or through brief in-person contacts can maintain or improve metabolic control when access barriers are addressed. Public-health programs should embed these strategies into pandemic preparedness planning to maintain chronic disease management during future crises. PMC+1
Screening and follow-up after COVID-19 infection
Given the association between SARS-CoV-2 and subsequent dysglycaemia, clinicians should adopt pragmatic screening for hyperglycaemia in post-COVID follow-up, especially among patients who required hospitalization, received corticosteroids, or have risk factors for diabetes (obesity, family history). Suggested measures include fasting plasma glucose, HbA1c at 3 months post-infection, and repeat testing as clinically indicated. Early diagnosis allows timely initiation of lifestyle interventions or pharmacotherapy, reducing the risk of complications. Clear care pathways and coordination between primary care, endocrinology and rehabilitation services will improve detection and management of post-COVID metabolic issues. BMJ DRC+1
Equity, access and policy implications
The pandemic exposed and amplified health inequities: socioeconomic deprivation, minority status and limited access to care were associated with higher COVID-19 exposure, worse outcomes, and poorer diabetes control. Policy responses should ensure uninterrupted access to essential diabetes medications and supplies, expand telehealth affordability, and prioritize community-based support in disadvantaged areas. Strengthening primary care, integrating chronic disease management into emergency preparedness, and maintaining surveillance of metabolic outcomes after pandemics are policy actions that will reduce future vulnerability. The Lancet+1

Research gaps and future directions

Key areas needing further research include: long-term trajectories of post-COVID hyperglycaemia (transient vs. permanent diabetes); mechanisms of SARS-CoV-2-mediated β-cell dysfunction; effectiveness of remote lifestyle interventions in diverse populations; and optimal screening intervals and thresholds for post-infection diabetes surveillance. Large, prospective cohorts with standardized metabolic phenotyping and biobanking will be valuable

to answer these questions and guide evidence-based policy. Frontiers+1

Conclusion and recommendations

The interaction between COVID-19 and diabetes mellitus encompasses increased acute clinical risk, potential for new-onset or worsened diabetes, and pandemic-driven lifestyle and healthcare disruptions that can undermine metabolic control. To reduce this dual burden, the following actions are recommended:

• Prioritize vaccination and infection prevention in people with diabetes.
• Restore and strengthen routine diabetes services, using telehealth plus targeted in-person care for screening and complications.
• Implement practical, accessible lifestyle promotion programs to support physical activity, healthy diet, sleep and mental health during and after public-health emergencies.
• Screen high-risk individuals for post-COVID dysglycaemia and provide timely management.
• Address inequities in access to care, digital resources and medication supplies through policy measures.
• Promote research on long-term metabolic effects of SARS-CoV-2 and evaluate integrated care models.

Integrated clinical care, public-health action and research are essential to mitigate the pandemic's impact on people with diabetes and to enhance resilience of chronic disease systems for future health crises. Diabetes Journals+1

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