Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Review article

Psychological consequences of the COVID-19 pandemic in people with type 1 diabetes: A systematic literature review

Alda Troncone [a], Crescenzo Cascella [a], Antonietta Chianese [a], Angela Zanfardino [b,*], Barbara Pizzini [a], Dario Iafusco [b]

[a] Department of Psychology, University of Campania "Luigi Vanvitelli", 81100, Viale Ellittico 31, Caserta, Italy
[b] Department of the Woman, of the Child and of the General and Specialized Surgery, University of Campania "Luigi Vanvitelli", Via L. De Crecchio 2, 80138 Naples, Italy

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ABSTRACT

Objective: A comprehensive picture of the data on the impact of COVID-19 on the mental health of individuals with type 1 diabetes (T1D) is currently lacking. The purpose of this systematic review was to synthesize extant literature reporting on the effects of COVID-19 on psychological outcomes in individuals with T1D and to identify associated factors.

Methods: A systematic search was conducted with PubMed, Scopus, PychInfo, PsycArticles, ProQuest, and WoS using a selection procedure according to the PRISMA methodology. Study quality was assessed using a modified Newcastle-Ottawa Scale. In all, 44 studies fulfilling the eligibility criteria were included.

Results: Findings suggest that during the COVID-19 pandemic, people with T1D had impaired mental health, with relatively high rates of symptoms of depression (11.5–60.7%, $n = 13$ studies), anxiety (7–27.5%, $n = 16$ studies), and distress (14–86.6%, $n = 21$ studies). Factors associated with psychological problems include female gender, lower income, poorer diabetes control, difficulties in diabetes self-care behaviors, and complications. Of the 44 studies, 22 were of low methodological quality.

Conclusions: Taking appropriate measures to improve medical and psychological services is needed to support individuals with T1D in appropriately coping with the burden and difficulties caused by the COVID-19 pandemic and to prevent mental health problems from enduring, worsening, or having a long-term impact on physical health outcomes. Heterogeneity in measurement methods, lack of longitudinal data, the fact that most included studies did not aim to make a specific diagnosis of mental disorders limit the generalizability of the findings and have implications for practice.

1. Introduction

The COVID-19 pandemic has been established as an unprecedented threat to public health that has created significant psychological pressure. The economic recession, financial loss, and measures containing the spread of infection (i.e., home confinement and isolation, physical distancing, school and workplace closures, and social contact deprivation and related overuse of social media and the Internet) are psychological stressors that may lead to experiencing worry, uncertainty about the future, loneliness, and fear, along with developing negative psychological repercussions. According to recent literature, COVID-19 was found to seriously impact the mental health of the general population and to be associated with higher rates of anxiety, depression, and psychological distress [1–3].

People with type 1 diabetes (T1D), who are generally considered to be at greater risk for psychological difficulties [4–6], may be particularly vulnerable to the mental distress stemming from the uncertainties and fears associated with the virus's outbreak. In particular, difficulties in access to health services, risk of treatment interruption, fear of a greater vulnerability to infection due to suffering from a chronic disease, and fear of running out of diabetes supplies may be considered as potential stressors that are unique to individuals with T1D. It is necessary to consider that, on a daily basis, individuals with T1D must deal with a complex and challenging treatment regimen that requires frequent self-monitoring of blood glucose levels, carbohydrate controlling and counting, insulin administration, and adjustments of insulin doses based

* Corresponding author.
E-mail address: dottangelazanfardino@gmail.com (A. Zanfardino).

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on food intake and physical activity. The general psychological burden of this psychologically demanding disease might have combined with the psychological stressors of a pandemic, burdening individuals with T1D with further psychological pressure and problems.

Additionally, it should be noted that in individuals with T1D, potential co-morbid psychopathology is generally recognized as being linked with a greater risk of poorer diabetes management and poorer physical health [7,8], which in turn may increase diabetes complications and, consequently, the cost of health care service.

Given that the psychological consequences of a pandemic may be more relevant and traumatic than pandemic itself—potentially leading to important psychosocial and economic impacts in subsequent years—as well as the potential severe and enduring effects of mental health problems on physical health (especially among individuals with T1D), the psychological impact of COVID-19 should be a priority for public health research, and it requires dedicated attention. Therefore, it is crucial to review existing studies on this topic as a first step to providing appropriate policies assisting people with T1D during this challenging time.

To date, there is a lack of systematic reviews focused specifically on the mental health effects experienced by individuals with T1D during the COVID-19 pandemic. Two previous reviews looked at pandemic-related psychological repercussions on people with diabetes and with chronic diseases, but they were somewhat limited in their depth [[9]: only 6 empirical studies on T1D; [10]: only 3 empirical studies on T1D] and in their distribution (neither appeared in a major electronic database).

The aim of the present systematic review is to analyze the extant literature, assessing the impact of the COVID-19 pandemic on the mental health of individuals with T1D. Specifically, the objectives of this study are: 1) to report the prevalence of main psychological problems and psychopathological disorders in individuals with T1D during the pandemic; 2) to identify sociodemographic and clinical factors associated with psychological/psychopathological problems.

2. Methods

A systematic search was conducted in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [11,12]. The protocol of this systematic review was registered with OSF (it is available on: osf.io/r87s6; https://archive.org/details/osf-registrations-jvadq-v1).

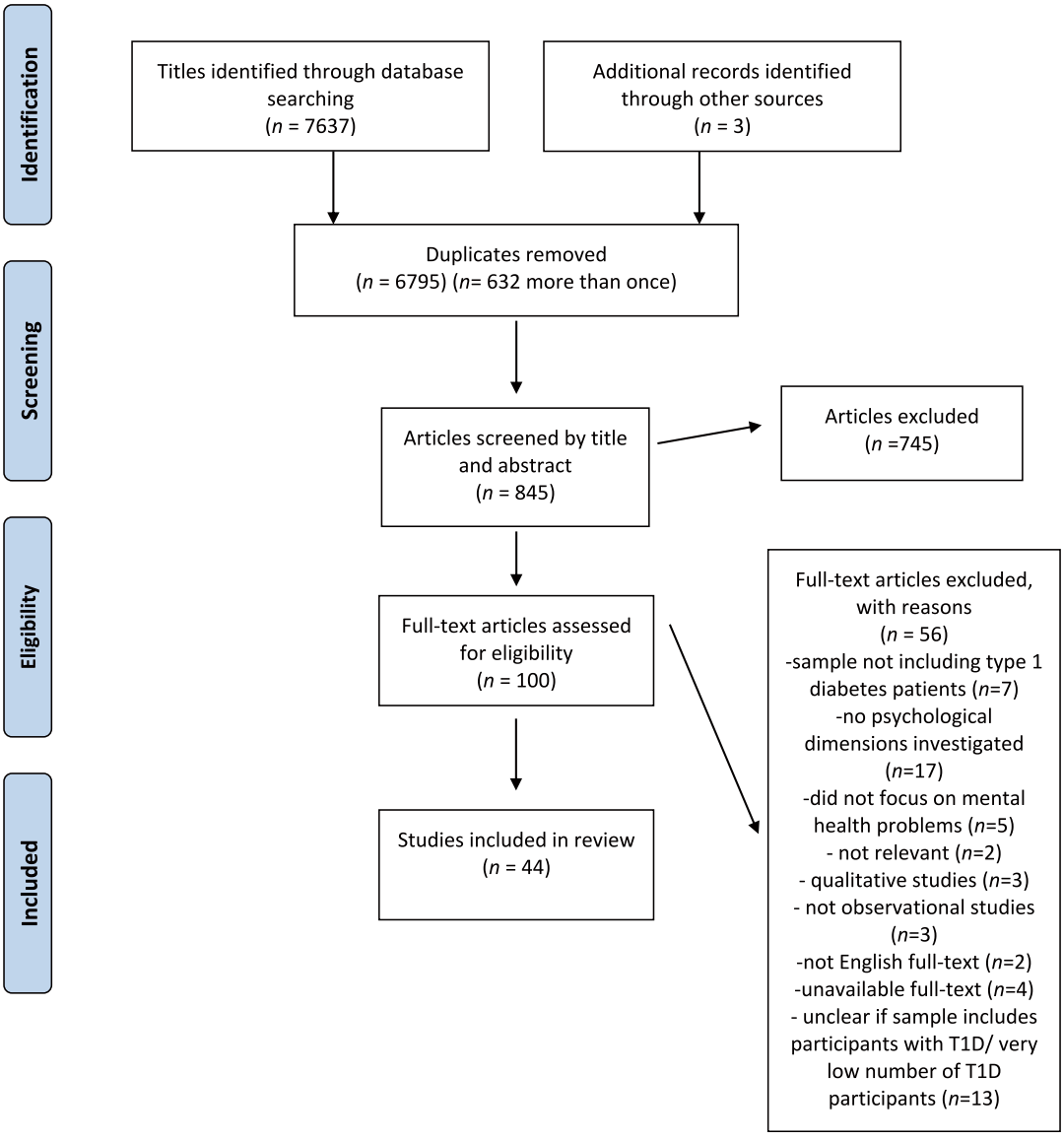

Fig. 1. PRISMA Flow Diagram describing the study selection process.

2.1. Search strategy

The following electronic databases was used in this search: PsycInfo, PsycArticles, ProQuest, Pubmed, WoS and Scopus; no date restrictions were used. The search strategy utilized search terms in titles and/or abstracts for diabetes (i.e., "type 1 diabetes", "diabetic", "insulin dependent diabetes mellitus") in combination with terms for COVID-19 (i.e., "COVID-19", "pandemic", "lockdown", "coronavirus", "2019-ncov", "sars-cov-2", "cov-19", "coronavirus disease 2019", "coronavirus infection", "2019 novel coronavirus infection") and terms for psychological diseases (i.e., "mental health", "mental illness", "mental disorder", "psychiatric illness", "psychological impact", "psychosocial disease", "depression", "anxiety", "stress"). In addition, a manual search of relevant studies on Google Scholar was carried out.

The research was conducted from April 15 through May 15, 2022.

2.2. Study selection

The study selection process is shown in the PRISMA 2009 flow diagram (Fig. 1). The titles and abstract of each article were subjected to an initial screening evaluating their relevance. Case reports, treatment studies, commentaries, letters to editors, editorials, non-original studies (e.g., reviews and meta-analyses), books chapters, notes, guidelines, books chapters, and conference papers were excluded.

After the initial screening, articles' full texts were assessed in more detail for their eligibility. The inclusion criteria were as follows: (1) observational studies (cohort, longitudinal, case–control, cross-sectional); (2) examination of mental health problems (and related aspects) in individuals with T1D; (3) the presentation of quantitative data; and (4) the availability of the full text in English. Studies were excluded if they: (1) only measured mental health problems in individuals with type 2 diabetes (T2D); (2) were not fully relevant (e.g., studies that focus exclusively on diabetes management outcomes and not on psychological/psychopathological aspects); (3) were not peer-reviewed; and (4) did not have full-text availability in English. Gray literature was not included.

Two investigators (CC and BP) independently assessed all articles for eligibility in an unblinded standardized manner, and any inconsistencies were discussed and resolved with a third investigator (AT).

2.3. Data collection process

A data extraction sheet was developed. From each study, the following relevant data were extracted: study citations (name of the first authors, year of publication), country where the study was carried out, participants' characteristics, study design, data collection period, sample size, assessment tools, data collection method, study findings (prevalence of psychological/psychopathological problems), and associated factors.

2.4. Risk of bias across studies

All articles that were deemed suitable for inclusion were assessed for quality/risk of bias in observational studies using the Newcastle–Ottawa Scale (NOS); the original scale was for cohort and case-control studies (scores of 0–9) [13] and was adapted for cross-sectional studies (scores of 0–10), as used in previously published literature [3,14]. This assessment was performed by three independent reviewers (AT, CC, and BP), and disagreements were resolved by consensus. Higher scores indicated research of better quality, while studies scoring <5 points were considered to have a high risk of bias [15].

2.5. Data synthesis

Because of the great methodological heterogeneity—especially in how mental health outcomes were measured and reported—no meta-analysis of the investigated studies was performed. Instead, findings were synthetized through a narrative approach and summarized in tables. Results were also stratified in such a way as to distinguish studies whose data were collected by using patient report measures vis-à-vis parent/healthcare report measures.

3. Results

3.1. Search results

Study identification through the database searches resulted in retrieving a total of 7640 publications. After the papers were put through extensive scrutiny of their titles and abstract, 100 underwent full-text screening; of those, 44 studies met the criteria to be included in the final sample for this systematic review (Fig. 1).

3.2. Study characteristics

The characteristics of the included studies and primary findings are summarized in Table 1.

The sample sizes of the studies included in this systematic review varied from 20 to 2430 participants (1788 with T1D), for a total of 24,467 participants.

The mean age of participants ranged from 5.3 to 61.7 years (range: 0–86 years); female participants (about n = 11,888, although some studies did not report gender distribution) were about 52.91% of the total sample. In terms of studies on individuals with diabetes (n = 37), participants in the majority were adults (n = 28, 75.7%, excluding studies conducted exclusively with parents/healthcare providers). In 9 studies, data were collected from children/adolescents; in n = 13 (35.13%), samples included individuals with T1D and T2D.

Of the 44 studies examined, n = 6 took place in US, n = 7 in Italy, n = 4 in Saudi Arabia, n = 4 in Brazil, n = 2 in India, n = 2 in Denmark, n = 4 in Poland, n = 1 in Egypt, n = 1 in Japan, n = 1 in Spain, n = 1 in France, n = 1 in the Netherlands, n = 1 in UK, n = 1 in Turkey, n = 1 in Bangladesh, n = 1 in Iran, n = 1 in Singapore, n = 1 in Germany, and n = 4 in several countries across Europe or all continents.

Most studies were cross-sectional (n = 30); the others (n = 14) followed a cohort/case-control study design. The data in the included studies were collected between March 2020 and April 2021. N = 26 studies collected data through online surveys, often via social media or via email (e.g., [16]; [17]); n = 7 studies collected data through telephone interview questionnaires (e.g., [18]; [19]); n = 5 studies collected data through in-person outpatient encounters (e.g., [20]); n = 3 collected data using both telephone interviews and an online questionnaire via e-mail or SMS [21, 22; 23]; n = 2 studies collected data through virtual outpatient encounters [24,25]; and n = 1 study compared patients' data collected through both in-person and virtual outpatient encounters [26].

3.3. Risk of bias within studies

The quality scores for studies ranged from 1 to 7 (see Supplemental 1, results of quality assessment according to NOS). Of the 44 studies, 22 were categorized as being at high risk of bias, mainly related to the selection of participants (e.g., online sampling affected the representativeness of the sample and the ascertainment of exposure), no estimated sample size, the number of non-respondents not being reported, or confounding factors not always being controlled. In addition, several studies (n = 13) evaluated main outcomes without using validated measures.

3.4. Measurement tools

Most studies assessed psychological problems using patient self-report measures (n = 24) or questions addressed to patients that were

Table 1
Characteristics and data of included studies (n = 44).

Author (year)	Country	Study design (data collection period)	Sample size	Sample characteristics	Assessment tools (data collection method)	Prevalence n/tot (%)	Associated factors	Quality appraisal total score
[36]	US, Brazil, Iran	Cross-sectional (April 1st–June 30th 2020)	1788 individuals with T1D (1099 US, 477 Brazil, 212 Iran)	Median age: (Iran) 29, (Brazil) 28.87, (US) 45 Gender: US (839 f), Brazil (396 f), Iran (160 f) Mean T1D duration: NR (median time of diagnosis: (US) 25, (Brazil) 14, (Iran) 11)	The Type 1-Diabetes Distress Scale (T1-DDS) to assess diabetes distress. Diabetes Burnout Scale (DBS) to assess diabetes burnout. Patient Health Questionnaire (PHQ-8) to assess depressive symptoms. (Online survey via social media).	The Iranian sample had the highest prevalence of high diabetes distress (57.1%), compared to Brazil (30.8%) and the US (13.4%) ($p <$ .0001). The mean scores of diabetes burnout varied between the three countries (Iran = 3.0; Brazil = 2.6; US = 2.3; ($p <$ .0001); in Iran, 50% reported moderate to severe burnout, compared to 30.8% in Brazil and 22.57% in US. 26.4% of US participants, 52.8% of Brazilian participants, and 60.9% of Iranian participants were classified as having moderately severe or severe depressive symptoms ($p <$ .0001).	Female, younger, single participants, with lower educational levels, higher HbA1c levels, and lower TiR, who experienced difficulties in access to or changes in diabetes self-care behaviors, are most likely to present lower levels of psychosocial well-being (as higher distress, levels of diabetes burnout, and depressive symptoms).	5
[52]	India	Cross-sectional (30th April – 10th May 2020)	89 youths with T1D	Mean age: 19.61 ± 3.8 (range 12–24 years) Gender: 43 f Mean diabetes duration: 8.4 ± 5.0 years	Perceived Stress Scale (PSS-10) to evaluate stress (Online survey via social media)	51.7% (n = 46) reported moderate stress; 42.7% (n = 38) reported low stress; 5.5% (n = 5) reported severe stress.	Female participants, graduates and post-graduates, those who were employed, and those who were reportedly dissatisfied with pandemic-related information were found to have significantly higher PSS-10 scores. PSS-10 scores were positively correlated with age and HBA1C level within the preceding 3 months. Those with a higher mean PSS-10 score reported worsened glycemic control on SMBG in the preceding 4 weeks and more common self-reported worsening of glycemic control.	4
[33]†	Saudi Arabia	Cross-sectional (5th May 2020-21th April 2021)	568 individuals with diabetes (T1D n = 316) 1598 individuals without diabetes	Mean age with diabetes: NR (Age ≤ 30: 33%, 31–40: 12%, 41–50: 20%, >50: 35%) Gender (whole sample): 326 f Mean diabetes duration: NR (< 1: 10.81%, 1 – <5: 22.88%, 5	Patient Health Questionnaire (PHQ-9) to assess symptoms of depression 7-item Generalized Anxiety Disorder (GAD-7) scale to assess symptoms of anxiety Participants were asked to choose from a list	(Participants with diabetes) 60.74% had depressive symptoms and 44.54% had anxiety symptoms during the COVID-19 outbreak (no differences between people with and without diabetes). Those who had their diabetes clinic visit	Individuals with diabetes who had their diabetes clinic visit canceled during the outbreak, who had no method of telecommunication with their diabetes care providers during the pandemic, who had HbA1c levels of ≥10%, and who reported having	5

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Table 1 (*continued*)

Author (year)	Country	Study design (data collection period)	Sample size	Sample characteristics	Assessment tools (data collection method)	Prevalence n/tot (%)	Associated factors	Quality appraisal total score
				- <10: 20%, ≥ 10: 46.31%)	(designed ad hoc) of potential stressors/issues that concerned them the most during the COVID-19 outbreak and could have contributed to any anxiety or depression symptoms they may have. (Online survey via social media)	canceled during the outbreak were more likely to report depression and anxiety symptoms compared to those who did not have an appointment canceled (both $p <$ .01). The ORs of those with depression and anxiety symptoms were not significantly different for participants with diabetes who had their diabetes clinic visit canceled during the outbreak (OR, 1.28 [95% CI, 1.00, 1.64] and OR, 1.31 [95% CIs, 1.04, 1.65] for depression and anxiety, respectively) compared to those for people without diabetes.	higher glucose levels during the outbreak than prior to the outbreak were more likely to report depression and/or anxiety symptoms. Fears of infection, running out of diabetes medications, or requiring hospitalization for hypoglycemia, hyperglycemia, or diabetic ketoacidosis, together with a lack of telecommunication with HCPs, and feeling worried when following the news about COVID-19 were all associated with significantly higher odds of having depression and anxiety symptoms.	
[37]	Brazil	Cross-sectional (1 month after the disclosure of the national ordinance that standardizes the social distancing)	120 individuals with diabetes (T1D $n = 52$)	Mean age (T1D): 45.0 ± 14.2 Gender (T1D): 25 f Mean T1D duration: 25.2 ± 11.5	Self-Report Questionnaire-20 (SRQ 20) to assess psychological distress Problem Areas in Diabetes Scale (B-PAID) to assess diabetes-related emotional distress Eating Attitudes Test (EAT-26) to assess the prevalence of eating disorders Mini Sleep Questionnaire (MSQ) to assess sleep disorders (Telephone interview)	(T1D) 94.2% had some sign of a psychiatric disorder (assessed by a positive screening in at least one of the specific scales measured in the study): 32.7% had a positive screening for psychological distress (based on the SRQ 20), 78.8% for eating disorders, 28.8% for diabetes-related emotional distress, and 76.9% for sleeping disorders. (Whole sample): 6.7% showed suicidal ideation.	BMI was found to have no impact on the interaction between positive screenings for eating and sleeping disorders and type of diabetes.	7
[16]	Saudi Arabia	Cross-sectional (after lockdown)	143 Individuals with T1D	Mean age: 29.6 ± 1.8 Gender: 76 f Mean T1D duration: NR	Ad hoc structured questionnaire evaluating psychological effects psychological impact of the epidemic period (Online questionnaire via e-mail)	23% were affected psychologically by COVID-19.	No gender differences in psychological impact.	1
[31]	Saudi Arabia	Cross-sectional (30th October - 28th February 2021)	164 children with T1D	Mean age: 12.45 ± 3.66 Gender: 90 f Mean T1D duration: NR	Ad hoc two questions to assess psychological health (Telephone interview)	COVID-19 lockdown did not have a negative effect on children's psychological status: 47% never experienced any symptoms suggestive of depression or change in mood	NR	3

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Table 1 (*continued*)

Author (year)	Country	Study design (data collection period)	Sample size	Sample characteristics	Assessment tools (data collection method)	Prevalence n/tot (%)	Associated factors	Quality appraisal total score
						during the lockdown ($p = .123$).		
[18]	Italy	Cross-sectional (30th May and 13th June 2020, i.e., when the restrictions ended, post-lockdown)	50 individuals with T1D	Mean age: 40.7 ± 13.5 Gender: 19 f Mean T1D duration: 17.7 ± 9.7	Perceived stress scale (PSS) to evaluate perceived stress (Telephone interview)	14% experienced severe and 61% moderate perceived stress.	Patients with higher perceived stress had greater frequency of severe hypoglycemia.	6
[19]	Italy	Cohort study* (April 2020)	48 individuals with T1D	Mean age: 42.4 ± 15.9 Gender: 23 f Mean T1D duration: NR	General Health Questionnaire-12 items (GHQ-12) to assess general psychiatric well-being (Telephone interview)	50% reported a score above the ≥4 cut-off level, indicating risk of mild psychological distress.	The total GHQ-12 score did not differ according to changes in working habits.	4
[26]	US	Cohort study (15th March 2020 - 14th March 2021, 14th March is approximate day that COVID restrictions were imposed in Dallas County)	About 1600 children and adolescents with T1D (evaluated in 1 year periods preceding and following the local imposition of COVID-related restrictions)	Mean age: 13.8 ± 3.6 Gender: 755 f Mean T1D duration: NR	Patient Health Questionnaire-9 (PHQ-9), to assess depression (administered to patients with T1D >10 years who were seen in person). (In-person and virtual outpatient encounters)	No significant change in incidence of depression during the first year of the COVID-19 pandemic (compared with the preceding year).	Female gender was the only demographic factor associated with PHQ-9 increased scores.	7
[21]	Italy	Cohort study* (30th March - 12th April 2020, collection psychological data)	117 youths with T1D	Mean age: 15.9 ± 2.3 Gender: 52 f Mean T1D duration: 7.9 ± 4.6	Test of anxiety and depression in childhood and adolescence (TAD) to screen the presence of anxiety and depression disorders (Telephone interview, online questionnaire via e-mail)	14 participants (16%) had a significant score for depression, and 6 participants (7%) had a significant score for anxiety (score ≥ 115).	A higher score for depression and anxiety was associated with lower TIR (when adjusted for age, sex, and diabetes duration).	6
[43]	Poland	Cross-sectional (April 14th - May 11th, 2020, i.e., during the pandemic lockdown)	20 individuals with T1Dwho asked for psychological intervention compared to 39 individuals with T1Dwho did not ask for psychological intervention	Mean age (patients who asked for psychological consultation): 25 years Gender (patients who asked for psychological consultation): 13 f Mean T1D duration: NR	ICD-10 to formulate psychiatric diagnosis The Coping Inventory for Stressful Situations (CISS) to assess coping style The State-Trait Anxiety Inventory (STAI) to measure trait and state anxiety. The Perceived Stress Scale-10 (PSS-10) to assess the perception of stress. The General Health Questionnaire-30 (GHQ-30) to identify minor psychiatric disorders (Telephone interview)	7 were diagnosed with anxiety disorder and depression, 5 with a personality disorder, and 2 with an eating disorder (according to ICD-10). 10 of 20 patients who asked for psychological intervention (the other 10 chose to stay anonymous or refused to fill in the questionnaires) had higher levels of anxiety (state anxiety $p = .043$; trait anxiety $p = .022$), perceived stress ($p = .001$), and emotion-focused coping style ($p = .001$), as well as worse general mental health and higher scale scores (as fear and depression [$p < .001$], interpersonal relations [$p = .01$], and general functioning [$p =$	NR	3

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Table 1 (*continued*)

Author (year)	Country	Study design (data collection period)	Sample size	Sample characteristics	Assessment tools (data collection method)	Prevalence n/tot (%)	Associated factors	Quality appraisal total score
						.006) than those who did not seek psychological support.		
[22]	Poland	Case-control (March 2020–May 2020, i.e., first months of pandemic)	49 individuals with T1D 38 healthy controls	Mean age (T1D): 29.8 ± 8.9; (control): 37.6 ± 11.8) Gender (T1D): 37 f; (control): 27 f Mean T1D duration 16.2 ± 7.3	Coping Inventory for Stressful Situations (CISS) to assess the coping style State-Trait Anxiety Inventory (STAI) to assess trait and state anxiety Perceived Stress Scale (PSS-10) to measure the perception of stress General Health Questionnaire-30 (GHQ-30) for identifying minor psychiatric disorders (Telephone interview, online questionnaire via e-mail)	The level of stress in both groups (mean, T1D: 21.0 ± 4.1; control 22.2 ± 3.0) was higher than typical for population in non-stressful condition (as indicated by validation studies). No statistically significant differences were found between individuals with T1D and controls in coping style, perceived stress, and trait anxiety (all $p >$ .05), apart from state anxiety (higher in the control group).	Individuals with a T1D duration >10 years or who lived alone or with only one person more often used task-oriented coping style. Individuals with a T1D duration <10 years and women tended to more often use an avoidance strategy coping style. The global level of psychopathology (measured by GHQ-30) was higher in individuals with T1D who had levels of anxiety that were higher than the general population. Individuals with T1D with higher levels of GHQ (score ≥ 12) more often used emotion-oriented coping strategies, and their general level of anxiety was higher.	4
[27]	Brazil	Cross-sectional (July 2020)	427 individuals with T1D	Mean age: NR Age range: 25–44 Gender: 406 f Mean T1D duration: NR	Ad hoc questionnaire to assess stress for social isolation (Online questionnaire via social media)	15% did not notice any stress, 50.4% realized little stress, 34.5% realized a lot of stress in the home environment.	Reporting little stress in the home environment was associated with maintaining physical activity; reporting a lot of stress in the home environment was associated with stopping physical activity.	5
[54]	Italy	Cohort study* (pre-lockdown: 20th February 2020 - 10th March 2020; during lockdown: 11th - 30th March 2020)	130 individuals with T1D (only $n = 76 \geq 18$ years were assessed for psychological variables)	Median age: 45.0 Age range: 29.0–58.1 Gender: 37 f Median T1D duration (adults): 22 years (range: 14.3–30.8)	10-Item Italian Perceived Stress Scale questionnaire (PSS) to assess the degree to which aspects of the life are perceived as uncontrollable, unpredictable, and overloaded (Telephone interview)	Mean perceived stress (PSS) score: 14.5 (range 9.8–20)[||].	Patients with worsened glucose variability (i.e., worse glucose management during lockdown compared to pre-lockdown) had significantly higher values in the PSS questionnaire than participants belonging to the group with improved variability.	5
[20]	Italy	Cross-sectional (18th May – 18th June 2020)	71 children with T1D and their caregivers	Mean age (children): 10.8 ± 2.26; (parents): 43.1 ± 6 Gender (children): 32 f; (parents): 56 f Mean T1D duration: 5.69 ± 2.96	Ad hoc survey to evaluate psychological well-being General Health Questionnaire (GHQ-12) to assess caregivers' well-being Strengths and Difficulties Questionnaire (SDQ) to assess psychological	14.9% of children scored above the clinical cut-off for the SDQ (total score) and 6.7% for the SCAS total. 67.6%/76.5% of caregivers reported that their children's psychological/ physical well-being was unvaried or improved immediately after	Separation anxiety showed positive association with the percentage of time above the range (as measured at the end of lockdown) and children who perceived fear of COVID-19 infection. Separation anxiety was negatively associated with the children's age,	5

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Table 1 (*continued*)

Author (year)	Country	Study design (data collection period)	Sample size	Sample characteristics	Assessment tools (data collection method)	Prevalence n/tot (%)	Associated factors	Quality appraisal total score
					functioning in children Spence Children Anxiety Scale (SCAS) to assess children's anxiety symptoms (6 dimensions: panic and agoraphobia, separation anxiety, fears of physical injury, social phobia, obsessive-compulsive problems, and generalized anxiety/ overanxious symptoms. (In-person outpatient encounters)	the lockdown; 47.1% reported minor difficulties (as general health, measured by GHQ-12) immediately after the lockdown, 26.5% reported no difficulties, and 26.4% reported important impairment. 50%/63.8% of mothers reported (ad hoc survey) that their psychological/ physical well-being was unvaried or improved immediately after the lockdown compared to the period before the COVID-19 pandemic. Children in primary school (7–10 years) had significantly higher separation anxiety scores (p = .006) and lower social anxiety (p = .003) compared with secondary school children (11–14 years). Girls scored significantly higher in fear of physical injury (p = .034), social anxiety (p = .015), and SCAS total score (p = .014) than boys.	diabetes duration, percentage of time in range (as measured at the end of lockdown), children's autonomy in T1D management, and frequency of contacts with peers. Increases in children's separation anxiety symptoms were predicted by age (younger children), gender (female), diabetes duration (more recent T1D diagnosis), percentage of TiR as measured at the end of lockdown (less time spent in target range), and children's increased perceived fear of COVID-19 infection.	
[56]	Egypt	Cross-sectional (after lockdown that started on March 2020)	115 individuals with T1D and/or their caregivers	Age range: 0–18 years Gender: 62 f Mean T1D duration: NR (T1D duration range: 6 months - >5 years)	Perceived stress scale-10 (PSS-10) to measure patients'/ caregivers' level of stress[§] (Online questionnaire)	76.5% of patients/ caregivers showed moderate stress, 23.5% high perceived distress. Severe stress was more evident among caregivers of infants and toddlers with diabetes (p = .017).	Eating habits and overall diabetes control during the lockdown period was the worst among patients with a diabetes duration of 1–5 years. A significant positive correlation was noticed between PSS-10 and glycemic control (as indicated by HbA1C levels before and after lockdown).	3
[28]	US	Cohort study* (April 2020)	1382 individuals with diabetes (T1D n = 763)	Mean age (T1D): 53.3 ± 15.3 Gender (T1D): 546 f Mean T1D duration: 30.05 ± 16.50	Ad hoc questions to assess general and diabetes-related stress/distress (e.g., "compared to before the coronavirus pandemic, how would you describe your current overall level of stress or worry?") (Online survey)	(T1D) Compared to pre-pandemic, 86.6% reported higher general life stress; 61.8% higher diabetes-related distress; 61.2% reported to be somewhat or very concerned about employment or finances; 85.3%	A significant correlation was found between higher reported HbA1C levels and greater increases in diabetes-related stress compared to before the pandemic. No association between HbA1c and general life stress.	2

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Table 1 (*continued*)

Author (year)	Country	Study design (data collection period)	Sample size	Sample characteristics	Assessment tools (data collection method)	Prevalence n/tot (%)	Associated factors	Quality appraisal total score
						reported greater social isolation. (T1D)		
[34]	Poland	Cross-sectional (6th July - 22th July 2020)	124 individuals with diabetes (T1D $n = 90$) (11% of questionnaires were filled in by parents of children with T1D)	Median age (T1D): 20 (range 17–28) Gender (T1D): 75 f Mean T1D duration: NR (40% >10 years, 17% 5–10 years, 28% 2–5 years, 15% up to 2 years)	Ad hoc questionnaire to assess stress levels (classified as follows: "low", "medium", "high", and "very high") (Online survey via social media)	14% reported high/ very high level of stress before pandemic, 29/32% at the beginning of the pandemic, 17/ 4% currently ($p <$ .001)	NR	2
[83]	Northeast Poland	Case-control (December 2020, the peak of the second wave of the COVID-19 pandemic)	113 individuals with T1D 106 healthy individuals	Median age (T1D): 25 Age range (T1D): 20–29 Median age (healthy): 22 Age range (healthy): 21–23 Gender (T1D): 113 f Mean T1D duration: NR (28% up to 5 years, 35% 5–10 years, 37% >10 years)	Questions (in ad hoc survey) to evaluate stress levels; the responses were to refer to the last month preceding the completion of the questionnaire. (Online survey via social media)	In women with T1D, 26% reported a low stress level, 44% a medium stress level, 23% a high stress level, and 7% a very high stress level. Stress levels distribution in individuals with T1D differed from controls (11% reported a low stress level, 44% a medium stress level, 32% a high stress level, and 13% a very high stress level) ($p <$ .05).	NR	3
[35]	Japan	Cohort study (April 16th - May 1st, 2020)	34 individuals with T1D	Mean age: 59.1 ± 16.0 Gender: 23 f Mean T1D duration: 14.5 ± 16.0	Ad hoc questionnaire of six questions to assess how stress levels and lifestyles changed due to the COVID-19 pandemic. (In-person outpatient encounters)	In 59.3% (19/32) of the participants, increased stress levels were observed during the COVID-19 pandemic.	Stress levels did not correlate with change in HbA1c levels or with change in body weight.	4
[39]†	Denmark	Cross-sectional (NR, described as "in the initial phase of the COVID-19 pandemic in Denmark")	2430 individuals with diabetes (T1D $n = 471$)	Mean age (whole sample): 61.6 ± 12.9 Gender (whole sample): 685 f Mean diabetes duration: NR	Three-item UCLA Loneliness Scale to assess general loneliness Ad hoc two questions to assess COVID-specific worries, social relations, diabetes distress, mental health diabetes-related loneliness, diabetes-specific social support (from family, friends, people at work, healthcare professionals, other people in the community and people on social media, questions inspired by the Diabetes Attitudes, Wishes and Needs Support for Diabetes Self-Management	(Whole sample) 8.5% suffered from mental illness. Participants were most frequently worried about 'being overly affected due to diabetes if infected with COVID-19' (56%). About 25% had moderate to high diabetes distress (DDS2 score > 2). 56.8% often or sometimes felt lonely, 28.8% felt isolated from others, 61.1% often or sometimes felt starved for company, 23.1% often or sometimes missed someone to talk to about diabetes, and 32.6% often or sometimes felt alone with their diabetes.	Compared with people with low/no distress, people who reported moderate to high levels of distress were more likely to be worried about being overly affected if infected, about people with diabetes being characterized as a risk group, and about not being able to manage diabetes if infected. Participants who felt left out, isolated from others, starved for company, missed having someone to talk to about diabetes, and felt lonely with diabetes were more likely to experience worries compared to people who did not experience diabetes-related loneliness.	6

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Table 1 (*continued*)

Author (year)	Country	Study design (data collection period)	Sample size	Sample characteristics	Assessment tools (data collection method)	Prevalence n/tot (%)	Associated factors	Quality appraisal total score
					Profile) Two-item Brief Diabetes Distress scale (DDS2) to assess diabetes distress (Online survey)	80.2% reported that they received moderate to high levels of support from family, friends, and people close to them; 35.4% received such support from people at work or school, 52.2% from their diabetes care team, 37.2% from other people in the community, 39.8% from other people with diabetes, and 40% from people on social media.		
[17]	Denmark	Longitudinal* (March 19th - June 25th 2020)	1366 individuals with diabetes in Q1 (T1D n = 461).	Mean age (whole sample): 61.7 ± 12.8 Gender (whole sample): 580 f Mean diabetes duration (whole sample): 19.5 ± 15	Copenhagen Corona-Related Mental Health questionnaire diabetes-specific version to assess: worries about COVID-19, quality of life and feelings of social isolation (1–10-point VAS); psychological distress during the COVID-19 pandemic (adapted items form GAD-7, CES-D and Event Scale Revised); diabetes distress (two-items Brief Diabetes Distress Scale, DDS2); anxiety (Symptom Check List-revised anxiety subscale, SCL-ANX4); general loneliness (three-item UCLA Loneliness Scale, UCLA); diabetes-specific loneliness (two questions about the degree of feeling alone with diabetes and missing someone to talk to about diabetes, UCLA-D). (Online survey via e-mail, administered in six waves Q1-Q6)	(Whole sample) Baseline: 11.7% reported having mental illness (anxiety, depression, or other diagnosis of psychiatric disorder); 24.6% had moderate to severe diabetes distress; 14.6% had a 20% risk or more of an anxiety disorder; 56.9%/61.2% often or sometimes felt lack of company/ isolated from others; 28.7% often or sometimes felt left out; 23% often or sometimes missed having someone to talk to about diabetes; and 32% often or sometimes felt alone with their diabetes. In comparisons of COVID-19-specific worries from Q1 to Q5/Q6, feelings of social isolation, psychological distress, anxiety, and general loneliness all improved ($p < .001$), while diabetes-specific loneliness and diabetes distress remained stable ($p > .05$). Quality of life decreased at Q2 ($p = .016$), Q3 ($p < .001$), and Q4 ($p = .002$) compared to Q1, and remained at that level through Q6. Anxiety increased in respondents with T2D compared to respondents with T1D at Q2 ($p = .024$), Q3 ($p = .025$), and	Respondents with two or more diabetes complications had a greater increase at Q6 relative to Q1 in feelings of social isolation, a greater increase in diabetes distress at Q5, and a greater decrease in general loneliness at Q4, compared to respondents without complications. Respondents with high HbA1c levels (>70 mmol/mol / 11.1%) had increased diabetes-specific loneliness scores at Q5 and Q6 relative to Q1 compared to respondents with low HbA1c levels. Women had larger decreases in feelings of social isolation, anxiety, and psychological distress, and larger increases in quality of life, compared to men.	5

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Author (year)	Country	Study design (data collection period)	Sample size	Sample characteristics	Assessment tools (data collection method)	Prevalence n/tot (%)	Associated factors	Quality appraisal total score
						Q4 ($p = .001$) relative to Q1.		
[57]	Saudi Arabia	Cross-sectional (June 21th -23th 2020, i.e., three days after the lockdown ended in Saudi Arabia).	65 adults with T1D	Mean age: 30 ± 7.88 Gender: 46 f Mean T1D duration: 17.67 ± 6.89	Arabic versions of the Patient Health Questionnaire-9 (PHQ-9) to assess depression General Anxiety Disorder-7 (GAD-7) scales to measure anxiety. (Online survey via social media)	23.1% had moderate to severe depression (PHQ-9 score ≥ 10), 29.2% had mild depression. 18.5% had moderate to severe anxiety (GAD-7 score ≥ 10), 24.6% had mild anxiety. 13% had combined moderate to severe depression and anxiety.	Those who reported a previous diagnosis of mental disorder (6 patients, 9.2%) were significantly more likely to have moderate to severe depression and moderate to severe anxiety than those who did not have a history of mental disorders.	3
[40]	US (including Alaska and Hawaii)	Longitudinal (data from baseline collected from 29th May 2020 – 30th June 2020)	2176 participants, 580 with diabetes (T1D $n = 100$)	Mean age (T1D): 42.96 ± 14.47 Gender (T1D): 72 f Mean T1D duration: NR (mean age at T1D diagnosis: 18.3 ± 9.89)	Questions assessing the effects of COVID-19 on the participants. Diabetes Distress Scale-17 (DDS) to measure emotional burden, physician-related distress, regimen-related distress, and interpersonal distress specific to diabetes Patient Health Questionnaire depression scale (PHQ-8) to assess depressive symptoms according to DSM −5 criteria Generalized Anxiety Disorder (GAD-7) to assess symptoms of generalized anxiety disorder based on DSM-IV Perceived Stress Scale (PSS) to measure the perception of stress in the past month Brief Resilience Scale (BRS) to assess resilience (Online survey)	(T1D) 32% had also a diagnosis of (comorbid) depression. 45.05%/20.88%/ 12.09% reported mild/moderate/ severe depression (PHQ-8). 35.79%/33.68% reported moderate/ high distress (DDS). 26% reported general anxiety (GAD). 59%/9% reported moderate/high stress (PSS). 2% reported low resilience/not low resilience. Adults reported higher levels of diabetes distress than the T2D group ($p <$ .05).	NR	5
[25]	Spain	Cohort study* (14 days from 11th April 2020 onwards)	50 individuals with T1D	Mean age: 43.4 ± 15.6 Gender: 27 f Mean T1D duration: 22.24 ± 12.21	Ad hoc questions to assess emotional patterns (Virtual outpatient encounters)	48% stated that they had not noted any evident changes in their mood in relation to their diabetes or the potential emotional impact of the lockdown. 52% mentioned changes in different emotions, such as fear (28%), anxiety (22%), sadness (16%), and stress (16%).	NR	3
[30]	France	Cross-sectional (23th - 28th April,2020, i.e.,	1378 individuals with T1D	Mean age: 45.6 ± 13.6 Gender: 866 f	NR (Online	Mean scores of anxiety and depression at the	Individuals with improved glycemic control during	3

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Author (year)	Country	Study design (data collection period)	Sample size	Sample characteristics	Assessment tools (data collection method)	Prevalence n/tot (%)	Associated factors	Quality appraisal total score
		38 days after the beginning of the lockdown in France)		Mean T1D duration: NR	questionnaire via social media)	start of lockdown: anxiety = 6.1 ± 3.1; depression = 5.0 ± 3.7.	lockdown had a higher anxiety score than those with worsened glucose control.	
[48]	US	Cross-sectional (21th - 28th April 2020)	667 individuals with diabetes (T1D $n = 120$)	Mean age (T1D): 45.96 ± 14.43 Age range (T1D): 20–87 Gender: (T1D) 80 f Median T1D duration: 26 (IQR: 23)	Ad hoc questions designed to assess psychosocial aspects of participants' diabetes management (Online survey)	(T1D) With regard to diabetes management, 7.5% felt the pandemic situation had made it "somewhat harder"; 4.17% found it "much harder" to remain in control of their hypoglycemia; 10.8% reported insufficient social support to help manage their hypoglycemia; 8.33% reported that accessing social support was "somewhat harder"; and 2.5% reported that accessing social support was "much harder".	NR	2
[55]	Netherlands	Cohort study* (8–11 weeks after the start of lockdown period, started on March 15, 2020).	435 individuals with diabetes (T1D $n = 280$)	Mean age (T1D): 50.1 ± 14.9 Gender (T1D): 129 f Mean T1D duration: 27.5 ± 15.1	Multiple items to assess the impact of the lockdown on psychological stress, including the Perceived Stress Scale (PSS) (Online questionnaire)	(T1D) 33.6% reported elevated stress during self-lockdown (no differences between people with T1D and T2D). 27.5% reported elevated levels of anxiety (no differences between people with T1D and T2D).	(Whole sample) Perceived stress was associated with HbA1c. People who reported more difficult glycemic control experienced higher stress during the lockdown period and needed more insulin than before the lockdown period. Anxiety for COVID-19 infection was not associated with the change in HbA1c.	5
[49]	UK	Cross-sectional (April 24th 2020 - August 31th 2020, i.e., the first lockdown and initial easing)	773 individuals with diabetes (T1D $n = 535$)	Mean age (T1D): 44.4 ± 14.2 Gender (T1D): 365 f Mean T1D duration: NR	Ad hoc questions to assess individuals experience and opinions about the impact of pandemic on people with diabetes. (Online survey)	(T1D) 14.7% reported that they are confident that at that moment, their mental wellbeing had increased; 46.1% felt it was the same; and 39.1% felt it had decreased. 13.5% reported that, for them, it was very difficult to obtain information/advice applicable to them for their emotional wellbeing during the pandemic; 20.7% reported it as difficult, and 31.7% reported it as moderately difficult. 16.2% reported that for them, it was very difficult to obtain support applicable to them for emotional	NR	2

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Table 1 (*continued*)

Author (year)	Country	Study design (data collection period)	Sample size	Sample characteristics	Assessment tools (data collection method)	Prevalence n/tot (%)	Associated factors	Quality appraisal total score
						wellbeing; 25.5% reported it as difficult, and 27.4% reported it as moderately difficult.		
[41]	Brazil	Cross-sectional (May–July 2020, i.e., the first months of the COVID- 19 pandemic)	477 individuals with T1D	Mean age: 30.52 ± 9.22 Gender: 396 f Mean T1D duration: CW/ North/ Northeast 13.57 ± 9.02; Southeast 16.6 ± 10.13, South 12.53 ± 8.62 NR	Diabetes Burnout Scale (DBS) to assess diabetes burnout Type 1 Diabetes Distress Scale (T1DDS) to assess diabetes distress Patient Health Questionnaire depression scale (PHQ-8) to assess depressive symptoms according to DSM −5 criteria for Major Depressive Disorder A single-item question about their perceived burnout and the response options (categorized as no, mild, moderate, or severe). (Online survey)	Diabetes perceived burnout was reported as moderate or high for a great part of the study participants (32.3% in CW/North/ Northeast; 30.9% in Southeast, and 25% in South). In 30.8% diabetes distress levels were moderate or high (35.4% in CW/ North/Northeast; 29.2% in Southeast; 31.2% in South). >50% reported moderate-severe or severe diabetes distress (56.7% in CW/North/ Northeast; 50% in Southeast; 64.6% in South).	Higher diabetes burnout was associated with women, lower income, higher HbA1c levels, and shorter duration since T1D diagnosis. Difficulty accessing safe places to exercise, marital status (participants without a partner), male gender, younger age, and higher HbA1c levels were predictors of higher levels of diabetes distress. Difficulty accessing diabetes supplies and higher HbA1c levels were predictors of experiencing higher levels of depressive symptoms.	5
[53]	Turkey	Cross-sectional (during the COVID-19 pandemic)	304 individuals with diabetes (T1D $n = 141$)	Mean age (T1D): 30.6 ± 11.4 Gender (T1D): 87 f Mean T1D duration: 12.0 ± 9.7	Hospital Anxiety and Depression Scale (HADS) to assess anxiety and depression Impact of Event Scale Revised (IES-R) questionnaire to assess distress and traumatic symptoms associated with a traumatic life event. (Online survey via social media)	(T1D) 44.7% reported anxiety, 27.7% reported depression. No significant difference in anxiety between T1D and T2D ($p = .73$), the frequency of depression was found to be higher in individuals with T2D ($p = .03$).	(Whole sample) Anxiety and acute stress were more common in women. A positive correlation was found between high body mass index (BMI) and anxiety and depression. HAD-Anxiety (HAD-A) and HAD-Total (HAD-T) scores were higher in patients whose financial income decreased during the pandemic. The duration of T1D was positively correlated with acute stress level (but not with anxiety or depression). A positive correlation was found between limitations on daily activities due to diabetes and anxiety, depression, and acute stress. Decreased financial income, stress, and depression were found to be associated with poor glycemic control during the pandemic.	6
[47]†	Bangladesh	Cross-sectional (15th November - 12th December 2020, i.e., the second wave of	928 individuals with diabetes (T1D $n = 433$)	Mean age (whole sample): 52.48 ± 11.76 Age range (whole sample):	Ad hoc items to assess COVID-19-specific diabetes worries, lifestyle	(Whole sample): 81.1% were worried that people with diabetes have a higher risk of	(Whole sample) COVID-19-specific diabetes worries were negatively correlated with social support.	6

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Author (year)	Country	Study design (data collection period)	Sample size	Sample characteristics	Assessment tools (data collection method)	Prevalence n/tot (%)	Associated factors	Quality appraisal total score
		the COVID-19 pandemic)		18–86 years Gender (whole sample): 449 f Mean diabetes duration (whole sample): 7.28 ± 5.96	and social support. (Online survey)	infection; 64.5% worried that they might not be able to manage their diabetes if infected; 17.8% worried about diabetes medications; 26.4% worried about lack of diabetes equipment; 27.4% worried about receiving inadequate treatment/diabetic care during the pandemic; 32% worried that they might not be able to manage their blood glucose level; 17.0% worried about possible food shortages.	COVID-19-specific diabetes worries were higher among younger participants who lived in rural areas, had sleep disturbance, were smokers, were not physically active, had self-reported poor health status, and had multiple complications due to diabetes. COVID-19-specific diabetes worries were significantly associated with lower age, smoking, poor self-reported health status, presence of multiple diabetes complications, lack of social support, and eating more compared to the pre-pandemic period.	
[45]	Iran	Cross-sectional (the first half of 2020, before and during lockdown)	98 youths with T1D	Mean age: 13.56 ± 4.94 Gender: 50 f Mean T1D duration: 4.64 ± 3.31 years	Depression, Anxiety and Stress Scale-21 Items to assess participants' stress levels (In-person outpatient encounters)	44.9% of the participants had severe stress. 70% were upset about the closure of schools and staying home, and the key source of their dissatisfaction was that they had to take classes and exams online.	NR	3
[23]	Italy	Cross-sectional (1st - 30th April 2020)	138 youths with T1D 276 controls	Mean age (T1D): 13.67 ± 3.21 Mean age (controls): 13.78 ± 3.01 Gender: 73 f Mean T1D duration: 5.98 ± 3.22	Children Eating Attitudes Test (ChEAT) to assess eating problems symptoms in children Eating Attitudes Test-26 (EAT-26) to assess eating problems symptoms in adolescents (Telephone interview, online questionnaire)	8.69% (N = 12) of T1D participants had ChEAT/EAT-26 scores indicating presence of disordered eating. No differences in disordered eating between patients—whether children (total ChEAT score, p = .748) or adolescents (total EAT-26 score, p = .731)—and controls. In both groups, adolescents had lower Oral Control scores than children (T1D: $p < .0001$; controls: $p < .0001$).	In T1D and controls gender (female) and age were found to be significant predictors of several ChEAT/EAT-26 scores.	6
[50]	India	Cross-sectional (25th March -30th May 2020, i.e., 15 days after the lockdown)	52 youths with T1D	Mean age: 11.9 ± NR Gender: 30 f Mean T1D duration: NR	Ad hoc questions to assess psychological issues. (In-person outpatient encounters)	48.1% described their psychological status as normal, 9.6% as irritable, 30.8% as happy, 11.5% as depressed.	NR	3
[46]	US	Cross-sectional (April 2020)	100 youths with T1D and their caregivers 93 healthy	Mean age (T1D): 13.8 ± NR Mean age (controls): 5.3	PHQ-4 to assess symptoms of depression and anxiety Additional	Individuals with T1D had a five times higher risk of anxiety (p = .002) than controls.	No significant association between T1D and depressive symptoms. Hemoglobin A1c	5

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Author (year)	Country	Study design (data collection period)	Sample size	Sample characteristics	Assessment tools (data collection method)	Prevalence n/tot (%)	Associated factors	Quality appraisal total score
			children and their caregivers	± NR Gender: NR Mean T1D duration: NR	qualitative questions to investigate specific T1D-associated concerns during the COVID-19 pandemic. Interviews administered to youths and caregivers (only caregivers when the subjects were < 14 years, both when ≥14 yrs) (Telephone interview)	50% of responders (T1D group) reported concerns regarding the higher risk for severe COVID-19 due to T1D, and 27% of responders expressed worries about access to insulin and diabetes supplies.	(HbA1c) was not associated with anxiety or depressive symptoms.	
[44]†	Singapore	Cross-sectional (June–October 2020)	301 individuals with diabetes (T1D $n = 79$)	Age range (whole sample): 30–60 and above Gender (whole sample): 136 f Mean T1D duration: NR (duration T1D: 19% up to 5 years, 22.8% 5–9 years, 15.2% 10–14 years, 16.5% 15–20 years, 26.6% >20)	DHP-18 18-item scale to assesses psychosocial and behavioral impact of living with diabetes in three domains: psychological distress (PD, six questions), barriers to activity (BTA, seven questions) and disinhibited eating (DE, five questions). (Online survey)	(Whole sample) Disinhibited eating (DE) had the highest score (μ = 43.3, SD = 17.2), then barriers to activity (BTA) (μ = 34.5, SD = 18.1) and psychological distress (PD) (mean 20.6 ± 20.0). No significant difference in DHP-18 scales between T1D and T2D respondents.	(Whole sample) Previous diagnosis of mental health conditions, T1D, number of diabetes-related comorbidities, Indian ethnicity, being less able to look after themselves when sick, and being less able to keep themselves mentally active were associated with higher PD scores, less or more frequent checking of BG, higher BTA, and higher disinhibited eating scores. Older age, low income, and ability to reach their doctor despite not going to the clinic were negatively associated with PD and BTA. The age groups of 40–49 years and 50–59 years, unemployed status, diabetes duration15–20 years and > 20 years, low income, unknown declared income, and being able to contact their doctor despite not going to the clinic were associated with lower barriers to activity scores and lower DE scores.	6
Data from parents/health care professionals								
[38]	Brazil	Cross-sectional (May 18th - June 9th 2020)	381 parents of children and adolescent with T1D 383 parents of children and adolescent without T1D	Mean age (parents): 39.9 ± 8.5 Mean age (children and adolescents with T1D): 11.8 ± 4.3 Gender (parents): 339 f	Ad hoc questions to assess pandemic-related emotional burden and diabetes-specific emotional burden related to diabetes care Self-Reporting Questionnaire	Parents of youths with T1D most often expressed personal concern (84.4% vs. 78.3%, $p = .041$), child-related concern (92.6% vs 86.0%, $p = .005$), personal emotional burden (78.2% vs 65.3%, p	(Parents of youths with T1D) The presence of unsatisfactory relationships and of an unwelcoming family environment were predictors of having a greater likelihood of	6

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Author (year)	Country	Study design (data collection period)	Sample size	Sample characteristics	Assessment tools (data collection method)	Prevalence n/tot (%)	Associated factors	Quality appraisal total score
				Mean T1D duration: 5.0 ± 3.8	(SRQ-20) to assess mental health disorders (Online questionnaire)	< .001) and child-related emotional burden (75.2% vs. 57.1%, $p < .001$) than parents of youths without T1D. Positive screening for mental health disorders was found in 69.0% of parents of youths with T1D and in 50.3% of the parents of youths without T1D ($p <$ .001 for the difference between groups). Regarding the diabetes-specific emotional burden related, 40.6% of parents of youths with T1D reported discontent in care sharing, 36.0% discontent in support, 41.8% discontent in appreciation, 48.3% exhaustion and 75.7% guilt problems.	reporting emotional burden related to care sharing, support, appreciation, and exhaustion in diabetes care. The presence of a positive screening for a mental health disorder was a predictor for burden in all areas of diabetes care that were evaluated.	
[51]	Germany	Longitudinal (December 2019–June 2020, i.e., before, during, and after the COVID-19 lockdown period)	28 children with T1D and their caregivers	Median age (children): 8 Gender (children): 18 f Median T1D duration: 4 years (SD 2.2)	Pediatric Quality of Life Inventory to assess quality of life (administered to parents) (In-person outpatient encounters)	After 6 months of remote visits, patients' psychosocial health significantly improved ($p = .04$).	NR	6
[24]	Italy	Cross-sectional (March–May 2020)	55 parents of 34 children with T1D	Mean age (mothers): 43.0 ± 4.2; (fathers): 45.6 ± 5.9 years Gender (parents): 30 mothers Mean T1D duration: NR	Impact of Event Scale – Revised" (IES-R) questionnaire asking parents to express their emotions about the ongoing COVID-19 pandemic (Virtual outpatient encounters)	Sixteen out of 55 parents (29.1%) had a score that allows to define a clinically relevant level of PTSD. Ten mothers and 6 fathers had a PTSD clinically relevant score, corresponding, respectively, to 28.4 and 24% of total mothers and fathers.	Age significantly differed between parents reporting high levels of stress and those reporting symptom-free status (42 vs 45,5 years).	2
[42]†	75 countries (UK, US, India, Canada, Italy, Australia, Belgium, Denmark, Spain, etc.).	Cross-sectional (21th April - 17th May 2020)	303 responses from healthcare professionals taking care of children and young people with diabetes (from 215 diabetes centers)	Age range: 0–18 years Gender: NR Mean T1D duration: NR (T1D duration range: new onset - >10 years)	Ah hoc survey/ questions to evaluate the healthcare professionals' perceptions of parent's beliefs and psychological aspects faced. (Online survey)	Anxiety and parental stress were the most reported psychological problems faced (31% and 24%, respectively); few patients (15%) did not face any problems. Reports also included: 8% depression, 7% insomnia/ hypersomnia, 6% eating disorders, 4% panic attacks, 3.5% improved mood in patient/caregiver, and 0.5% denial,	NR	2

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Author (year)	Country	Study design (data collection period)	Sample size	Sample characteristics	Assessment tools (data collection method)	Prevalence n/tot (%)	Associated factors	Quality appraisal total score
						night terrors, and/or suicide attempts.		
[29]	51 countries across all continents (members of the International Consortium for Pediatric Endocrinology)	Cross-sectional (December 3th 2020 -February 5th 2021)	Healthcare professional from a convenience sample of 131 pediatric endocrine centers ($n = 113$ taking care youths T1D) 46 centres <100 patients, 39 centres 100–250 patients; 16 centres 251–500 patients; 12 centres >500 patients	Mean age: NR Gender: NR Mean T1D duration: NR	Ad hoc questions administered to healthcare professionals (136 responses assessed) (Online survey)	General psychosocial and behavioral changes were commonly reported in patients with T1D; healthcare professionals reported in patients or caregivers the following problems: 61.1% anxiety; 54.0% parenting stress; 37.2% depression; 31.8% insomnia/ hypersomnia or other sleep disruption; 22.1% eating disorders; 15% panic attacks; 5.3% suicide attempts; 3.5% improved mood; 27.4% no psychological problems.	NR	2
[84]	27 countries across Europe	Cross-sectional (Early June to July 2020)	1829 diabetes nurse ($n = 992$ working with both T1D and T2D, $n = 135$ with T1D)	Mean age: NR Gender: NR Mean T1D duration: NR	Ad hoc survey administered to assess (according to nurse opinion) impact of COVID-19 on psychological health of people with diabetes (Online survey)	48% of diabetes nurses felt that the risks of psychological problems in their patient populations (both T1D and T2D) had increased (anxiety, diabetes distress, and depression were reported to have increased significantly during the COVID-19 pandemic). Nurses rated the effect of the pandemic as having an extreme or very severe negative impact on diabetes care in general (Median 46.5% (IQR,20)) and with respect to psychological care (Median 31% (IQR,20)).	NR	2
[32]	US	Cohort study (pre-pandemic: November 2017–December 2019; pandemic: June–July 2020)	100 parents of children with T1D	Mean age (children): 6.74 ± 1.59; (parents): 36.41 ± 6.83 Gender (children): 60 f, (parents): 92 f Mean T1D duration: 2.95 ± 0.54	20-item Center for Epidemiological Studies-Depression Scale to assess depressive symptoms. 7-item Patient Reported Outcomes Measurement Information System Anxiety-Short Form (PROMIS-A) to assess anxiety symptoms. Two subscales of the Protective Factors Survey (i.e.,	Rates of elevated parents' depressive symptoms (CES-D scores) were similar pre-pandemic (24.30%) and during the COVID-19 pandemic (22.20%).	Parents of color, parents with college education, and parents whose children used CGM experienced significantly more negative diabetes-specific experiences, more COVID-19-specific distress (than non-Hispanic, white parents), and more parent depressive symptoms. More pre-pandemic depressive symptoms,	6

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Author (year)	Country	Study design (data collection period)	Sample size	Sample characteristics	Assessment tools (data collection method)	Prevalence n/tot (%)	Associated factors	Quality appraisal total score
					Family Functioning/ Resiliency and Social Support) to assess family and social support. Pandemic Parenting—Type 1 Diabetes (PP-T1D) survey to assess parents' COVID-19 experiences, COVID-19-specific distress (12 items measuring parents' own levels of anxiety, stress, depressive symptoms, eating, sleep, and activity specifically during the COVID-19 pandemic) and positive/negative diabetes-specific experiences. (Online questionnaire)		lower social support, more anxiety, more life disruptions due to the COVID-19 pandemic, and strict social distancing practices were significantly correlated with more current depressive symptoms, fewer positive/more negative diabetes-specific experiences, and more COVID-19-specific distress. More pre-pandemic family/social support, COVID-19 exposure in non-immediate family members, and fewer life disruptions due to the COVID-19 pandemic were significantly correlated with more positive diabetes-specific experiences, fewer current depressive symptoms, and less COVID-19-specific distress. Fewer pre-pandemic depressive symptoms and more pre-pandemic social support predicted fewer depressive symptoms during the pandemic.	

[*] Psychological data was collected once, without comparison with pre-pandemic data.
[†] Results did not differentiate between individuals with T1D and individuals with T2D.
[§] It is not clear how many questionnaires were completed by children and how many by parents.
[||] As reported by Elhenawy and Eltonbary [56], scores of 0–13 were considered low stress, 14–26 were considered moderate stress, and 27–40 were considered high perceived stress.

purposely designed to evaluate psychological issues ($n = 12$) (e.g., [27]; [28]). Other studies adopted parent-report measures (e.g., Pediatric Quality of Life Inventory) ($n = 4$) or ad hoc questions administered to healthcare providers ($n = 3$) (e.g., [29]). Only one study did not describe how the psychological data were collected [30].

In terms of standardized assessment tools, the Type 1 Diabetes Distress Scale (T1-DDS) and Problem Areas in Diabetes Scale (B-PAID) were adopted to assess diabetes-related emotional distress. The Self-Report Questionnaire-20 (SRQ 20), Perceived Stress Scale (PSS-10), and Impact of Event Scale Revised (IES-R) were used to evaluate psychological distress and other traumatic symptoms associated with a traumatic life event. The Diabetes Burnout Scale (DBS), Diabetes Health Profile (DHP-18) scale, and Hypoglycaemia Fear Survey were employed to assess the psychosocial and behavioral impact/burden of living with diabetes and the fear of hypoglycemia. The Patient Health Questionnaire (PHQ-8) and Center for Epidemiological Studies-Depression Scale (CES-D) were used to assess depressive symptoms. The State-Trait Anxiety Inventory (STAI), Generalized Anxiety Disorder (GAD-7) scale, Symptom Check List revised anxiety subscale (SCL-ANX4), Patient Reported Outcomes Measurement Information System Anxiety-Short Form (PROMIS-A) and Spence Children Anxiety Scale (SCAS) were adopted to assess anxiety symptoms. The Hospital Anxiety and Depression scale (HAD scale), Stress, Anxiety and Depression Scale (DASS-21) and Test of Anxiety and Depression in childhood and adolescence (TAD) were used to assess symptoms of stress, anxiety, and depression. The Self-Reporting Questionnaire (SRQ-20) and General Health Questionnaire-12 items (GHQ-12/30) were employed to assess general psychiatric well-being and minor psychiatric disorders and mental health disorders. The Eating Attitudes Test (EAT-26) and Children Eating Attitudes Test (ChEAT) were adopted to assess the prevalence of symptoms of eating problems. The Mini Sleep Questionnaire (MSQ) was employed to assess sleep disorders. The Pediatric Quality of Life Inventory (QOLID) and WHO-5 Well-being Index questionnaire were used to assess quality of life and general psychosocial health. The Strengths and Difficulties Questionnaire (SDQ) was used to assess psychological functioning in children. The Pandemic Parenting–Type 1 Diabetes (PP-T1D) survey and Impact of Event Scale–Revised (IES-R) questionnaire were used to assess emotions about the COVID-19 pandemic. The Coping Inventory for Stressful Situations (CISS) and the Brief Resilience Scale (BRS) were employed to assess coping styles and resilience, and the UCLA Loneliness Scale was used to assess general loneliness. Finally, the Protective Factors Survey (specifically, the Family Functioning/Resiliency and

Social Support subscales) was used to assess family and social support.

3.5. Evidence for psychological problems and psychopathological disorders

Overall, the findings of the included studies suggested that COVID-19 was associated with a number of negative mental health outcomes. The most commonly evaluated mental outcomes were distress, depression, and anxiety.

In particular, depression symptoms were assessed in 17 of the 44 studies examined. The prevalence of depressive symptoms varied from 11.5% to 60.9% (moderate to severe). However, two of the 17 studies indicated that the whole sample or about half the sample of children and adolescents had never experienced any depressive symptoms and had reported no significant change in incidence of depression during the COVID-19 pandemic compared with preceding years [26,31]. One study conducted with parents of children with T1D showed that elevated rates of parents' depressive symptoms pre-pandemic were similar to those during the COVID-19 pandemic [32]. In addition, one study assessed depression and anxiety without mentioning the method adopted to assess anxiety/depression symptoms and reported only mean and SD, failing to specify whether those scores were clinically significant [30].

Anxiety symptoms were assessed in 16 of the 44 studies evaluated. The prevalence of anxiety symptoms in participants with T1D varied from 7 to 27.5%, although they were particularly high in a Saudi Arabia sample including individuals with T1D and T2D evaluated during the COVID-19 outbreak [33].

Twenty-one studies (2 studies of parental distress) indicated that psychological distress/stress is present in individuals with T1D, reporting prevalence rates ranging from 14% to 86.6%. In five studies—which carried out a comparison to pre-pandemic levels—stress levels were reported as being increased [17,25,28,34,35]. Additionally, eight of the 44 studies focused on diabetes distress/burnout experienced during the pandemic, which was described as moderate to high and moderate to severe [17,28,36–41].

Anxiety (depression and parental stress were also among the most common problems reported in patients with T1D by health care professionals [29,42].

Some studies evaluated other psychological problems, such as eating problems, which were assessed in six studies [23,29,37,42–44], PTSD (in parents of children with T1D) [24], sleep disorders [29,42], and—albeit at low rates—suicidal ideation/attempts, according to reports by patients with T1D or their healthcare professionals [29,37,42].

Some studies assessed COVID-specific worries, indicating that compared to the period before the COVID-19 pandemic, individuals with T1D reported fear of physical injury [20], being somewhat or very concerned about employment or finances [28], being upset about the closure of schools [45], worrying about access to insulin and diabetes supplies, and facing the higher risk for severe COVID-19 due to T1D [46]. Moreover, individuals with diabetes (both T1D and T2D) reported being worried about being severely affected (due to their diabetes) if they were to become infected with COVID-19 [39], about having a higher risk of infection, about not being able to manage their diabetes if infected, and about receiving inadequate treatment/diabetic care during the pandemic [47]. In addition, parents of youths with T1D expressed personal concern, child-related concern, personal emotional burden, and child-related emotional burden more often than parents of youths without T1D [38].

Other studies reported that participants perceived greater social isolation [28], felt isolated, felt lonely, missed having someone to talk to about diabetes, felt alone with their diabetes [17,39], and received insufficient social and emotional support [48,49].

In contrast, in a small number of studies ($n = 8$), data was reported that did not indicate that COVID-19 was associated with negative mental outcomes. As already mentioned in the paragraph on depressive symptoms, two studies on children and adolescents with T1D showed that COVID-19 lockdowns did not have a negative effect on children's psychological status, with no significant change in incidence of depression during the first year of the COVID-19 pandemic [26,31]. Similarly, in one cohort study, rates of parents' elevated depressive symptoms were similar pre-pandemic and during the COVID-19 pandemic, according to caregivers' opinions [32]. In another study, almost half of individuals with T1D stated that they had not noted any evident changes in their mood in relation to their diabetes or the potential emotional impact of the lockdown [25]. In a small sample of youths with T1D, up to nearly half of the participants described their psychological status as normal, and as happy [50]. In another study, most caregivers reported that their children's psychological/physical well-being was unvaried or improved immediately after the lockdown [20]. In a separate longitudinal study, compared to the enrollment period that occurred before the COVID-19 pandemic, patients' psychosocial health significantly improved after six months of remote visits, according to parents' opinions [51]. In another study, individuals with T1D did not differ from controls in trait anxiety, coping style, and perceived stress when assessed at the beginning of pandemic [22].

3.6. Evidence for sociodemographic and clinical factors associated with psychological problems

Negative mental health outcomes were frequently associated with the female gender [17,23,26,36,41,52,53]. In one study conducted in the first months of the pandemic, only male gender was found to be a predictor of high level of diabetes distress [41]. Alqahtani et al. [16] reported no gender differences in individuals with T1D who were psychologically affected by COVID-19.

Data about age are conflicting, indicating either a positive [23,44,52] or a negative association [20,36,41,47] with psychological problems.

Similarly, one study described lower education [36] and two studies described higher education [32,52] as being associated with increased psychological problems.

In some studies, those with decreased/low financial income [41,44,53] were described as most likely to present lower levels of psychosocial well-being (as diabetes burnout, anxiety, depressive symptoms, and distress).

In terms of clinical factors, several studies reported that worse glycemic control/higher HbA1c levels were associated with negative mental health outcomes [17,28,33,36,41,52,54,55]. Associations between higher stress/depression/anxiety and greater frequency of hypoglycemia [18] and lower time in range (TiR) [20,21] were also described. Three studies did not describe correlations between stress levels/anxiety and changes in HbA1c levels [35,46,55]. In addition, one study [30] indicated that individuals with T1D with improved glycemic control during lockdown had higher anxiety scores than those with worsened glucose control. With inconsistent results, some studies focused on the role of diabetes duration [20,41,53,56] and that of BMI; the latter was described both as having no association with psychological problems [35,37] and as being positively correlated with anxiety and depression [53].

Additionally, during the outbreak, low levels of psychosocial well-being, depression and/or anxiety symptoms, and high diabetes distress were more likely to be presented by: those who experienced obstacles around access to or changes in diabetes self-care behaviors (e.g., diabetes clinic visits canceled, no method of telecommunication with diabetes care providers, insufficient ability to reach doctors) [33,36,44]; those who required hospitalization for poor diabetes control [33]; those who had complications due to diabetes or comorbidities [17,44,47]; those who stopped (or did not engage in) physical activity [27,47], or struggled to access safe places to exercise [41]; and those who reported a previous diagnosis of a mental disorder [44,57]. Higher distress and depression and/or anxiety symptoms were also reported by those who were dissatisfied with (or worried by) pandemic-related information

[33,52], those who were worried about being overly affected if infected, and those who were worried about not being able to manage their diabetes if infected, compared to those who were not [39]. Higher diabetes distress, depression, and separation anxiety symptoms were associated with greater difficulties in accessing diabetes supplies [41], fear of infection, lower autonomy in T1D management, and lower frequency of contact with peers [20].

According to parents' opinions, the presence of unsatisfactory relationships and of unwelcoming family environments were predictors of having a greater likelihood of reporting emotional burden [38]; lower pre-pandemic family support, more life disruptions due to the pandemic, and having children who use continuous glucose monitoring (CGM) were associated with more negative diabetes-specific experiences, more parent depressive symptoms, and more COVID-19-specific distress [32].

Ethnicity (parents of color, e.g., being Indian) was associated with higher psychological problems and more negative diabetes-specific experiences during the pandemic [32,44].

4. Discussion

To the best of the authors' knowledge, this is the first comprehensive systematic review focusing on the impact of the COVID-19 pandemic on the mental health of individuals with T1D.

The studies examined in the present review showed that during the COVID-19 pandemic, people with T1D had impaired mental health, particularly symptoms of depression, anxiety, and distress. Rates of psychological problems varied across studies as a result of the use of different measurement scales and methods to assess these problems. However, the studies reported prevalence data (depression: 11.5–60.9%; anxiety: 7–27.5%, up to 44.54% for sample composed of both types of diabetes; distress/stress: 14–86.6%) that generally concur with the evidence recently reported by systematic reviews on the impact of COVID-19 on mental health in the general population (depression: 2.2–63.8%; anxiety: 1.8–50.9%; psychological distress: 34.43–38%; stress: 8.1–81.9%) ([2,3,58,59], data from Asia, Europe, China, Spain, Italy, Iran, the US, Turkey, Nepal, Denmark etc.). It should be noted that the prevalence rates of psychological symptoms described here are relatively higher than the rates reported in pre-COVID-19 studies with people with T1D (depression: 9–54%; anxiety: 13–38%; diabetes distress: 24–67%) [5,6,60–62].

COVID-19 emergency restrictions—including school closures, mandatory long-term lockdowns and home quarantine, reduction of social communication, social distancing measures—difficulties in getting referrals to physicians, limited contact with friends and relatives, relevant changes in lifestyle, and fear of being infected have exacerbated anxiety in populations globally, leading to mental health disorders in all types of individuals [59]. Such conditions can make the management of everyday life extremely challenging and can themselves cause increased anxiety and stress—especially in individuals with T1D, who are generally described as more vulnerable to poor mental health outcomes and more susceptible to experiencing psychological problems [4,6,63]. Extensive research has already described a high prevalence of symptoms of depression and anxiety in individuals with T1D, as well as such symptoms' negative impact on glycemic control, adherence to medical treatment, and risk of diabetes complications [64–66]. It is reasonable to expect that the COVID-19 pandemic has introduced new challenges to people with T1D in addition to the pre-existing challenges imposed by the demands and management of their chronic illness, leading them to experience high levels of mental health problems, such as depression and distress. Unsurprisingly, in line with the present data, research evidence indicates that, in general, the COVID-19 pandemic negatively impacted chronically ill patients' outcomes and the quality of care [67], resulting in delayed diagnosis and care (e.g., in the case of cancer), a negative toll on the patients' mental health [68,69], and a consequently increased risk of mortality rates [70].

In interpretations of the present results, it should be also considered that, particularly at the start of the COVID-19 epidemic, many media outlets spread news about the greater vulnerability of people with chronic diseases and with diabetes if infected. Although evidence proved no higher risk of infection with COVID-19 among youths with T1D [71], this could have favored additional fear, distress, and anxiety in these people. Unsurprisingly, it was also reported in the general population that COVID-19 media exposure was associated with an increase in anxiety levels and stress [72].

Several sociodemographic and clinical factors were described as being associated with psychological and psychopathological problems. As described in the general population [3,73,74], women and those with lower household incomes tended to be more vulnerable to developing symptoms of mental health problems during the pandemic. The fact that women represent a high percentage of the workforce sectors negatively affected by the pandemic [3], and that they are generally (according to epidemiological studies) at a higher risk of depression and are more vulnerable to stress [59,75], can reasonably explain the association with the former; the obvious consequences of low income on general well-being and on ability to cope with stressful events can reasonably explain the association with the latter.

Similarly, consistent with evidence from previous studies, worse glycemic control, difficulties in diabetes self-care behaviors, and complications were described as being significantly associated with lower levels of psychosocial well-being [4,76].

Given the conflicting results regarding age from the included studies, no conclusions can be drawn about the impact of COVID-19 and age differences, despite the importance of considering developmental differences in responses to COVID-19.

5. Strengths and limitations

This review contributes to a deeper understanding of the associations between COVID-19-related emotional reactions and mental health outcomes in people with T1D. In particular, this research presented a systematic review and synthesis of the evidence on COVID-19's impact on the mental health of individuals with T1D, providing a comprehensive picture of the state of research together with the main findings and methods adopted in investigations of this topic. In addition, the main sociodemographic and clinical factors associated with psychological/psychopathological problems were identified, providing further suggestions for addressing the mental health problems that arose or worsened during the pandemic.

This review has several limitations that must be considered. Half of the included studies are of unsatisfactory methodological quality, which should be considered when interpreting their results. Due to methodological heterogeneity across studies, this review does not carry out a meta-analysis of the magnitude and consistency of the mental health outcomes described. Most reviewed studies were cross-sectional, preventing any postulation about causal inferences and direction of the relationship between T1D, COVID-19, and psychological problems. Heterogeneity in measurement methods, lack of longitudinal data, and the fact that most included studies evaluated psychological reactions/problems/symptoms—i.e., they did not aim to make a specific diagnosis of mental disorders—limit the generalizability of the findings and have implications for practice. Some results come from studies that did not differentiate findings by individuals with T1D from individuals with T2D. Of the 44 studies examined, eleven included very small samples (n 20–71), which warrants caution in interpreting their findings as a result of the limited statistical power. Lastly, the fact that most studies were conducted online may yield imprecise, and possibly inaccurate, ratings of psychological data, as this prevents the possibility for participants to ask for clarification on questions they did not fully understand; additionally, it may have favored a selection bias in the population studied in terms of ease in Internet accessibility.

Future research should be conducted to address these limitations—especially follow-up studies post-pandemic, which can be

helpful to evaluate the long-term psychological impacts of the COVID-19 pandemic.

6. Conclusions

The findings in the present review suggest that the COVID-19 pandemic had a negative impact on the mental health of people with T1D, whose general psychological conditions were described as worse and often characterized by depression, distress, and anxiety. Given that the literature has well established that psychological factors adversely affect the management of T1D [77,78], it is necessary to take appropriate measures to improve medical and psychological services that aim to support individuals with T1D in appropriately coping with the burdens and difficulties caused by the pandemic. Medical assistance should be provided by clinicians working in a multidisciplinary team in which psychologists are involved in T1D patients' care/management and are actively part of the medical staff support, as they may play a key role in detecting emerging psychological difficulties early. Regardless of the presence of manifesting psychopathological symptoms, T1D management requires that periodical psychological screening and assessment of patients' mental status (also including caregivers and family members) be routine [79]. In this way, in line with a patient-centered care approach and within an integrated multidisciplinary approach, each intervention can be tailored to address individuals' needs and problems, as well as the aspects of the diabetes regimen (e.g., dietary restrictions, the interference of symptoms such as hypoglycemia with daily activities) that can create psychological burden and or affect regimen adherence.

Continually monitoring the psychological conditions of individuals with T1D—both at periodic intervals and when a change occurs in disease, treatment, or life circumstances—is the only way to effectively care for and manage the emotionally and physically demanding chronic pathology of T1D [4], especially in the difficult yet critical time that is the COVID-19 pandemic.

Telemedicine care activities can also be implemented to facilitate care and ensure continuity of assistance for vulnerable populations, such as individuals with T1D. To this end, recent evidence has indicated that telemedicine video consultations are a useful opportunity to preserve access to a healthcare provider in a challenging time, such as a pandemic, and are a helpful approach to maintaining a supportive doctor-patient relationship in a virtual context [80]. Overall, digital mental health interventions (e.g., web-based interventions, app-based mobile health), which overcome the difficulties of delivering traditional in-person interventions under pandemic restrictions, may generally improve mental health care access and can be considered a useful tool for mitigating the psychological consequences of the COVID-19 pandemic on the population and for promoting mental health, as recently highlighted [81,82]. As such, digital approaches in mental health may play a key role in supporting individuals with T1D as they face the psychological burden of diabetes, and this useful approach can be made available not only in response to or during the COVID-19 crisis but in general routine care, as an integral component/supplementary service of healthcare delivery.

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Declaration of Competing Interest

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jpsychores.2023.111206.

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