



The Mental Health of Adolescents: Pandemic Challenges and Protective/Risk Factors

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Keywords

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Abstract

Aim: Adolescent mental health has been negatively affected by the COVID-19 pandemic, and aggravated or mitigated by risk and protective factors. This study aims to analyze the risk and protective factors of adolescent mental health and well-being in the context of the COVID-19 pandemic based on review of the scientific literature. **Materials and Methods:** A literature review was conducted, including 46 articles with reported research data on adolescent populations across all 6 continents. **Results:** Analysis was based on the criteria risk or protective factor, individual (I) or environmental (E) level factor, and general (G) or specific (S) to COVID-19 factor. Risk factors included: female sex, older age, negative coping, and prior mental health diagnosis or chronic condition (IG factors); COVID-19 fear, and excessive information about COVID-19 (IS factors); low socioeconomic status, single-caregiver family, poor family functioning, family and domestic violence, excessive online time, and prior adversities (EG factors); COVID-19 exposure, and school closure and remote education (ES factors). Protective factors included: male sex, young-

er age, resilience and positive coping, physical activity, and consistent routine (IG factors); knowledge and information about COVID-19 (IS factor); positive family relationships, and social support (EG factors). **Conclusion:** The findings support future pandemic preparedness and mental health interventions aimed at mitigating negative effects on adolescent mental health by focusing on general risk and protective factors early in crises, while building on COVID-19-specific insights into adolescents' emotional and cognitive responses to identify and address challenges posed by novel pathogens or other types of crises.

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Introduction

The COVID-19 pandemic has drastically changed the lives of 1.6 billion children and adolescents around the world [1]. Online education, quarantine, public health measures to limit the spread of the virus, disrupted daily routines, limited face-to-face contact with peers and extended family, and socioeconomic turmoils have been major stressors for adolescent mental health and well-being. Their effects have been particularly negative and have increased the levels of depressive and anxiety symptoms among children and adolescents, as well as

social isolation and maladaptive behavior and the risk of mental illness [2-5]. Adolescents' most common psychological reactions during the pandemic have been anxiety, depression, loneliness, stress, fear, tension, anger, fatigue, confusion and restlessness [6]. During the lockdown period, 40 % of adolescents have experienced symptoms of depression and anxiety, and life satisfaction levels dropped significantly, especially among girls [7-9]. The vulnerability of children and adolescents to the negative effects of the COVID-19 pandemic is considered particularly high due to their poorly developed coping strategies, limited opportunities to understand events, and insufficiently well-developed skills for verbalizing the emotions they experience [10].

Findings of longitudinal research show that anxiety and depression scores have been significantly higher than previous trajectories would have predicted and that adolescent personal mental health trajectories have been altered in relation to high levels of perceived lifestyle impact due to the pandemic [11]. Six months after the start of the pandemic, it has been found that even with positive changes in the lifestyle of adolescents (increased social and family support, increased attention to mental health status, etc.), there are negative effects: adolescents feel more vulnerable, stressed, frightened and helpless [12]. Recent reviews of longitudinal evidence have confirmed the long-term impacts of the COVID-19 pandemic on adolescent mental health [13,14]. In view of the pandemic's long-term effects, adolescents have been defined a vulnerable group at risk of lifelong pandemic consequences [15]. Moreover, the COVID-19 pandemic has appeared in a period of sustained global decline in the mental well-being of adolescents, and has exacerbated this trend [16,17].

Given the importance of mental health for all facets of adolescent life and development including learning, socialization, self-esteem, general health and health behavior, there has been a consistent research interest in risk and protective factors for adolescent mental health even before the COVID-19 pandemic. A number of factors at the individual and environmental levels have been identified. Individual risk factors include female sex in terms of internalizing problems, psychological distress, and life satisfaction, and male sex in terms of externalizing problems; older age, negative coping strategies, and unhealthy behaviors such as dieting and substance use [18-20]. Individual protective factors include good emotional regulation abilities, optimism, self-control, self-efficacy, body satisfaction, healthy behaviors such as sleep and healthy eating [18,20-22]. At the environmental level, risk factors are parental mental health problems, stressful life events, poor relationships with family members and transgenerational conflicts, social distance, screen time of 2 or more hours

a day [22-25]. Protective environmental risk factors are connectedness with peers at school, extracurricular activities such as participation in sports, arts, and community programs, social support (from friends, other adults, the community), financial support, family closeness, parental presence and support, protective parenting, positive family climate, attachment to the mother, attachment to the father [18,21-25].

In the context of the COVID-19 pandemic, the research interest in the mental health of adolescents and the associated risk and protective factors has grown rapidly. The number of publications on the topic, both original research and review articles, has increased dramatically, generating an emerging body of evidence. A wide range of factors have been studied within the domains of individual characteristics, personality traits, coping strategies, lifestyle, family and peer relationships, internet and social media use, pre-pandemic rates of stress and psychiatric symptoms, life events, etc. [7,8,26-30]. In this article, we extend previous work on identification and summarization of these factors by their evaluation and categorization towards generality or specificity in relation to the COVID-19 crisis. The aim of the present study is to analyze the risk and protective factors of adolescent mental health and well-being in the context of the COVID-19 pandemic based on review of the scientific literature.

Materials and Methods

Electronic literature searches were conducted in Google Scholar database until July 31, 2022. The searches included the use of the following terms: impact, effects, pandemic, COVID-19, coronavirus, adolescent, mental health, and well-being. Additional articles were identified by scanning the bibliographies.

The inclusion criteria were: articles in English, published between 2020 and 2022, literature reviews, systematic reviews or original scientific articles (articles that present or review original scientific results), including adolescent population, exclusively examining the impact of the COVID-19 pandemic on mental health and well-being. Exclusion criteria were: articles not in English, articles that do not present or review original scientific results (e.g., protocols, methodologies, perspectives, opinions, etc.), and not including adolescent population (e.g., studies on children only). Our definition of adolescents included young people aged 11-19 years; we also accepted the authors' definition in four of the reviewed studies, which included the 10-year-olds as well. Twenty-eight of the reviewed studies included only adolescent populations, 16 studies included both child and adolescent populations, three studies included both adolescents and young adults, and one study included children, adolescents, and young adults. Whenever possible, in studies of populations of different ages, we reviewed and included in our analysis only the

results for the adolescent group (i.e., when study results were reported separately for the different age populations).

Three reviewers participated in the process of identifying and screening the articles. They independently performed title-abstract screening on all selected studies and then reviewed the full-text of the selected articles. A total of 46 articles that met the above inclusion criteria and that identified and discussed risk and protective factors were selected and reviewed. Of them, 36 were original studies, including 24 cross-sectional

studies, 11 longitudinal studies, and one qualitative study, and 10 were reviews, including four systematic reviews and six narrative reviews. The three reviewers separately extracted the data from the included studies, considering key characteristics including author and publication year, type of study, country, study population, age range, sample size (total, males and females), adolescent mental health and well-being outcomes, and identified risk and protective factors in the adolescent samples (summarized in Table 1).

Table 1. Studies included in the review

References	Type of study	Country	Study population	Age range	Sample size			Mental health & well-being outcomes*	Factors identified**	
					Total	Male	Female		Risk factors	Protective factors
Ravens-Sieberer et al., 2022 [1]	Original research, cross-sectional study	Germany	Children and adolescents, general population	7 - 10 years	546	508	531	Health-related quality of life Anxiety Depression Psychosomatic complaints	<ul style="list-style-type: none"> • Low socioeconomic status • Deteriorating family climate 	
Samji et al., 2021 [4]	Systematic review	Europe Asia North America Australia South America Africa	Children and adolescents, general population and specific population subgroups	0 - 18 years	127 923			COVID-19-related fear/concern/worry Depression Anxiety General mental health Self-harm/suicidal ideation/suicide Mental health service utilization Conduct problems Attention deficits and hyperactivity Loneliness Anger	<ul style="list-style-type: none"> • Female sex • Older age • Public health measures • Social isolation • Family relationships • Increased technology and media use • Prior mental and chronic physical conditions 	<ul style="list-style-type: none"> • Positive coping • Physical activity • Consistent routine • Knowledge and information about COVID-19
De France et al., 2021 [11]	Original research, longitudinal study	Canada	Adolescents, general population	Mean age = 16.21 (SD = 0.97)	136 (Wave 5)	46.3 %	53.7 %	Anxiety Depression Emotion regulation	<ul style="list-style-type: none"> • Sex (mixed results) • Lifestyle changes • Financial impact • Fear of COVID-19 	
Shoshani, Kor, 2021 [28]	Original research, longitudinal study	Israel	Adolescents, general population	11 - 17 years Mean age = 13.97 (SD = 2.02)	1537 (Wave 2)	738	799	Somatization Anxiety Depression Panic Global psychological distress Positive affect Negative affect Life satisfaction Gratitude	<ul style="list-style-type: none"> • Social support • Consistent daily routines 	
Tamarit et al., 2020 [29]	Original research, cross-sectional study	Spain	Adolescents, general population	13 - 17 years Mean age = 14.89 (SD = 1.13)	523	187 35.8 %	330 63.1 %	Depression Anxiety Stress	<ul style="list-style-type: none"> • Female sex • Stressful life event • Searching information about COVID-19 	<ul style="list-style-type: none"> • Being in a romantic relationship

Meherali et al., 2021 [31]	Rapid systematic review	China United States Canada Italy Australia India West Africa	Children and adolescents, general population	5 - 19 years	From 22 to 8079	2502	2673	5175	2502	Depression Anxiety Stress	<ul style="list-style-type: none"> • Female sex • Older age • Negative coping styles • Less education and knowledge about COVID-19 • Prior exposure to emergency situations • Low socioeconomic backgrounds • Female sex • Older age • Quarrelling with parents • Difficulty concentrating during online learning • School closure and remote education
Liu et al., 2021 [32]	Original research, cross-sectional study	China	Children and adolescents, general population	9 - 18 years Mean age = 13.37; SD = 0.02	5175	2673	2502	5175	2502	Depression Anxiety	<ul style="list-style-type: none"> • Female sex • Older age • Quarrelling with parents • Difficulty concentrating during online learning • School closure and remote education
Lu et al., 2022 [33]	Original research, cross-sectional study	China	Adolescents, general population	11 - 19 years (Mean age = 17; SD = 1.42)	795	73.2 %	26.8 %	795	26.8 %	Depression Anxiety	<ul style="list-style-type: none"> • Female sex • Knowledge and understanding of COVID-19 • Contradiction with family and friends • Mental disease history
Qi et al., 2020 [34]	Original research, cross-sectional study	China	Adolescents, general population	14 - 18 years	7202	3343	3859	7202	3859	Depression Anxiety	<ul style="list-style-type: none"> • Female sex • Older age • COVID-19 exposure (infection or close contact) • Low/medium social support
Zhang et al., 2020 [35]	Original research, cross-sectional study	China	Adolescents, general population	Junior high and high school students (Mean age = 15.56; SD = 1.89)	1025	528	497	1025	497	Depression Anxiety Stress	<ul style="list-style-type: none"> • Negative coping • Resilience • Positive coping

Table 1. (continued)

References	Type of study	Country	Study population	Age range	Sample size			Mental health & well-being outcomes*	Factors identified**	
					Total	Male	Female		Risk factors	Protective factors
Esposito et al., 2021 [36]	Original research, cross-sectional study	Italy	Adolescents, general population	11 - 19 years (Mean age = 15.4; SD = 2.1)	2064	37.2 %	62.8 %	Depression Anxiety	<ul style="list-style-type: none"> Female sex Older age COVID-19 exposure (infection of family member/acquaintance) 	<ul style="list-style-type: none"> Male sex
Gazmararian et al., 2021 [37]	Original research, cross-sectional study	United States	Adolescents, general population	Grades 9 - 12 (high school)	761	38 %	62 %	Worry Anxiety Depression Loneliness Stress	<ul style="list-style-type: none"> Female sex Older age Lower socioeconomic status 	
Ng et al., 2021 [38]	Original research, cross-sectional study	Czechia	Adolescents, general population	11, 13, and 15 years (Mean age = 13.5; SD = 1.6)	3440	46 %	54 %	Loneliness Life satisfaction	<ul style="list-style-type: none"> Female sex Older age 	
Pizarro-Ruiz, Ordóñez-Cambor, 2021 [39]	Original research, cross-sectional study	Spain	Children and adolescents, general population	8 - 18 years (Mean age = 13.5; SD = 1.6)	590			Depression Anxiety Emotional dysregulation Self-esteem	<ul style="list-style-type: none"> Female sex 	
Castillo-Martínez et al., 2021 [40]	Original research, cross-sectional study	Spain	Children and adolescents, general population (and their caregivers)	8 - 18 years	397	178 44.8 %	216 54.5 %	Depression	<ul style="list-style-type: none"> Female sex Living with a single caregiver 	
De Abreu et al., 2021 [41]	Original research, cross-sectional study	Luxembourg Germany Brazil	Adolescents, general population	10-16 years (Mean age = 12.8; SD = 1.93)	1515	42 %	58 %	General life satisfaction Satisfaction with health and safety Negative affect Worry	<ul style="list-style-type: none"> Female sex Fear of COVID-19 Low-income households 	<ul style="list-style-type: none"> Satisfaction with the way adults listen during the pandemic Satisfaction with freedom during the pandemic

Wright et al., 2021 [42]	Original research, cross-sectional study	United Kingdom	Adolescents, general population	13 - 19 years (Mean age = 15.90; SD = 1.48)	165	65	100	Depression Anxiety Stress Fatigue Vitality Perceived general health	<ul style="list-style-type: none"> • Female sex • Coronavirus fear • Perceived COVID-19 prevalence 	<ul style="list-style-type: none"> • Physical activity
Hu, Qian, 2021 [43]	Original research, longitudinal study	United Kingdom	Adolescents, general population	10 - 16 years (Mean age = 13.3; SD = 1.38)	886	433	453	Emotional problems Conduct problems Hyperactivity Peer relationship problems Prosocial behavior	<ul style="list-style-type: none"> • Female sex • Low-income households • One-child and one-parent families • COVID-19 exposure (illness in the household) 	
Hawes et al., 2020 [44]	Original research, longitudinal study	United States	Adolescents and young adults, general population	12 - 22 years (Mean age = 17.34; SD = 1.5)	532	31 %	69 %	Depression Anxiety	<ul style="list-style-type: none"> • Female sex • Younger age 	
Kiss et al., 2022 [45]	Original research, longitudinal study	United States	Adolescents, general population	11 - 14 years > 3000				Positive affect Depression Anxiety Perceived stress	<ul style="list-style-type: none"> • Female sex • Preexisting internalizing symptoms • Poor quality and functioning of family relationships • Excessive use of digital devices 	<ul style="list-style-type: none"> • Physical activity • Consistent routines • Social support • Coping strategies
Stinson et al., 2021 [46]	Original research, longitudinal study	United States	Adolescents, general population	10.6 - 14.6 years (Mean age = 12.45; SD = 1.96)	7983	51 %	49 %	Depression Anxiety Stress	<ul style="list-style-type: none"> • Female sex • Older age • Preexisting internalizing symptoms • Adverse childhood experiences 	
Guessoum et al., 2020 [47]	Narrative review		Adolescents					Depression Anxiety Posttraumatic stress	<ul style="list-style-type: none"> • Female sex • Family and intra-family violence • Time/investment in social media • Prior mental health diagnosis 	

Table 1. (continued)

References	Type of study	Country	Study population	Age range	Sample size			Mental health & well-being outcomes*		Factors identified**	
					Total	Male	Female	Risk factors	Protective factors		
Halldorsdottir et al., 2021 [48]	Original research, cross-sectional study	Iceland	Adolescents, general population	Born in 2004	523	217 41.5 %	287 56.5 %	Depression Anger Suicide attempts General mental health	<ul style="list-style-type: none"> Female sex Social media use/gaming Fear of COVID-19 Not seeing friends in person Changes in daily and school routines 	<ul style="list-style-type: none"> Spending more time relaxing, sleeping, and doing hobbies 	
Von Soest et al., 2022 [49]	Original research, longitudinal study	Norway	Adolescents, general population	13 - 18 years (Mean age = 15.30; SD = 1.60)	227 258	50 %	50 %	Depression Loneliness Positive future expectations	<ul style="list-style-type: none"> Female sex Younger age Low socioeconomic background 		
Bera et al., 2022 [50]	Review	Europe Asia America	Adolescents, with mental health diagnosis and general population					Anxiety Depression Posttraumatic stress Suicidal ideation and behavior	<ul style="list-style-type: none"> Female sex Prior mental health diagnosis 		
Racine et al., 2020 [51]	Rapid review	China United States	Children and adolescents, general population	3 - 18 years	From 209 to 8079			Depression Anxiety Psychological distress	<ul style="list-style-type: none"> Age (mixed results) Fear of infection and perceived life threat Parental distress and anxiety Financial difficulties of the family Residing in highly infected areas 	<ul style="list-style-type: none"> Physical activity Knowledge and awareness of COVID-19 Media entertainment and reading 	
Ma et al., 2021 [52]	Original research, cross-sectional study	China	Children and adolescents, general population	6 - 18 years (Mean age = 12.87; SD = 2.65)	17 740			Anxiety Depression Compulsive symptoms Sleep problems	<ul style="list-style-type: none"> Older age Perceived parents' anxiety about COVID-19 Mental disorder history Parents infected with COVID-19 	<ul style="list-style-type: none"> Physical activity 	
Zhou et al., 2020 [53]	Original research, cross-sectional study	China	Adolescents, general population	12 - 18 years	8079	46.5 %	53.5 %	Depression Anxiety	<ul style="list-style-type: none"> Female sex Older age 	<ul style="list-style-type: none"> Knowledge and awareness of COVID-19 	

Lehmann et al., 2022 [54]	Original research, longitudinal study	Norway	Adolescents, general population	11 - 19 years	2997 (Wave 1)	41 %	59 %	Emotional problems Conduct problems Hyperactivity Peer relationship problems Prosocial behavior Loneliness	<ul style="list-style-type: none"> • Sex • Age • Situation at home
Lavigne-Cerván et al., 2021 [55]	Original research, cross-sectional study	Spain	Children and adolescents, general population	6-18 years (Mean age = 10.34; SD = 3.64)	1028	548	478	Anxiety Sleep disorders	<ul style="list-style-type: none"> • Older age
Jones et al., 2021 [56]	Systematic review	China United States Canada Denmark Germany Japan Philippines United Kingdom	Adolescents, general population and special populations	13 - 17 years	From 102 to 9554			Anxiety Depression Psychological distress	<ul style="list-style-type: none"> • Negative coping skills • Low/moderate social support • Internet/smartphone addiction • Preexisting disorders • Positive coping skills • Social support • Discussions with parents
Wang et al., 2021 [57]	Original research, longitudinal study	United States	Adolescents, general population	13 - 18 years (Mean age = 15.0)	444	40 %	60 %	Positive affect Negative affect	<ul style="list-style-type: none"> • Health stress (COVID-19 exposure) • Financial stress
Angelina et al., 2021 [58]	Original research, cross-sectional study	Indonesia	Adolescents and young adults, general population	10 - 24 years	2018	91.8 %	8.2 %	Psychological distress	<ul style="list-style-type: none"> • Lack of a confident • Frequent arguments with parents • Having a chronic disease • History of mental illness • Dietary pattern • Sleep quality
Liu et al., 2021 [59]	Original research, cross-sectional study	China	Children and adolescents, general population (and their mothers)	9 - 16 years (Mean age = 13.13; SD = 1.54)	1594	49.4 %	50.6 %	Depression Loneliness	<ul style="list-style-type: none"> • Older age • Lack of daily routine • Parent-child conflict

Table 1. (continued)

References	Type of study	Country	Study population	Age range	Sample size			Mental health & well-being outcomes*	Factors identified**	
					Total	Male	Female		Risk factors	Protective factors
Sifat et al., 2022 [60]	Original research, qualitative study	Bangladesh	Adolescents, general population	13 - 15 years	60	30	30	Stress Depression Anxiety Sleeping disorders	<ul style="list-style-type: none"> • Fear of COVID-19 • School closure/online education • Loss of income in the family • Addiction to digital devices/games/social media • Culture of ignoring mental health 	<ul style="list-style-type: none"> • Parental support • Friend support
Götz et al., 2020 [61]	Original research, cross-sectional study	42 countries across 6 continents	Children and adolescents, general population	9 - 13 years	4 322			Worry	<ul style="list-style-type: none"> • Less accurate knowledge and information about COVID-19 • Fear of COVID-19 	
Wiguna et al., 2021 [62]	Original research, cross-sectional study	Indonesia	Adolescents, general population	11 - 17 years (Mean age = 14.07; SD = 2.18)	113	53.1 %	46.9 %	Emotional problems Conduct problems Hyperactivity Peer relationship problems Prosocial behavior	<ul style="list-style-type: none"> • Health and mental health information 	<ul style="list-style-type: none"> • Parental support • Friend support
Meade, 2021 [63]	Review	China United States Canada Japan Bangladesh	Children, adolescents, and young adults, general population	1 - 28 years				Depression Anxiety Inattention or impulsivity Internalizing disorders Externalizing disorders Suicidal ideation and attempts Stress Sleep problems	<ul style="list-style-type: none"> • Female sex • Late adolescence • Social isolation • Screen time • Lack of physical activity • Perceived COVID-19 risk • Time on COVID-19 information in the media • Parental stress 	<ul style="list-style-type: none"> • Discussing COVID-19 information with parents
Akkaya-Kalayci et al., 2020 [64]	Original research, cross-sectional study	Austria Turkey	Adolescents and young adults, general population and with mental health problems	15 - 25 years	1240			Anxiety Depression Positive well-being Self-control General health Vitality	<ul style="list-style-type: none"> • Female sex • Late adolescence • Financial problems • Preexisting mental health problems 	<ul style="list-style-type: none"> • Current treatment for mental health problems

Barros et al., 2021 [65]	Original research, cross-sectional study	Brazil	Adolescents, general population	12 - 17 years	9470	49.8 %	50.2%	Sadness Nervousness	<ul style="list-style-type: none"> • Female sex • Older age • Financial difficulties • Disagreements with family members • Lack of close friends / missing friends • Health problems • Sleep problems • COVID-19 exposure (infection) • Difficulties with remote education
Rogers et al., 2020 [66]	Original research, longitudinal mixed-methods study	United States	Adolescents, general population	14 - 17 years (Mean age = 15.42; SD = 1.16)	407	50 %	50 %	Depression Anxiety Loneliness	<ul style="list-style-type: none"> • Less support from friends • Conflict with friends • Family conflict
Singh et al., 2020 [67]	Narrative review		Children and adolescents, general population and having special needs					<ul style="list-style-type: none"> • Irritability • Inattention • Anxiety • Depression • Suicide 	<ul style="list-style-type: none"> • Age • School closures • Preexisting disorders / special needs • Low socioeconomic background • Domestic violence and abuse • Compulsive use of internet gaming and social media
Palacio-Ortiz et al., 2020 [68]	Review		Children and adolescents, with psychiatric disorders					<ul style="list-style-type: none"> • Stable and serene adult 	<ul style="list-style-type: none"> • Preexisting psychiatric disorders • Financial difficulties • Parental substance abuse • Intrafamily violence

Table 1. (continued)

References	Type of study	Country	Study population	Age range	Sample size			Mental health & well-being outcomes*	Factors identified**	
					Total	Male	Female		Risk factors	Protective factors
De Oliveira et al., 2022 [69]	Systematic review		Children and adolescents	< 18 years	> 35 543			Emotional symptoms Depression Anxiety Stress Post-traumatic stress disorder Suicidal ideation Worry	<ul style="list-style-type: none"> • Female sex • Emotion-focused coping styles • Time on internet and social media • Medium/low levels of social support 	<ul style="list-style-type: none"> • Problem-focused coping style • Family time
Cooper et al., 2021 [70]	Original research, longitudinal study	United Kingdom	Adolescents, general population	11 - 16 years	894 (Wave 1) 443 (Wave 2)			Emotional symptoms Conduct problems Hyperactivity-inattention Psychological distress	<ul style="list-style-type: none"> • Loneliness during lockdown 	<ul style="list-style-type: none"> • Time spent talking to others • Feeling closer to parents
Raviv et al., 2021 [71]	Original research, cross-sectional study	United States	Children and adolescents (caregiver reports)	Pre-kindergarten to 12th grade	49 397			Anger Loneliness Depression Anxiety Stress Suicidal ideation Self-harm	<ul style="list-style-type: none"> • Low-income households • COVID-19 exposure (contact, infection, death) • Family stressors (financial and difficulty of receiving health care) 	

* Measures used in the adolescent samples

** Factors identified in the adolescent samples

Results

Based on the reviewed articles, a number of factors of adolescent mental health in the context of the COVID-19 pandemic were identified: sex, age, resilience and coping, physical activity, consistent routine, prior mental health diagnosis, COVID-19 fear, knowledge and information about COVID-19, socioeconomic status and financial difficulties of the family, single-caregiver family, poor family functioning, family and domestic violence, positive family relationships, social support, screen and online time, prior adversities, COVID-19 exposure, school closure and remote education, and others. These factors were analyzed according to the criteria risk or protective factor, individual (I) or environmental (E) level factor, and general (G) or specific (S) to the COVID-19 crisis factor. Factors were considered general if they had been consistently identified in research as being related to adolescent mental health before the COVID-19 pandemic.

Individual general (IG) factors

Sex

Sex was the most commonly reported factor, identified in 28 of the reviewed studies. The majority of findings suggest that adolescent girls are more negatively impacted from the COVID-19 pandemic than boys; female sex is an individual risk factor and male sex – an individual protective factor. Adolescent girls showed higher COVID-19 worry, depression and anxiety levels than boys in systematic reviews and studies from China [4,31-34]. Higher resilience, which predicted better mental health outcomes, was associated with male sex [35]. In Italy, male sex was a protective factor against negative feelings and sadness [36]. In Georgia, female sex was associated with higher rates of COVID-19-related worry [37], in Czechia – with more regularly feeling loneliness and lower life satisfaction during lockdown [38], and in Spain - with experiencing more anxiety, depression and stress symptoms, more problems with emotional regulation, somatic complaints, and less self-esteem [29,39,40]. In an international study from Luxembourg, Germany, and Brazil being a girl was associated with lower levels of subjective well-being [41]. In UK, girls reported higher levels of coronavirus fear, perceived stress, and anxiety, and experienced a greater increase in emotional problems [42,43]. In the USA, adolescent girls reported greater anxiety, depression, and psychological distress than boys [44-46]. Increased risk of psychiatric disorders, including anxiety and depression, has also been associated with female sex in previous pandemics and disasters [47]. In Iceland, girls reported greater negative impact across all indicators of well-being and perceived

the pandemic as having a more drastic and global impact on their lives [48]. In Norway girls showed more adverse changes than boys in psychosocial well-being [49]. Adolescent girls were at greater risk of engaging in suicidal behaviour than boys [50].

A small minority of studies do not support female sex to be a risk factor or even report greater declines in boys. Within reviews, few studies revealed male sex as a risk factor or sex did not predict mental health outcomes [4,51]. During lockdown, adolescent boys reported lower integration, social competence and awareness of the problems than girls [39]. In Canada, there was an increase in depression symptoms in boys, and an increase in anxiety symptoms in girls. Financial impacts and fear of the virus were more adverse for boys, and lifestyle impacts were more adverse for girls [11].

Age

Age was also frequently studied and was identified as a factor in 18 of the reviewed studies. Systematic reviews reported that among children and adolescents, older age was associated with higher levels of depression, anxiety, stress, worry, concern, and COVID-19 related fear [4, 31]. In China, age/higher school grade was associated with higher risk of depressive and anxiety symptoms [32,34,52,53]. In the USA, older adolescents reported worse mental health than younger adolescents [46]. Social and mental well-being were negatively associated with age among adolescents in Czechia [38]. In Georgia, COVID-19-related worry was higher in older school grades; among younger adolescents, life satisfaction was higher, and feelings of loneliness were lower [37].

However, other findings on the effect of age/school grade were mixed [51]. In Norway, age had an effect on internalizing symptoms but not on externalizing symptoms [54]. In Spain, anxiety was highest in the 9 to 12 age group, among a sample from 6 to 18 years; yet sleep disturbances were highest in the older (13 to 18 years) age group [55].

Two studies reported the opposite effect of age. Younger age was associated with more severe symptoms of anxiety in a US study [44], and in Norway one year after the outbreak of the COVID-19 pandemic younger adolescents showed more adverse changes in psychosocial well-being [49].

Resilience and coping

Coping skills were found to be a determinant of adolescent mental health in the context of COVID-19 [56]. Resilience, and positive and negative coping predicted symptoms of depression, anxiety, and stress among adolescents in China [35]. A US longitudinal study found coping strategies to predict emotional well-being [45].

Another US longitudinal daily-diary study showed that secondary control engagement coping predicted an increase in positive affect for the same and the following day [57]. The use of negative coping styles was related to worse mental health [31].

Physical activity

Reviews outlined physical exercise to be a protective factor for adolescent mental health in the context of the COVID-19 pandemic [4, 51]. In UK adolescents, physical activity predicted positive effects in a wide range of mental health outcomes [42]. Regular physical activities predicted better emotional well-being in US adolescents, and in China exercise intensity had a significant, albeit small, effect on psychological symptoms [45,52].

Consistent routine

Consistent daily routines were identified as a protective factor against mental health symptomatology during the COVID-19 pandemic among adolescents from Israel [28], China [59] and in a systematic review [4]. In Indonesia, improving dietary pattern and sleep quality was a protective factor against psychological distress [58]. A US longitudinal study found that maintaining routines was a predictor of adolescents' emotional well-being [45].

Prior mental health diagnosis or chronic condition

Adolescents with prior mental health diagnosis or chronic condition reported more severe emotional and anxiety symptoms compared to general population samples [4]. Preexisting mental disorder was associated with significantly more affected mental health by the lockdown [50]. Adolescents with chronic diseases [58] and various preexisting disorders [56,67] had higher depression, anxiety, and psychological distress. In China, mental disease history was associated with depression and anxiety, as well as compulsive symptoms and sleep problems [33,52]. In the USA, adolescents with preexisting internalizing symptoms were more vulnerable to psychological distress [45,46].

Individual COVID-19 specific (IS) factors

COVID-19 fear

In UK, adolescents' COVID-19 fear predicted negative effects in a wide range of mental health outcomes (stress, anxiety, depressive symptoms, fatigue, vitality); perceived COVID-19 prevalence was also linked to depressive symptoms [42]. In adolescents from Luxembourg, Germany, and Brazil, fear of COVID-19 was associated with lower life satisfaction and emotional well-being [41]. In Iceland, worrying about someone

close contracting COVID-19 was associated with mental health decline [48]. A qualitative study from Bangladesh also outlined fear of the disease as a risk factor for mental health [60].

A rapid review showed that risk factors were fear of infection, perceived life threat and parental distress and anxiety [51]. A review reported 3 studies to indicate higher parental COVID-19-related worry to be linked to declines in adolescent mental health [4]. Father's perceived anxiety about COVID-19 had a stronger impact on adolescent's mental health than mother's anxiety [52].

Knowledge and information about COVID-19

In an international study among children from 42 countries, an association was observed between having less accurate knowledge about COVID-19 and greater worry [61]. In China, knowledge of COVID-19 was linked to a lower rate of depression and anxiety [33]. Literature reviews reported knowledge and awareness of COVID-19 to be beneficial to adolescent mental health [4,51]. Being less educated, which was related to worse adolescent mental health in the context of the COVID-19 pandemic, may underlie these results [31].

In contrast, frequent searching for information about COVID-19 was related to psychological distress among Spanish adolescents [29]. In Indonesia, unnecessary health or mental health information (both factual and false) during COVID-19 pandemic also increased the risk of emotional and behaviour problems [62]. Being exposed to excessive information about COVID-19 without discussing the topic with parents may lead to higher anxiety and PTSD symptoms [63].

Environmental general (EG) factors

Socioeconomic status and financial difficulties of the family

A systematic review identified the socioeconomic circumstances of the family and their cultural background to be risk factors for adolescent mental health [31]. In Georgia, rates of worry concerning the pandemic were higher in adolescents from families with lower socioeconomic status [37]. In line, studies from Norway, UK, Germany, Luxembourg, Germany, and Brazil reported that more adverse mental health changes during the pandemic were observed among adolescents from low socioeconomic backgrounds [1,41,43,49].

Financial problems increased the probability of worsening in the mental health status of adolescents and young people from Austria and Turkey [64] and in a rapid review [51]. In Bangladesh, loss of income in the family during the pandemic impacted adolescents' mental health [60]. Pre-pandemic financial difficulties were also linked to frequent sadness among Brazilian adolescents

[65]. Financial difficulties in Canadian families were associated with emotion dysregulation in adolescents [11].

Single-caregiver family

Findings from UK indicated that adolescents from one-child and one-parent families were particularly impacted during the COVID-19 pandemic with declines in mental health [43]. Child and adolescent depression was more prevalent among participants that lived with a single caregiver during the lockdown in Spain, too [40].

Poor family functioning

For adolescents, greater family conflict contributed to depressive symptoms and loneliness during COVID-19 [66]. In China, adolescents' quarrelling with parents during lockdown was associated with depression and anxiety after lockdown [32]. Among Brazilian adolescents, disagreements with family members were associated with negative feelings (sadness and nervousness), and in China family conflicts were associated with anxiety [33,65]. In Indonesia, frequent arguments with parents were a risk factor for psychological distress [58]. In the USA, poorer quality and functioning of family relationships were a strong predictor of psychological distress [45]. In Germany, deteriorating family climate was associated with higher anxiety, depressive symptoms, and psychosomatic complaints, and lower health-related quality of life [1].

Family and domestic violence

Several narrative reviews identified the risk factor of family and domestic violence in relation to COVID-19 lockdowns, when an increase in reported cases of domestic violence was recorded [47,67]. The lockdown affected the family and changed family dynamics. Financial difficulties, unemployment, and restrictions on freedom were associated with increased parental risk of greater alcohol and other substance use and adolescent violence and abuse [68]. Home confinement and stressful life events were linked to parental emotional distress, leading to less availability for adolescents and more punitive attitudes towards them [47]. A specific risk group were adolescents from poor and underprivileged homes who had an increased risk of being exploited and becoming victims of violence and abuse [67].

Positive family relationships

Family environment was considered to determine mental health and well-being of children and adolescents during the pandemic; they coped better alongside a stable and serene adult [68]. For adolescents, family time was related to fewer depressive symptoms [69]. An inter-

national study from Luxembourg, Germany, and Brazil reported that satisfaction with the way adults listened to adolescents during the pandemic benefited their subjective and emotional well-being [41]. A UK longitudinal study reported that for adolescents feeling closer to parents was associated with both immediate (on the moment) and long-term (in a month) better mental health outcomes [70]. Discussions with parents were a protective factor to mental health of adolescents in a systematic review [56]. Family relationships could modify changes in adolescent mental health during the pandemic [4]. A longitudinal daily-diary study from the USA showed that parental social support predicted an increase in adolescents' positive affect for the same and the following day, as well as a reduction in negative affect for the same day [57].

Social support

Social support was outlined to be a protective factor to mental health of adolescents during the COVID-19 pandemic in systematic reviews [4,56] and in Israel [28]. In China, adolescents reporting low or medium levels of social support suffered a higher level of anxiety and depression symptoms [34]. In the USA, better social support predicted adolescents' better emotional well-being during the pandemic [45]. Less support from friends contributed to depressive symptoms in adolescents, and greater conflict with friends contributed to loneliness [66]. Lack of face-to-face communication with friends was detrimental to adolescent mental health in Iceland [48]. In Indonesia, a lack of a confidant was a risk factor for psychological distress [58]. In Brazil, the lack of close friends or romantic relationship were associated with feelings of sadness and nervousness [65]. For adolescents infected with the coronavirus, being in a romantic relationship increased the likelihood of good mental health [29].

However, among UK adolescents loneliness during COVID-19 lockdown was associated with immediate decline in emotional well-being, but not with long-term mental health difficulties. At the same time, more frequent social contact was not associated with either short or long-term mental health [70].

Online time

A qualitative study from Bangladesh and a US longitudinal study reported excessive use of digital devices during the pandemic to impact adolescents' mental health [45,60]. Time spent and investment in social media were also linked to worse mental health (levels of depression, anxiety, and psychological distress) [47]. Compulsive use of internet gaming and social media put adolescents' mental health at higher risk [67]. For ado-

lescents, increased internet, social media, gaming, and smartphone use was linked to declines in mental health outcomes [4].

Prior adversities

Adolescents who had greater number of adverse experiences before the COVID-19 pandemic (e.g. abuse, neglect, household substance use, grief, natural disaster, war, terrorism) were more likely to experience greater COVID-19-related stress as well as greater impact of virus fears on their well-being [46]. A systematic review also identified prior exposure to emergency situations as one of the determinants of pandemic's impact on adolescents [31].

Environmental COVID-19 specific (ES) factors

COVID-19 exposure

COVID-19 exposure was generally understood as someone in the family (or someone close, community member, etc.) having COVID-19 symptoms, being diagnosed or hospitalized, or having been in contact with someone with COVID-19. One study also included COVID-19 death of a family member, but analyzed it within the general factor of COVID-19 exposure without examining its independent effect [71]. The independent effect of COVID-19 death of a family member or friend was examined in a study among Spanish adolescents, but was not statistically significant [29]. In China, during the early stage of the pandemic COVID-19 exposure was associated with a higher prevalence of depression and anxiety symptoms in adolescents [34] and parents' infection with COVID-19 had a significant, albeit small, effect on psychological symptoms of their adolescent child [52]. In Brazil, personal or close other's exposure increased the likelihood of adolescents feeling sadness and nervousness [65]. In Italy, having a close someone with COVID-19 increased negative feelings [36]. In UK family members' COVID-19 exposure undermined adolescents' peer relationships [43]. Among US children and adolescents, COVID-19 exposure increased negative well-being indicators and decreased positive well-being indicators [71]. Conversely, in an international study, conducted in the early phase of the pandemic, exposure to COVID-19 was less predictive of emotional well-being than the fear of getting the virus (either oneself or close other), which was the strongest correlate across all countries – Luxembourg, Germany, and Brazil [41].

School closure and remote education

Among Brazilian adolescents, feelings of sadness and nervousness during the pandemic were associated with perceived difficulties with remote education, such as lack

of concentration, not interacting with the teacher, perception of learning little or nothing, etc. [65]. In China, difficulty in concentrating during online learning was linked to depression and anxiety after COVID-19 lockdown [32]. In Bangladesh, disruption in education and long school closure were factors impacting adolescent mental health [60]. In Iceland, change in school routine due to COVID-19 was detrimental to adolescent mental health [48].

Others

Other reported risk factors included environmental general factors such as culture of ignoring mental health and environmental COVID-19 specific factors such as residing in highly infected areas, limited living space, living in an apartment without balcony, and staying at home more often [1,29,51,60].

Other reported protective factors were individual general factors such as spending more time relaxing, sleeping, and doing hobbies, individual COVID-19 specific factors such as satisfaction with freedom during the pandemic, and general environmental factors such as access to entertainment, and media entertainment and reading [4,41,48,51].

Discussion

This study aimed to analyze the risk and protective factors of adolescent mental health and well-being in the context of the COVID-19 pandemic based on review of the scientific literature according to the criteria risk or protective factor, individual (I) or environmental (E) level factor, and general (G) or specific (S) to the COVID-19 crisis factor. The review included 46 original research and review articles with reported research data on adolescent populations across all 6 continents. The identified risk factors of adolescent mental health included: female sex, older age, negative coping, and prior mental health diagnosis or chronic condition (IG factors); COVID-19 fear, and excessive information about COVID-19 (IS factors); low socioeconomic status and financial difficulties of the family, single-caregiver family, poor family functioning, family and domestic violence, excessive online time, and prior adversities (EG factors); COVID-19 exposure, and school closure and remote education (ES factors). The identified protective factors of adolescent mental health included: male sex, younger age, resilience and positive coping, physical activity, and consistent routine (IG factors); knowledge and information about COVID-19 (IS factor); positive family relationships, and social support (EG factors).

The variety of factors identified outlines the multiple vulnerabilities associated with adolescents' intra-individ-

ual processes and the characteristics of their important social contexts and, at the same time, the strengths and positives that could mitigate the adverse effects of the pandemic and help maintain adolescents' mental health during upheavals and crises. Other recent reviews have also identified an array of factors risk or protective to adolescent mental health and well-being in the context of the COVID-19 pandemic [14,72,73]. Some of the identified factors are similar to those identified in our study such as age and sex, socioeconomic status and financial difficulties in the families, previous state of mental health, health-related worries, consistent routines, family functioning, social support, virtual/online learning, and adaptive coping styles [14,72,73]. Additionally, factors such as parental mental health, vulnerable adolescent communities, and reduced bullying rates have been identified [14,72,73]. Overall, all review studies have provided different categorizations and conceptualizations of the identified risk and protective factors of adolescent mental health in the context of the COVID-19 pandemic, but none of them has differentiated between general and specific to the COVID-19 crisis factors.

Our analysis towards factors' generality or specificity in relation to the COVID-19 crisis shows that most of the identified risk or protective factors that manifested during the pandemic are actually general factors, consistently identified in adolescent mental health research before the outbreak of COVID-19. At the individual level, the gender gap in adolescent mental health has been largely discussed. In terms of internalizing symptoms, female sex is a well-known risk factor [18,19,74-76]. Older age of adolescents has also been revealed as a risk factor for poor mental health [76]. Negative coping strategies have been particularly related to depression in adolescence, with avoidance coping being associated with both internalizing and externalizing problems [10,77,78]. Positive health behaviors, associated with consistent routines, are healthy diet and sleep, and physical activity is a prominent protective factor for mental health and well-being [20,74,79]. Excessive screen time has been associated with psychosomatic complaints, and heavy social media use – with depression and anxiety [79-81]. At the environmental level, crucial factors are family environment and social support. Adolescents who live in socioeconomically disadvantaged families have been found to be two to three times more likely to develop mental health problems [82]. Trend analysis indicates that mental health problems increase over time among adolescents with low socioeconomic status, while decreasing among those with high socioeconomic status [83]. Low socioeconomic status is associated with single motherhood and negative parenting behaviors, and adolescents from single-parent families are at increased risk for depressive symptoms and externalizing

disorders [84]. It has been demonstrated that the quality of family functioning has a direct impact on adolescent mental health. Parental risk factors for anxiety and depression include less warmth, more inter-parental conflict, over-involvement, aversiveness, less autonomy granting and monitoring [85]. Conversely, positive family climate, family connectedness, and parental monitoring are known to protect the mental health of adolescents [22,25]. Among the strongest protective factors is social support by family, peers, school, and community [21,22,25]. Prior adverse life events have also been identified as an important risk factor for poor adolescent mental health [23].

Despite the novelty of the virus, the ubiquity of the pandemic agenda, and the challenges of life in a pandemic unprecedented in modern times, our COVID-19 specific factors' category includes fewer factors. They are mainly risk factors such as COVID-19 fear, excessive information about COVID-19, COVID-19 exposure, school closure and remote education. The effects of other public health measures such as social distancing and quarantine can also be considered in this category [86,87]. The only protective factor is knowledge and information about COVID-19.

The balance between general and COVID-19 specific factors demonstrated in our study suggests that even in situations of unprecedented health crisis, general risk and protective factors with a dominant role in the psychological functioning of young people have the greatest contribution to the effects on the mental health of adolescents. Implications of this finding include that, building on fundamental psychological knowledge, general psychosocial risk and protective factors could be addressed immediately in the early stages of a health crisis through national, community, group and individual level interventions targeting the mental health of adolescents, thereby mitigating the negative and harmful short- and long-term effects and reducing the risk of lifelong pandemic consequences.

The specific psychosocial risk and protective factors identified during the COVID-19 pandemic provide important insights into adolescents' emotional and cognitive responses to uncertainty, the disease and its consequences, disruptions to daily routines and social life, and education and social connections mediated by technology that could be interpreted and applied to a different pathogen in a potential future pandemic.

Overall, the findings of this study could be useful for informing the development and implementation of public health interventions targeting adolescent mental health, for the provision of psychosocial support to adolescents and their families by mental health professionals, and for increasing future pandemic preparedness of health, school, and social systems, as well as parents,

youth, and the society. The findings may also have implications for other types of global crisis.

This study has some limitations. It is a non-systematic literature review and therefore has not identified and screened all existing literature on the topic of risk and protective factors for adolescent mental health during the COVID-19 pandemic, which is associated with selection bias. The inclusion of studies published between 2020 and 2022 may have led to the omission of valuable information published later. Relevant data might have been missed also due to the exclusion of non-English language studies and grey literature.

In conclusion, this literature review and analysis confirms that a number of risk and protective factors at the individual and environmental levels, most of which are general psychosocial factors consistently identified in previous research, and some specific to the COVID-19 crisis, modify the effects of the pandemic on adolescent mental health. The findings support future pandemic preparedness and mental health interventions mitigating

the negative effects of the pandemic on adolescent mental health through focusing on general psychosocial risk and protective factors in the early stages of a pandemic and building on COVID-19 specific insights into adolescents' emotional and cognitive responses to identify and address challenges related to novel pathogens, or to other types of crises.

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Conflict of Interest

None to declare.

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