

Effects of COVID-19 Lockdowns on the Development of Educational, Social and Emotional Gaps among Children: A Retrospective Chart Review

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ABSTRACT

Background: School closures due to the coronavirus disease 2019 (COVID-19) outbreak affected students physically, socially, and psychologically with an increase in the number of children and adolescent presenting with anxiety, depression, and drug abuse.

Objectives: To examine the impact of COVID-19 and lockdown on the mental health of minors during the pandemic period and to characterize the type and number of referrals to a regional psychiatric outpatient clinic.

Methods: This study included 380 children evaluated in an outpatient child psychiatric clinic. They were divided into two groups: before the lockdowns (BLD) (n=248), from January 2019 to February 2020, and during the lockdowns (LD) (n=132), from March 2020 to April 2021.

Results: When comparing the LD to BLD, there was increase in suicide attempts (9.8% vs. 2.8%) and in the use of psychotherapy (81% vs. 56%). There was a decrease in the diagnoses of behavior disorders (29.5% vs. 44.8%) and ADHD (29.5% vs. 50%); as well as a decrease in stimulant usage (22.7% vs. 38%). There was a statistically non-significant increase in the number of children with depression, anxiety, and drug-use disorder.

Conclusions: Many children developed educational, social, emotional, and behavioral gaps during LD, and they lost skills to deal with everyday problems due to social isolation. It is important to follow the long-term impact of the lockdowns and social isolation.

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KEY WORDS: adolescents, children, coronavirus disease 2019 (COVID-19), psychiatric problems, suicide attempts

The spread of the coronavirus disease 2019 (COVID-19) caused many changes in society and has led to isolation and distancing, economic crises, and environmental changes in families and at the academic and interpersonal level in the affected countries. Globally, early childhood centers, primary schools, and secondary schools experienced closures for long periods

of time as part of COVID-19 lockdowns (LD). These measures brought a loss of education time, restricted access to peers, and involved loss of daily structure. On a global scale, 463 million children were unable to access remote learning in 2020 [1].

When early childhood centers, primary schools, and secondary schools returned to work, they worked inconsistently due to illness of staff or children and group isolation policies. A sense of uncertainty, deaths due to coronavirus, and fear of becoming infected by coronavirus all led to an exacerbation of anxiety, depression, and avoidant behavior; thus, deepening the mental health difficulties in minors and adults that had existed before. In studies addressing the psychological effects of COVID-19 in China, more than half of the adults who participated in the study (53.8%) developed stress, depression, and anxiety responses in the first wave of the plague; 84.7% of this subgroup chose to stay at home most of the day [2].

Fear and anxiety due to the spread of the coronavirus, as well as consequences of the economic crisis following the pandemic, led to an increase in conflicts and quarrels within the family and an increase in the incidence of abuse, drug use, and suicide [3,4]. In the shadow of the economic and health crises there has been a significant decrease in visits to the emergency department due to physical and psychological complaints, specifically among children and adolescents during the pandemic period compared with the preceding year [5]. This finding raises concerns that psychiatric problems among minors remain unmonitored and untreated [5–7]. The reduction in referrals to mental healthcare could be explained in several ways, one of which is lack of attention from educational staff to student distress [7]. However, a study from England that examined changes in emotional symptoms, behavioral problems, and hyperactivity/inattention using an online survey about children's mental health at two points between March and May 2020 during early lockdown, showed a deterioration in mental health symptoms among preadolescent children [8]. Similar results were shown in a prospective cohort study conducted in Japan, which found an increase in

the number of schoolchildren with severe emotional/behavioral problems during the COVID-19 pandemic [9]. A recent Israeli study found an increase in depression, eating disorders, anxiety, and stress-related diagnoses during the COVID-19 period [10].

A family atmosphere that depends on the parents' financial and health situation, the lack of support of an extended family, and the quality of the familial relationship added to this complexity. There indirect effects of COVID-19, including disruptions to daily life that impact on mental health and well-being, disrupted family income and increased household stress [11]. Several studies described the immediate impact and long-term consequences of the lockdowns on the economic and health crisis and formulated recommendations for educational staff and parents regarding their conduct toward children, but there is still a long way to go in understanding the consequences of the pandemic [12].

In the present study, we examined the impact of COVID-19 and lockdown on the mental health of minors during the pandemic period and characterized the type and number of referrals to a regional psychiatric outpatient clinic. We assumed that during LD fewer minors would be referred to psychiatric evaluation due to behavioral disorders and there would be a decrease in diagnosis of attention deficit hyperactivity disorder (ADHD) and stimulant use because of closure of the educational system, which detects many of the psychiatric disorders in children, especially those with manifestations of behavioral disorders. At the same time, we assumed there would be an increase in anxiety, depression, suicide, and eating and drug abuse disorders.

PATIENTS AND METHODS

In this study, we compared the medical charts of minors who were brought for a first psychiatric evaluation during a period one year and two months before the lockdowns to the identical time period during lockdown.

COHORT GROUP

The medical charts of 380 children were reviewed. All children were brought for a first psychiatric evaluation in the outpatient child psychiatric clinic at the Hillel Yaffe Medical Center (Hadera, Israel) between January 2019 and April 2021. We divided this study population into two groups. The first group included minors who were brought for a first psychiatric evaluation during the time period between January 2019 to February 2020 before the lockdowns (BLD), and the second group included minors who were brought for a first psychiatric evaluation in the time period between March 2020 to April 2021, during the LD. Demographics (age, gender, marriage, religious affiliation, socioeconomic status, number of siblings, and learning framework) and medical data (psychiatric heredity, medical co-morbidity, and children with developmental delay), the types of psychiatric diagnoses and recommended treatments were recorded from the medical records.

STATISTICAL ANALYSIS

Descriptive statistics including mean, standard deviation, and percentage were conducted for the parameters in the study. Differences between the two groups (BLD vs. LD) according to quantitative parameters were tested by *t*-test. For categorical parameters, we used Fisher's exact tests or Pearson's chi-square. Multivariate logistic regression models (with odds ratio and 95% confidence interval) were performed for suicide attempts, suicide gesture, drug use, post-traumatic stress disorder (PTSD), depression, anxiety disorder, eating disorder, behavior disorder, and ADHD according to BLD vs. LD groups and socioeconomic status. Statistical analyses were performed using IBM Statistical Package for the Social Sciences statistics software, version 27 (SPSS, IBM Corp, Armonk, NY, USA). $P < 0.05$ was considered as significant.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The name of the ethics committee was HYMC-0032-21. The ethics approval number was 45405

RESULTS

DEMOGRAPHICS

The BLD group included a chart review of 248 children who were brought for a first psychiatric evaluation. Their demographic data were compared to the chart reviews of 132 children from LD [Table 1]. No clinically significant differences were found between the two groups in age, gender, marital status of parents, and socioeconomic status, number of siblings, and learning framework. However, we found a statistically significant increase in the number of referrals of minors from the religious population: BLD 8.9% ($n=22$) vs. LD 22% ($n=29$), $P < 0.000$, odds ratio (OR) 2.9, and minors from families with first- or second-degree psychiatric heredity: BLD 22.2% ($n=55$) vs. LD 40.9% ($n=54$), $P < 0.000$, OR 2.43.

COVID-19 DEPENDENT CONSEQUENCES

There were no children who studied remotely in the BLD period; 94% of minors continued to study frontally [Table 2]. During the LD period most children studied remotely: 68.2% ($n=90$), due to closures of the education system, and only 21.2% ($n=28$) continued to study frontally, most of them children from special education frameworks. Half of the children 50.4% ($n=125$) BLD were referred for the first psychiatric evaluation by educational staff compared to the LD period, when only 12.1% ($n=16$) of children were referred by educational staff, $P < 0.000$, OR 0.51. There was a statistically significant increase in the number of suicide attempts: 9.8% ($n=13$) in LD vs. 2.8% ($n=7$) BLD, $P = 0.006$, OR 3.75 and use of psychotherapy: 81% ($n=107$) in LD vs. 56% ($n=139$) BLD, $P < 0.000$, OR 3.35, during LD. There was a statistically significant decrease in the number of children with behavior disorder:

Table 1. Demographic characteristics

Characteristics	Before lockdown % (n)	Lockdown % (n)	Odds ratio (95% confidence interval)	P-value
Number of children referred for first psychiatric evaluation	248	132		
Boys	66% (164)	60% (79)	Ref.	0.26
Girls	34% (84)	40% (53)	1.31 (0.84–2.03)	
Age in years, mean ± standard deviation	10.5 ± 3.9	11.19 ± 4	1.044 (0.984–1.102)	0.12
Number of siblings, mean ± standard deviation	1.9 ± 1.5	2.11 ± 1.8	1.065 (0.939–1.208)	0.33
Single parents	37% (92)	39% (52)	1.102 (0.714–1.701)	0.66
Low-income family	33% (82)	33% (44)	1.012 (0.647–1.858)	1.00
Religious (Jewish) family	8.9% (22)	22% (29)	2.9 (1.58–5.27)	< 0.000
Learning framework				
Without	3.6% (9)	8.3% (11)	Ref.	0.069
Regular	69% (171)	71.2% (94)	0.45 (0.18–0.124)	
Special	27.4% (68)	20.5 % (27)	0.325 (0.121–0.872)	
Psychiatric heredity (family with first- or second-degree relatives)	22.2% (55)	40.9% (54)	2.43 (1.536–3.842)	< 0.000
Medical co-morbidity	3.2% (8)	6.8% (9)	2.19 (0.826–5.830)	0.12
Children with developmental delay	19% (47)	17.4% (23)	1.108 (0.714–1.701)	0.78

Table 2. Coronavirus disease 2019 (COVID-19) dependent consequences

Characteristics	Before lockdown % (n)	Lockdown % (n)	Odds ratio (95% confidence interval)	P-value
Referring factor				< 0.000
Parents	46.4% (115)	84.9% (112)	Ref.	
Educational staff	50.4% (125)	12.1% (16)	0.131 (0.073–0.235)	
Social services	3.2% (8)	3% (4)	0.513 (0.15–1.733)	
Form of learning			NA	< 0.000
Frontal learning	94% (233)	21.2% (28)		
Remote learning	0%	68.2% (90)		
Without academic framework	6% (15)	10.6% (14)		
Social difficulties	23.4% (58)	18.2% (24)	0.73 (0.43–1.24)	0.29
Suicide attempts	2.8% (7)	9.8% (13)	3.75 (1.46–9.63)	0.006
Suicide gesture and threat	12.9% (32)	8.3% (11)	0.61 (0.299–1.261)	0.23
Drug use	3.6% (9)	5.3% (7)	1.48 (0.541–4.09)	0.43
Post-traumatic stress disorder	1.6% (4)	1.5% (2)	0.94 (0.17–5.19)	1.00
Depression disorder	6.5% (16)	11.4% (15)	1.86 (0.88–3.84)	0.11
Anxiety disorder	28.6% (71)	37.9% (50)	1.52 (0.973–2.37)	0.083
Eating disorder	3.6% (9)	1.5% (2)	0.41 (0.087–1.091)	0.34
Obsessive–compulsive disorder	6% (15)	3.8% (5)	0.61 (0.217–1.72)	0.47
Psychotic disorder	3.6% (9)	4.5% (6)	1.27 (0.44–3.633)	0.78
Behavior disorder	44.8% (111)	29.5% (39)	0.52 (0.33–0.81)	0.004
Attention deficit hyperactivity disorder	50% (124)	29.5% (39)	0.42 (0.27–0.657)	< 0.000
Stimulant use	38% (95)	22.7% (30)	0.47 (0.293–0.766)	0.002
SSRIs drug use	15% (37)	22% (29)	1.61 (0.936–2.76)	0.09
Antipsychotic drug use	26% (65)	24% (32)	0.91 (0.55–1.47)	0.71
Psychotherapy	56% (139)	81% (107)	3.35 (2.031–5.547)	< 0.000

SSRI = selective serotonin reuptake inhibitors

SSRIs = fluoxetine, escitalopram, sertraline

antipsychotic drugs = risperdal, quetiapine, olanzapine, clothiapine, aripiprazole

Bold signifies statistical significance

29.5% (n=39) in LD vs. 44.8% (n=111) BLD, $P < 0.000$, OR 0.52; with ADHD diagnosis: 29.5% (n=39) in LD vs. 50% (n=124) in BLD, $P < 0.000$, OR 0.42, and with stimulant use: 22.7% (n=30) compared to BLD: 38% (n=95), $P = 0.002$, OR 0.47. There was a statistically non-significant increase in the number of children with depression, anxiety, and drug-use disorder.

Table 3. Coronavirus disease 2019 (COVID-19) dependent consequences in low-income families

	Odds ratio	Lower-Upper	P-value
Suicide attempts			
Group: LD vs. BLD	3.75	1.46–9.65	0.006
Low-income family	1.37	0.539–3.479	0.51
Suicide gesture and threat			
Group: LD vs. BLD	0.61	0.29–1.26	0.18
Low-income family	1.71	0.896–3.59	0.10
Drug use			
Group: LD vs. BLD	1.49	0.54–41.1	0.44
Low-income family	2.72	0.98–7.48	0.053
Post-traumatic stress disorder			
Group: LD vs. BLD	0.94	0.17–5.2	0.94
Low-income family	2.04	0.41–10.26	0.38
Depression			
Group: LD vs. BLD	1.88	0.89–3.96	0.098
Low-income family	2.69	1.27–5.67	0.009
Anxiety disorder			
Group: LD vs. BLD	1.52	0.97–2.38	0.066
Low-income family	1.17	0.74–1.85	0.50
Eating disorder			
Group: LD vs. BLD	0.41	0.086–1.92	0.26
Low-income family	0.195	0.025–1.54	0.12
Behavior disorder			
Group: LD vs. BLD	0.51	0.32–0.805	0.004
Low-income family	1.76	1.14–2.74	0.011
Attention deficit hyperactivity disorder			
Group: LD vs. BLD	0.42	0.27–0.65	< 0.001
Low-income family	1	0.64–1.55	1.00

BLD = before lockdown, LD = lockdown

Bold signifies statistical significance

COVID-19 DEPENDENT CONSEQUENCES IN LOW-INCOME FAMILIES

A comparison of the changes in psychiatric conditions in children and adolescents coming from low-income families is displayed in Table 3. In this specific group the results were different from the general population. A statistically significant increase in depression OR 2.69, $P = 0.009$, drug use OR 2.72, $P = 0.053$, and behavioral disorders OR 1.76, $P = 0.011$, can be seen during the LD period in low-income families.

DISCUSSION

In this study, we evaluated the impact of the COVID pandemic on demographic and medical characteristics and the cause for the initial psychiatric evaluation of minors who were brought to our outpatient clinic in the BLD period compared to a similar period (13 months) during the LD period. Our main results show a decrease in the number of children who were referred for the first psychiatric evaluation in the LD period. Probably the fear of being exposed to COVID-19 and the paralysis of the educational system brought about this phenomenon. Our findings correspond to previous studies that showed a significant decrease in the number of referrals to general and psychiatric emergency departments among the population of children and adolescents at the beginning of the spread of the pandemic [5-7]. It is also possible that for some of the minors, the reduction in demands of the education system led to a decrease in certain kinds of difficulties in the initial stage of the LD period or that they remained undetected.

No statistically significant difference was found in demographic characteristics such as gender, age, marital or socioeconomic status of the families, and medical co-morbidity of the children. There was an interesting finding demonstrated by a statistically significant increase in the number of children coming from religious families during the LD period. A possible explanation for the increase in the number of referrals from the religious population is the decrease in social support, which has great importance due to families' inability to meet with extended family, go to synagogues, and vent the internal tensions and pressures experienced by each family. We found a statistically significant increase in the number of referrals from families with first- or second-degree psychiatric heredity. We assumed that economic and family pressures resulting from the lockdowns, fears of COVID-19 infection and social isolation in a vulnerable population caused outbreaks of psychiatric disorders more frequently in families with psychiatric heredity.

During the LD period, most of the children were referred by their parents, compared to the BLD period when approximately half of the children were referred by educational staff. There was no statistically significant difference between the two groups in relation to educational framework, whether it was a special education framework or a regular education. In the LD

group only 21.2% continued to study frontally. These children studied in special education learning frameworks. In a regular education framework 68% of children studied remotely during the LD period. A higher percentage of children dropped out of school during the LD period compared to the BLD period, but the difference was not statistically significant. The explanation for this finding, among other things, was the inability of the educational staff to monitor the children's school attendance during the LD period. The influence of isolation on children's mental health and the number of children who committed self-harm or suicidal attempts tripled during the LD period and the difference was significant. The incidence of depression was doubled during the LD period, but the difference was statistically significant in low-income families. These findings reflect an injury to emotional development through a reduction in group mutual support, a lack of support from the education system, and a lack of a healthy routine that would allow regulation of stress and anxiety in minors. A similar finding was found in different studies around the world [13-20]. Conflicting data are reported in the literature regarding the incidence of anxiety disorder, obsessive-compulsive disorder (OCD), psychotic disorders, and PTSD. Our study did not find a significant difference in the incidence of those disorders. Our results matched the findings from a recent study evaluating American adolescents. This population also demonstrated similar incidence in anxiety, depression, and stress-related disorders during LD periods [21]. There was a statistically significant increase in adolescent drug use in low-income families. There was a decrease in the number of children presenting with eating disorders. We suspect that the reason was referral of these cases to specialized units or centers.

We observed a statistically significant reduction in children with behavioral disorders and ADHD diagnosis during the LD period with a parallel statistically significant reduction in recommendations for stimulant medications in the general population. We assumed that this phenomenon related to a decrease in educational staff attention, and detection of learning and behavior problems among the children.

Interestingly, among low-income families our findings were different. We found in that group a statistically significant increase in the number of children with behavior problems. We assume that it was related to larger psychological and economic pressures in low-income families. No difference was observed in the number of children who were recommended for antipsychotic treatment; however, a non-significant increase in the recommendation for selective serotonin reuptake inhibitors use was observed during the LD period. Moreover, statistically significant more children were referred for psychotherapy during the LD period compared to the last year before the LD.

The strength of this study is that it compared data from a psychiatric regional out-patient clinic, which evaluated each patient personally and separately and all intakes were conducted by professional psychiatrists, in contrast to other studies that used data from surveys or a database.

LIMITATION

This study presented the results of a specific group of children and adolescents who underwent a psychiatric assessment. The results do not reflect a mental health problem in the general population. The size of the groups was relatively small.

CONCLUSIONS

In our study, we found a significant change in the characteristics of the referrals for the first psychiatric evaluation. Indirect effects of COVID-19 include the disruptions to daily life that impacted on mental health and well-being, delayed health-seeking behaviors, disrupted family income, and increased household stress. These indirect effects were associated with higher suicide attempts and an increase in depression rate among children, with a parallel decrease in referrals for first psychiatric evaluation because of behavioral disorders, ADHD diagnosis, and stimulant drug use. The educational system is important in identifying learning and behavioral difficulties among children. It is likely that during the LD period many children developed educational, social, emotional, and behavioral gaps in addition to the loss of skills in dealing with everyday problems. More research is needed to understand the trajectory of adolescent mental health experiences during the COVID-19 pandemic, including the long-term impact of the lockdowns and social isolation. In the case of LD and social isolation, it is important to develop national programs to monitor the mental state of children and provide support for children and their families.

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If I can do no more, let my name stand among those who are willing to bear ridicule and reproach for the truth's sake, and so earn some right to rejoice when the victory is won.

Louisa May Alcott (1832–1888), American novelist, short story writer, and poet

Capsule

Circulating iNKT cells protect

Invariant natural killer T cells (iNKTs) are tissue-resident, innate-like T cells that recognize lipid antigens and are involved in immune regulation. The heterogeneity and development of iNKT cell populations has not been well defined. **Cui et al.** used various mouse models, transcriptomics, flow cytometry, and histology to better understand iNKT subpopulations. The authors uncovered a circulating population of iNKT cells that expressed

specific receptors and were distinct from conventional iNKT cells in mice and humans. This iNKT subset depended on interleukin-15-positive medullary thymic epithelial cells for development and maturation. The circulating iNKTs were highly cytotoxic and protected mice from melanoma metastasis and influenza infection.

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Eitan Israeli

Capsule

A new class of bacterial genotoxins

Individuals with inflammatory bowel disease are at increased risk of developing colorectal cancer compared with the general population. The gut microbiome is among the many factors that can influence tumorigenesis, in part by modulating the immune system and producing microbial metabolites. **Cao et al.** developed a functional screen to test whether gut bacteria from patients with inflammatory bowel disease showed genotoxic effects. The authors discovered a family of DNA damage-inducing microbial

metabolites called indolimines, which were produced by the Gram-negative bacteria *Morganella morganii*. In a mouse model of colon cancer, *M. morganii* exacerbated tumor burden, but a mutant form of the bacteria unable to produce indolimine did not. This diverse series of genotoxic small molecules from the human microbiome may play a role in intestinal tumorigenesis.

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