THE IMPACT OF THE COVID-19 PANDEMIC ON MENTAL HEALTH OF CHILDREN AND ADOLESCENTS.

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June 2020

UPPSALA
UNIVERSITET

A project work submitted for the fulfillment for the Master's programme in Medical Research, to the Department of Medical Biochemistry and Microbiology, Uppsala University.

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ACKNOWLEDGEMENTS

Thank you to my family – my Mother, Father and my Brother for their unconditional love and support.

Thank you to my supervisor Daniel Lin for his endless guidance and motivation I needed to bring this project to fruition.

Thank you to everyone at the Department of Medical Biochemistry and Microbiology, Uppsala University.

Special thanks to my classmates and other friends at Uppsala University.

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Abstract

The rapidly spreading pandemic of SARS-CoV-2 (COVID-19) infection with high morbidity and mortality has overwhelmed the global healthcare services. With mysterious origins and the capacity of affecting multiple types of tissues, SARS-CoV-2 has baffled many scientists - which has posed great challenges in the development of pharmaceutical treatments and preventions (i.e., vaccination). The COVID-19 pandemic has also led to a slew of non-pharmaceutical interventions (NPIs) to slow down the spread of the virus. The sudden imposition of these NPIs including social distancing, lock-down, school closures, isolation, and quarantine of suspected cases or contacts, has greatly affected the mental health of children and adolescents. Concerns about the impact of these NPIs on mental health, especially for vulnerable populations such as children and adolescents, have emerged. This study discusses several different aspects of the impact of the COVID-19 pandemic on the mental health of children and adolescents.

Accumulating evidence has shown that the vast majority of children and adolescents exposed to the SARS-CoV-2 virus are asymptomatic, although few cases turned unfortunately severely ill. The genomics, microbiology, and biochemistry of this novel coronavirus reveal several peculiarities, making it a tough entity. The profound impact of social distancing along with the closure of schools, parks, and other recreational activities on the delicate minds of children and adolescents makes them irritable, angry, and rebellious. This assumes a major challenge in children with mental health issues or in those with special needs. Lock-down, quarantine and isolation further complicate the mental

health issues and are discussed along with remedial measures. The impact of an already overwhelmed medical care system on the mental healthcare quality can be profound and needs a specially chartered approach by the psychiatrists supplementing the COVID-19 control activities. Children/adolescents with neuropsychiatric issues need special care, as they have abnormal impulsive behaviour and actions such as running away, unhygienic acts, spitting etc. All these mental health issues in children and adolescents, who form a sizable population of the society and are the future of the planet, forms the subject matter of this work. Thus, all programmes of COVID-19 control must simultaneously address these important mental health issues of children and adolescents to prevent this 'parallel pandemic' of psychiatric disorders. The latter may persist much longer and prove equally challenging and costly.

Introduction

The COVID-19 pandemic started out as a small viral outbreak and ended up becoming one of the largest pandemics that mankind has ever faced. It all started on December 31st, 2019 on the New Year's Eve when 27 cases of atypical pneumonia were found in Wuhan city, Hubei province in China (Lu. H, 2020). On 7th January 2020, the virus was first isolated and identified as Severe Acute Respiratory Syndrome Coronavirus 2 [SARS-CoV-2] (World Health Organization, 2020). We underestimated the disease and it took us a decent 2 months to declare it as an official pandemic, on 11th March 2020 (World Health Organization, 2020). As per 31st May 2020, the number of cases of confirmed COVID-19

globally is over 6.3 million; diagnosed in 213 countries and 2 international conveyances (Diamond Princess and MS Zaandam) according to an online virus tracker Worldometer. The last time a pandemic with a similarly extensive scale occurred, was the Spanish flu in the year 1918 to 1920. When compared to previous epidemics and pandemics in history, the rate of progression for the COVID-19 is exceptionally high. The ever-shrinking world with its superfast transport only aids the further spread of the virus. An unknown dread has descended on our species. The major lack of knowledge about the disease and a high rate of infectivity, creates a general sense of unrest and fear among the people. Few of the measures being taken to halt the chain of COVID-19 spread include: social distancing, lockdown of country borders, transport disruption and maintaining personal hygiene. This led to our daily lives coming to an abrupt pause, almost as if time itself is standing still. These drastic changes in the world in such a short period of time has cast a shadow of extreme pressure and stress on the mental health of the masses. Each and every one of us, especially the young ones are at a high risk of developing mental health issues and psychiatric symptoms that needs to be addressed.

Aims and Objectives

1. To study the impact of social distancing on mental health of children and adolescents.
2. To study the impact of lock-down on mental health of children and adolescents.

3. To study the impact of an overwhelmed healthcare system on mental health care quality.
4. To study other miscellaneous impacts on the mental health of children and adolescents.

Materials and Methods

The project was based on the study materials retrieved through the electronic bibliographic databases (PubMed, Cochrane library and CINAHL). COVID-19/SARS-CoV-2 "AND" mental health "AND" children/adolescents were used with 2 or 3 of these keyword pool – genomics, biochemistry, microbiology, anxiety, depression, social distancing, quarantine, isolation, lock-down, children with special needs (Table 1). The articles thus procured, were downloaded. They were thoroughly studied and important aspects highlighted. After this exhausted study, the collected material was classified according to the contents of the project. Wherever possible, the figures and tables were made from the existing material to compare the existing data.

In all, 128 research papers/reviews/correspondence were studied, of which 61 were included in my project. After several rectifications and corrections under my supervisor, the project was groomed to its present form.

Results and Discussion

The results and discussion has been combined to avoid the repetitions, and make text more concise. They are composed of 6 important sections. The first section gives a brief sketch of COVID-19 infection in children and adolescents. The second section briefly outlines the salient genomic, microbiological and biochemical characteristics of the virus. The 3rd,4th and 5th sections respectively discuss the impact of social distancing, an overwhelmed medical care and lock-down on the mental health of children and adolescent. The 6th section deals with the impact of quarantine/isolation on the minds of children/adolescents, altered parental behavior of health-care workers of COVID-19 control programs with their children, and the impact seen on neuropsychiatric children and adolescents.

(I) COVID-19 infection in children and adolescents

COVID-19 infection in children and adolescents shows epidemiology and clinical features similar to those seen in the adults. Wu and McGoogan (2020) from the Chinese Centre for Disease Control and Prevention studied 72,314 COVID-19 patients. They reported that 2% of the confirmed COVID-19 patients were children aged between 1-19 years, of which 0.9% were under the age of 10 years. The clinical symptoms were mild in the majority of them. COVID-19 infection can be asymptomatic at one end of the spectrum. The other end of the spectrum, which fortunately is uncommon, are the critical patients requiring intensive care and having a high mortality (Table 2) (Carlotti et al, 2020).

Table 2 : Spectrum of COVID-19 infection

Asymptomatic	**Mild**	**Moderate**	**Severe**	**Critical**
Absent signs and symptoms. COVID-19 test positive.	Non-specific constitutional features like fever, fatigue myalgia, sore-throat, running nose, gastrointestinal symptoms. COVID-19 test positive.	Persistent fever, dry or productive cough. Pulmonary lesions on CT scan. COVID-19 test positive.	Deterioration of previous symptoms within a week. Dyspnoea and hypoxemia. COVID-19 test positive.	Acute Respiratory Distress Syndrome (ARDS) Shock Encephalitis Myocardial injury Coagulopathy Kidney injury COVID-19 test positive.

The usual presentations in children are fever, fatigue, dry cough, nasal congestion and runny nose. Gastrointestinal symptoms are nausea, vomiting and diarrhoea. Most of them recover in a week or so. Zheng et al (2020) studied 25 hospitalized children and found that fever, dry cough, abdominal pain, vomiting and diarrhoea as a presenting complaint. Two of these children developed severe disease requiring ICU admission, but improved with medical intervention. Several other workers too recorded a milder disease in children (Xia et al, 2020, Castagnoli et al, 2020, Morand et al, 2020, Dong et al, 2020, Lu et al, 2020). Ludvigsson (2020) reviewed 45 studies and found that children accounted for 1-5% of total

diagnosed COVID-19 cases. A severe illness is sometimes seen in children under the age of 1 year, or those with underlying disease (Tezar and Demirag, 2020). Boys had a higher rate of infection than girls (Lu et al, 2020, Xia et al, 2020). Xu et al (2020) reported a positive rectal swab even though nasopharyngeal testing was negative in 8 pediatric patients. This might raise apprehension about a possible faeco-oral route of transmission.

CDC COVID-19 response team (2020) USA, scrolled 2572 COVID-19 cases in children less than 18 years of age (median age = 11 years). Of these, 813 (32%) were aged 15-17 years, another 682 (27%) below 10-14 years, and 398 (15%) aged less than a year. Further, of the 345 pediatric patients, 80 (23%) had atleast one underlying condition – chronic lung diseases (40 patients), cardiovascular disease (25 patients) and immunosuppression (10 patients). The incidence of <18 years patients was 1.7% of the total affected COVID-19 patients (CDC COVID-19, 2020). In a population-based study in Iceland for screening for SARS-CoV-2, 87 (0.8%) in open invitation screening and 13 (0.6%) in the random population screening were tested positive. Children under the age of 10 and females had a lower incidence of SARS-CoV-2 infection than adolescents or adults and males (Gudbjartsson et al, 2020). In Republic of Korea, from the total confirmed cases, the age distribution showed M shape with two peaks in the age group of 20s and 50s. The proportion of children (≤ 19 years) in the total population of Korea is 18%. Therefore, COVID-19 in this age group also needs significant attention (Korean Society of Infectious Diseases, 2020).

(II) Genomics, microbiology and biochemistry of SARS-CoV-2

All efforts to overpower SARS-CoV-2 (COVID-19) are being challenged due to its unique properties, genetic ambiguity and extreme contagiousness. However, a highly advanced molecular and genomic epidemiology is well on its way to unfold all mysteries of SARS-CoV-2, and devise ways for its precise therapy and effective vaccine. There is an urgent need to clearly understand the host-pathogen biology of COVID-19 along with all intricacies unique to this virus (Tay et al,2020). Coronaviruses are not alien for scientists. Human coronaviruses 229 E, NL63, OC43 and HKU-1 usually affect the upper respiratory tract with mild symptoms. Three other coronaviruses, which replicate in the lower respiratory tract, can cause severe, sometimes fatal, disease. They are:

a. SARS-CoV - Severe Acute Respiratory Syndrome Corona Virus
b. MERS-CoV - Middle East Respiratory Syndrome Corona Virus
c. SARS-CoV-2 - Severe Acute Respiratory Syndrome Corona Virus-2

COVID-19 pandemic has galvanized the research workers the world over, and triggered an unprecedented deep impact on biomedical research – molecular biology, virology with emphasis on molecular epidemiology and comparative genomics (Rodriguez-Morales et al, 2020 i & ii).

Advances in sequencing technology has ushered in a new era of genomic epidemiology where traditional molecular diagnostic and genotyping methods are enhanced/replaced with novel throughput genomic-based methods. The latter allows to analyze and compare the entire pathogen genome. This, in turn helps to unfold the mystery into how and why infectious diseases spread. This tool is now indispensable in understanding the many aspects of COVID-19 pandemic. The initial full genome sequence analysis of this virus revealed its taxonomic status as a member of the Betacoronavirus with a divergence from SARS-CoV or MERS-CoV (Rodriguez-Morales et al, 2020 iii). Further, refined methods of phylogenetic analysis clarified that COVID-19 and Bat-SARS-like coronavirus cluster is a distinct lineage within the subgenus of the Serbecovirus (Zhu et al,2020; Paraskaris et al,2020).

SARS-CoV-2 is 79 % genetically similar to previous SARS-CoV (Coronaviridae Study Group, 2020). The presence of spike protein (S) on the surface of COVID-19 gives it a characteristic "crown" appearance. The S protein comprises of 2 subunits – S1 and S2. The S1 subunit comprises of a receptor-binding domain (RBD) and an amino terminal domain. The RBD binds to angiotensin–converting enzyme-2 (ACE-2) as its host cell target receptor, thus starting the infectious process (Zhou et al,2020). The S2 subunit consists of a fusion peptide region which inserts into the host membrane. Two heptad repeat regions –HR1 and HR2 – are the other components of the S2 subunit, which cause membrane fusion and release the virus into the host cytoplasm (Tay et al,2020). SARS-CoV-2 has 98 % genetic similarity to bat coronavirus RaTG13 (Zhou et al,2020). Coronavirus sequences in the pangolin also share a high similarity to SARS-CoV-2 (Anderson et al,2020).

COVID-19 shows a difference in fatality rates between males (2.8%) and females (1.7%). As ACE-2 is located on the X chromosome, there may be alleles that confer resistance to COVID-19, explaining a lower fatality rate in women (Tay et al,2020).

Steffanelli et al (2020) characterized full length genomic sequence of two SARS-CoV-2 strains in Italy, one from an Italian and other from a Chinese patient who visited Rome. The sequences presented were analyzed in the context of other available genome sequences from Europe and elsewhere. In a phylogenetic tree, the Italian patient's sequence clustered with the sequences from Germany. The Chinese tourist's sequence clustered with other European sequences. This either suggests a multiple SARS-CoV-2 introduction in Europe or a virus evolution during circulation.

The database of the Global initiative on sharing all influenza data (GISAID), initially developed for genomic data sharing on influenza (Shu et al,2017), has presently widened its coverage to include a comprehensive, dynamic and constantly updated SARS-CoV-2 database (Rodriguez-Morales et al,2020 iii). Over 2220 full genomes of SARS-CoV-2 are included in the SARS-CoV-2 Public Database of GISAID. They are mainly located in 3 Clades, namely G Clade (931 genomes), S Clade (541 genomes), V Clade (208 genomes) and other 548 additional clades (Phan,2020; GISAID,2020). As new genomes of COVID-19 are being procured from imported cases, contacts and those of community transmission, this will definitely shed more light in better understanding its genomic epidemiology. This in turn will assist us in recognizing transmission clusters, biological evolutionary rate, magnitude

of the pandemic, genetic diversity, clinical and epidemiological patterns across the globe, usefulness of diagnostic tests and designing therapeutics (Rodriguez-Morales et al,2020 iii).

(III) Impact of social distancing on mental health of children and adolescents

Until a cure comes in sight and/or a vaccine develops for SARS-CoV-2, preventive measures will remain paramount in curtailing the infection rate. Social distancing is one such measure to avoid spread through infected droplets. This is being stressed and implemented all over the world. In a way, it is segregation of every individual as much as possible from other individuals. In vulnerable people who are at a high risk of getting serious COVID-19 infection, in particular, this can be life-saving. These include elderly people, pregnant females and patients suffering from diabetes, heart diseases, hypertension, or on immunosuppressant therapy. Countries after countries enforced “social distancing” measures to curb transmission, protect the at-risk individuals and to prevent the saturation and subsequent collapse of medical health services due to flooding of enormous numbers of infected people (Mahase, 2020). The duration of social distancing is being increased repeatedly by the law-enforcing authorities. It appears that we have to live with it for quite some time.

The enforced social distancing compounded with a lock-down has come as a bolt from the blue for our children and adolescents all over the globe. A sudden order of wearing mask,

cutting off social gathering, closure of their favorite sticking around café, gossip points, gyms, gloomy media coverage and other restrictions shake their psyche and rebel their mind. Anxiety, frustration, low mood, irritation, anger and depression set in as the days pass. Two issues that are most unacceptable to our free birds – children and adolescents – are the uncertainty of the situation and isolation. COVID-19 pandemic has brought both of these in an unprecedented way (Wagner, 2020, Ferguson et al, 2020).

Thus, it is imperative that we must keep in mind the mental health issues of our sizable population – children and adolescents- while advocating social distancing. Mitigating the mental health impact of social distancing should include active counselling by the parents. They should be assured that the current situation is temporary, and soon they will regain previous enjoyable life (Wagner,2020, Venkatesh and Edirappuli,2020).

(IV) Impact of the overwhelmed medical healthcare system on the mental health care quality

The national health system of all the affected countries are nearly overwhelmed by the near-impossibility of responding to the needs of multitude of serious, infected patients (Armocida et al,2020). Declared a public health emergency by the World Health Organization on January 30, 2020 (WHO,2020), it is getting compounded day by day for over 6 months. The relentless efforts – to contain the pandemic, treating innumerable

patients with limited resources and finding effective treatment and effective vaccine – has overwhelmed the medical care system unprecedentedly (Zaka et al,2020).

Though, all the energy and resources of national medical care systems are directed towards COVID-19 pandemic, yet they are utterly inadequate despite health care workers toiling incessantly. This has caused a gross neglect of other health priorities especially the mental health care. Paradoxically, the demand and importance of the latter has actually compounded several times, especially due to the containment measures taken to subdue COVID-19. Children and adolescents are the greatest victims in such a scenario, more so if they have a neurological/neuro-psychiatric disorder.

Zhang et al (2020) stressed that an additional effort is required if patients with psychiatric disorders get COVID-19 infection, because these patients present an impulsive behavior, running away and other abnormal actions including spitting and unhygienic acts, which are not conducive to the control of COVID-19. Yao et al (2020) believe that mental health disorder patients are more susceptible to infections, chiefly due to their apathy regarding personal protection, little awareness of risks, cognitive impairment and confined conditions. Seminog and Goldacre (2020) found that severe mental illness patients have an increased risk of pneumonia, thus making the present pandemic more severe and fatal for them. Sartorius (2013) way back had postulated that mental health disorder comorbidities to other infectious diseases will be the main challenge for medicine of the twenty-first century, which unfortunately may come true with COVID-19 pandemic.

Children and adolescents with mental illness show an anxiety and fear far disproportionate to that seen in the general population under stress. They may start hoarding medical supplies, food, restrict their social interaction, isolate themselves and overreact in every day routine (Banerjee 2020). After observations of several clusters of psychiatric symptoms in context of COVID-19 pandemic, Fakte et al (2020) recorded these salient features:

a) Increased anxiety in both in- and out-patients of psychiatry irrespective of the clinical diagnosis.

b) More domestic violence often associated with drug/ alcohol consumption, which may adversely affect children at home.

c) A nihilistic 'apocalyptic' syndrome of patient's cutoff from their families.

d) Pneumonia and sepsis-related confusional states causing visual/acoustic hallucinations.

e) Chloroquine-related psychosis or toxicity.

Choi et al (2020) observed that the unprecedented global health created by COVID-19 pandemic has ushered in a 'second pandemic' of mental health crisis in global health system and community. The latter will substantially affect all – children, adolescents, adults, elderly, and thus has to be addressed simultaneously, despite an already overwhelmed medical care system. Dalton et al (2020) found that health care workers are experiencing unprecedented demand caring for predominantly adult patients' population, thus magnifying the invisibility of children's urgent psychological needs who account for over 42% of the world's population.

It is imperative to support children and adolescents facing bereavement and issues related to the parental unemployment or loss of household income. There is also a need to monitor these young people's mental health status over the long term, and also to study the effect of prolonged school closure, strict social distancing and pandemic itself affect the well-being of children and adolescents (Lee,2020). Liu et al (2020) recommend that children's access to mental health services can be improved through the collaborative networks that are established nation-wide and consists of psychiatrists, psychotherapists, research workers and community volunteers. Further, post-pandemic surveillance of mental disorders among these children and adolescents should be mandatory.

(V) Impact of lockdown on mental health of children and adolescents

Lockdown imposition forms an important component in the control of COVID-19 pandemic. China has shown to contain it by strict enforcement of physical distancing, lockdown case isolation and contact tracing (Lau et al,2020). The longer the duration of lockdown, the better will be the control of infection (Sjodin et al, 2020). At present, a total or partial lockdown is continuing in most of the affected countries, with the resultant closure of schools and colleges. The examinations are postponed, recreation and other activities of students closed and social distancing has become mandatory. All this has put a tremendous mental pressure on every child/adolescent. To add to this psychological stress, the horror of the disease on social media and its consequences, add to despondency and hopelessness in the young hitherto carefree minds. Children/adolescents constitute a sizable population

of the world. The COVID-19 pandemic has ushered another parallel 'pandemic of mental health issues' in their innocent mind. Anxiety, anger, frustration, loneliness, difficulty in concentration, a low motivation, insecurity and depression has suddenly invaded their psyche (Jakovljevic et al, 2020, Hiremath et al, 2020, Wang et al, 2020). The scenario assumes more concern in children and adolescents who have a pre-existing neuropsychiatric disorder or have special needs. Unfortunately, their proportion is also quite high in the world.

Regarding the young children with special needs such as autism spectrum condition (ASC), the lockdown can hamper all interventions with special therapists either at home or at dedicated hospitals exacerbating their behavior problems (Narzisi et al, 2020). Thus, parents will have an additional burden to keep such children stimulated, explaining these children/adolescents what has suddenly caused all staying at home and suspension of normal routine. The children with ASC have high psychiatric vulnerabilities, executive functioning deficits and concrete cognitive style. Some of them have serious verbal issues and show difficulty in phenomenological perception, and anxiety disorder (Pellicano et al, 2012, Li et al,2019). A lock-down will pose a great challenge for such children and adolescents. Thus, it is imperative to incorporate psychiatric and psychosocial measures simultaneously to address the unspoken, confused and worried state of this young population.

(VI) Other impacts on mental health

a) Healthcare workers with child/adolescent at home

There has been a tremendous work pressure in healthcare workers – both physicians and nurses – who come directly in contact with hospitalized COVID-19 patients. Doing a long shift every day, dealing with a highly infectious, often lethal virus about which much is yet to be known, naturally causes a panic and fearful situation. Even after a long, tiring duty, their mind is far from rest, and remain apprehensive of getting infected, or spreading the infection to their children. The plight of suffering patients, perfectly healthy a few days ago, scares the sleep off their eyes. Lai et al (2020), in a cross-sectional study on 1257 health-care workers in 34 hospitals of China dealing with COVID-19 patients, recorded distress (71.5 %), depression (50.4 %), anxiety (44.6 %) and insomnia (34 %) as their commonest symptoms. Amongst them, the front-line health-care workers (doctors and nurses) who have to come in closed contact with infected COVID-19 patients, were associated with a higher incidence of such symptoms. Li et al (2020) studied psychological stress, especially vicarious traumatization caused by COVID-19 pandemic, among members and non-members of medical teams aiding COVID-19 control and compared it with that of the general public. They found that the vicarious traumatization score, including physiological and psychological responses, for front-line medical workers were significantly lower than non-frontline nurses or general public ($p < 0.001$). Table 3 summarizes several important research papers on the mental health issues of health-care workers involved in the management of COVID-19 patients.

This immense stress in parents, affects the psychological states of children/adolescents at home. Older children and teenagers find a new changed, self-distancing, cautious behavior of such parents. A singular focus on the child/adolescent will miss a critical component in the youth's outcome - the family. The healthcare worker parents are overwhelmed by COVID-19 crisis, their emotional stress may fuel the child's depression, anxiety or other psychiatric disorder (Wagner, 2020).

b) Quarantine and isolation of children and adolescents

Several factors – highly infective nature of the SARS-CoV-2 virus, limited knowledge on its epidemiology, behavior, infectivity and therapeutics, unpreparedness of the medical care system to deal with an enormous load of patients and prompt human to human spread – have necessitated quarantine and isolation of suspected/confirmed cases. This, along with other measures of social distancing and lock-down, is likely to reduce/control the spread of the virus, and thus give health care authorities a badly needed time to take gigantic steps and prepare to deal with any eventuality. However, the psychological impact of quarantine and isolation on the mental health of any individual, especially children and adolescents, is highly detrimental (Brooks et al,2020). Quarantine involves restriction of movement/ separation of an individual who has potentially been exposed to an active COVID-19 patient for 2 weeks and looking if they show signs of the disease. Isolation is done when an individual develops overt signs and symptoms with a confirmed diagnosis, treated with all precautions till becomes disease-free (CDC,2017). Separation from loved ones, uncertainty over disease status, loss of freedom, boredom, frustration, outbursts of anger/depression,

all may be the outcome during quarantine/isolation. Children and adolescents are more vulnerable as their naïve minds are not accustomed to such restrictions. This can translate into more problematic and enduring psychiatric effects in them (Wang et al, 2020). However, Sjodin et al (2020) believe more efforts need to be undertaken at household level – keeping physical distance even within a household, wearing face masks and segregating within.

Amongst the mental health problems encountered during quarantine/isolation, a low mood and irritability have the highest prevalence. Other symptoms include emotional disturbance, depression, stress, anger, insomnia, emotional exhaustion and post-traumatic stress symptoms (Xiao et al, 2020; Wang et al, 2020; Cosic et al, 2020; Wagner, 2020). Adolescents, in particular, are likely to react more adversely to encroachment on their usual routine, activities and livelihood, with increased level of loneliness, depression, harmful drug/alcohol use. Self-harm and suicidal behavior are bound to rise (Shigemura et al,2020; Cosic et al, 2020).

The stressors during and after quarantine, and how to mitigate the consequences are given in Table 4 (Brooks et al, 2020).

Table 4 : Stressors during and after quarantine.

A. <u>Stressors during quarantine:</u> i. Inadequate information – Poor information, insufficient, ambiguous guidelines, lack of clarity about risks, non-allaying of anxiety by public health authorities ii. Duration of quarantine – Longer duration are more likely to cause anger, avoidance behavior and post-traumatic stress disorder

iii. Boredom/Frustration – Sudden stoppage of day-to-day activity, confinement, reduced physical or social contact all contribute to it
iv. Horror of infection - Mind keeps thinking about fear of disease in self or family members, its grave consequences, or death
v. Inadequate supply – Food, water, clothes, accommodation, medical care, all cause frustration.

B. Stressors after quarantine:

i. Stigma - Stigmatization and rejection by people/society made them a recluse. Acquaintances avoided them, cancelled invitation, treated them with hatred or made critical comments
ii. Financial problems – loss of livelihood, poor socioeconomic background, difficulty in getting a job, inadequate government aid can make life tough.

C. Mitigating the consequences of quarantine:

i. Keep it as short as scientifically reasonable – Longer quarantines have proportionately more mental health issues.
ii. Inform adequately on every aspect – Allay the anxiety, and answer every query clearly. Encourage and reassure.
iii. Look for their problem and solve promptly – Keep a coordinated approach, provide adequate supplies promptly
iv. Improve communication/ Reduce boredom – Provide a mobile phone with Wi-Fi, provide social network, keep them reassured.

Good parenting skills becomes particularly crucial when their child/adolescent is in under home quarantine. Alleviating their anxiety and reassuring them that the current situation is only temporary, and they will be able to resume their usual enjoyable life soon, will go a long way to encourage their psyche (Wang et al, 2020; Wagner, 2020).

c) Children and adolescents with neuropsychiatric disorders with or without COVID-19 infection

A pandemic of this proportion is a nightmare in the carefree lives of the youth. Further, if they have neuropsychiatric disorders and in a compromised phase of mental health on medication, they need urgent monitoring and care. The COVID-19 scourge will make them more vulnerable on several counts – all-round stressful atmosphere, closed schools and outpatients in hospitals, difficulty in procurement of anti-psychotic drugs and a lack of attention from parents and siblings (Golberstein et al,2020). Moreover, social distancing and lockdown will further aggravate their agony. During these times, visiting their physician regularly, getting the medication and support of family will get more difficult, and may precipitate a crisis. If they get infected with COVID-19 virus and put in quarantine or isolation, it will add to their woes and might even become life-threatening. Zhang et al (2020) stressed that an additional effort is required if patients with psychiatric disorders get COVID-19 infection, because these patients present an impulsive behavior, running away and other abnormal actions including spitting and unhygienic acts, which are not conducive to the control of COVID-19. Yao et al (2020) believe that mental health disorder patients are more susceptible to infections, chiefly due to their apathy regarding personal protection, little awareness of risks, cognitive impairment and confined conditions. Seminog and Goldacre (2020) found that severe mental illness patients have an increased risk of pneumonia, thus making the present pandemic more severe and fatal for them. Sartorius (2013) way back had postulated that mental health disorder comorbidities to other infectious diseases will be the main challenge for medicine of the twenty-first century, which unfortunately may come true with COVID-19 pandemic.

Zhang et al (2020) studied school-age children with attention-deficit hyperactivity disorder (ADHD). Studying their acute stress, mood states and behavioral symptoms, they found a considerable deterioration during COVID-19 outbreak. Closure of schools and confinement to home brought elevated stress in both children and their parents. This urgently warrants a modified treatment regime to control negative mood and involve disaster-risk-reduction activities. Golberstein et al (2020) observed that in the United States, the schools are a major source of nutrition, delivery of health care and also mental health services, games, recreation etc. Their closure will deprive the ongoing mental health treatment and cause relapse/aggravate the condition. The treatment by private clinicians outside school physicians who do not have their confidential health record may make them more apprehensive due to breach of privacy, thus aggravating a crisis.

Zhang et al (2020) also pointed towards the drug interactions which are likely when antiviral drug will have to be used along with psychotropic medication. Most antipsychotic drugs and antiviral medications utilize cytochrome P-450 (CYP) enzymes for their metabolism (Roncero et al, 2018). Thus, antiviral drugs have to be combined with safe antipsychotic drugs which do not utilize (e.g. lorazepam) or minimally utilize (e.g. citalopram, olanzapine, valproate) the CYP enzyme system (Zhang et al 2020).

Whatever may be the course of COVID-19 pandemic, it certainly has ushered in a parallel epidemic of fear, anxiety, depression and despondency all over the globe, which needs simultaneous attention. Children and adolescents need particular attention as such events can cause indelible scarring in their psyche for a lifetime.

Future prospects

The SARS-CoV-2 pandemic has affected every sphere of life and every individual of the world, but affected the mental health of children and adolescents manifold. This project has endeavoured to highlight this seemingly indelible impact of COVID-19 pandemic on the mental health of children and adolescents. It is imperative to simultaneously include remedial therapy for mental well-being of this significant group while charting programmes for control of this pandemic.

As the COVID-19 pandemic is still at its zenith, the future studies should now concentrate on mental health implications in children and adolescents. Large scale studies should include the various aspects of mental health issues in different situations in this evolving age-group during this pandemic. They are facing situations, previously unimaginable, which include a cauldron of hostile home environment, bereavement, issues related to parental unemployment, loss of family income, restricted atmosphere, etc. If they get infected, these children are put in isolation and get separated from their loved ones. Otherwise too, they face school closure, halt of daily routine, and a plethora of strictures. Future projects must shed more light on the profound, indelible impact of each of these parameters on the mental health of children and adolescents. Social distancing, lock-down, quarantine/isolation, all can have long-lasting repercussions on the mental health of children and adolescents and need to be studied in detail for this aspect.

The mental health issues associated with this pandemic may exert a profound and long-term impact on mental health of these children and adolescents, and hence follow-up in-depth research for this cohort of youths may be warranted. This will, in turn, provide a lot of insight in understanding of this vital aspect of mental health in this age group. Future remedial measures, thus, can then be based on these studies to prevent or at least alleviate the mental health issues in children and adolescents, should such large-scale pandemics persist or recur in the future.

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Tables

Table 1 : Special tags/Syntax used in PubMed search for the project

Special tags/Syntax	Results found
COVID-19 (AND) Children and adolescents	188
COVID-19 (AND) Mental health issues	36
COVID-19 (AND) Mental health issues (AND) Children and adolescents	19
COVID-19 (AND) Children and adolescents (AND) Pre-existing mental health disorders	3
COVID-19 (AND) Children with mental disorders	5
COVID-19 (AND) Children with special needs	55
COVID-19 (AND) Children with special needs (AND) Mental health	4

COVID-19 (AND) Genomics, Microbiology, Biochemistry	13
COVID-19 (AND) Lockdown	6
COVID-19 (AND) Lockdown (AND) Children and adolescents	1
COVID-19 (AND) Social distancing	99
COVID-19 (AND) Mental health (AND) Social distancing	18
COVID-19 (AND) Social distancing (AND) Children and adolescents	2
COVID-19 (AND) Overwhelmed Medical care system	48
COVID-19 (AND) Overwhelmed Medical care system (AND) Mental health	2
COVID-19 (AND) Quarantine (AND) Children and adolescents	4
COVID-19 (AND) Quarantine (AND) Mental health	24
COVID-19 (AND) Isolation	117
COVID-19 (AND) Isolation (AND) Mental health	24
COVID-19 (AND) Isolation (AND) Mental health (AND) Children and adolescents	3

Table 3 : Studies conducted in China regarding Mental Health concerned in subject in relation to COVID-19 infection.

Authors	People Studied	Methodology	Study instruments	Observations
1. Lu et al, 2020.	Medical work force (n=2042) and administrative staff (n=257).	Cross- Sectional Survey	Numerical rating scale (NRS) for assessment of Fear, Hamilton Anxiety Scale (HAMA) for depression for anxiety, Hamilton	70.8 % from Fujian Province. Nearly ¾th in each group were females. Leading age band was 31-40 years (40%).

			Depression Scale (HAMD) for depression.	High risk (working directly with COVID-19) had maximum fear, anxiety and depression compared to low risk (other clinical departments) and non-clinical (administrative, logistic) subjects. Non-clinical subjects showed minimum fear, anxiety and depression compared to other two groups.
2. Lai et al, 2020	Health-Care workers (n=1257; physician = 493, nurses = 764)	Cross Sectional, 34 hospital-based, 2 stage cluster sampling	Patient Health Questionnaire (PHQ-9), Generalized Anxiety Disorder Scale (GAD-7), Insomnia Severity Index (ISI-7, Impact of Event Scale – Revised (IES-R).	65.5% worked in Wuhan, 20.8% in Hubei and 18.8% outside Hubei. Over ¾ were women (76.7%). Leading age band was 26-40 years (64.7%). Depression 50.4 % (severe in 4.9% physicians and 7.1% in nurses). Anxiety 44.6% (severe in 3.4% men and 5.8% in women).

				Insomnia 34% (severe in 1.7% front-line workers and 0.4% in second-line workers). Distress 71.5% (severe in 12.6% of Wuhan workers 7.2% in Hubei workers and 7.2% in outside both)
3. Xiao et al 2020(i)	Medical staff treating COVID-19 patients (n=100)	Cross-sectional, self-rated questionnaire	Self- rating Anxiety Scale (SAS), General Self-efficiency Scale (GSES), Stanford Acute stress Reaction Questionnaire (SARS), Pittsburgh Sleep Quality Index (PSQI), Social Support Rate Scale (SSRS)	Medical staff of several provinces in China (Doctors and nurses). Mean age was 32.31+-4.88. Levels of social support were significantly associated with self- efficacy and sleep quality, and negatively associated with degree of anxiety and stress. Anxiety and stress negatively impacted self-efficacy and sleep quality.
4. Li et al, 2020	General Public (n=214), frontline Nurse	Cross sectional, self- rating survey using	Vicarious Traumatization Index	Nurses working in hospital, and general public.

	(n=234) and non-frontline nurse (n=292).	mobile app.		Age ranged between 25-38 years. A higher traumatization among non-front-line nurses, compared to frontline nurses. A higher traumatization among general Public compared to frontline nurses, but comparable to non-frontline nurses.
5. Wang et al, 2020	General Population (n-1210).	Online survey, Cross-sectional	Depressions Anxiety and Stress Scale (DASS-21), Impact of Event Scale – revised (IES-R)	Included 194 cities in China. Majority (67.3%) were women. Ages between 21.4 to 30.8 years (53.1%). Moderate to severe depressive symptoms:16.5% Moderate to severe anxiety symptoms : 25.8%. Moderate to severe stress : 8.1%.

				Mean anxiety score 55.3 ± 14.2 Anxiety positively correlated with stress and negatively with sleep quality, social support and self-efficiency.
6. Xiao et al. 2020(ii)	People in self-isolation for 14 days (n=170).	Cross sectional self-rated questionnaire.	Self-rating Anxiety Scale (SAS), Stanford Acute stress reaction questionnaire (SASR), Pittsburgh Sleep Quality Index (PSQ1), Personal Social Capital Scale (PSCI-16)	Adult individuals from Central China who had self-isolated following mild COVID-19 infection. These were 101 males (59.5% and 69(40.5% females. Mean age was 37.78 +/- 4.12 years. Mean anxiety score was 55.4 ± 14.3 Anxiety positively correlated with stress and negatively with sleep quality and Social Capital. Social Capital positively correlated with

				sleep quality.
7. Cao et al,2020	College students (n-7143)	Cluster sampling	Generalized Anxiety Disorder Scale (GAD-7)	Lived in Hubei Province; 43.83% in rural areas. 2/3rd were women. Affliction with anxiety – 24.9%; severe - 0.9%, mild anxiety- 21.3%. Living in urban areas in contrast to rural areas was a protective factor, as was living with parents. Results suggested a negative correlation between social support and anxiety symptoms during COVID-19 outbreak.