

Comparative study of pandemics and their impact on children and adolescents: COVID-19 and Spanish Flu

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SUMMARY

Overview: Pandemics are characterized by an abrupt and sudden outburst and absence of preparation for its management. The focus during pandemics is on the medical aspect of the disease and not on its impact on the citizens' or vulnerable groups' psychosocial wellbeing.

Aim: The purpose of this study was to highlight the impact of the pandemics of the Spanish Flu and COVID-19 on children and adolescents as well as to recognize their short and long-term effects on children's and adolescents' physical and mental health.

Materials and Methods: The material of this review consisted of publications regarding the impact of the Spanish Flu and COVID-19 on children and adolescents via relative search through valid databases and websites of trustworthy organizations.

Results: The main finding of the present review was that pandemics negatively affect children and adolescents

undermining their mental and physical health. The factors that negatively impact on this population's normal development include parental death, financial hardships, restrictive measures, disruption of daily routine and absence of social contact. The short-term effects include anxiety, depression, aggressive behavior as well as fear and grief. Mental disorders, disability, poor academic performance and low socioeconomic level are among the long-term effects of the two under study pandemics.

Conclusions: Children and adolescents constitute a vulnerable group amidst pandemics and there is a need for coordinated worldwide and national actions to prevent and timely manage a pandemic's impact.

Keywords: Spanish Flu, COVID-19, anxiety, aggressive behavior, depression.

INTRODUCTION

An epidemic due to an infectious disease spreading worldwide and causing significant morbidity and mortality is defined as a pandemic. Its impact is obvious in many sectors of a society including health, economy, wellbeing as well as social cohesion having both short- and long-term consequences [1].

Prior the 20th century the major pandemics which affected humanity were first the Bubonic Plague (1346-1353) with 75-200 million deaths, followed by the cholera pandemic which lasted from 1846 to 1860 claiming the lives of >1 million people [2]. In the early 20th century during the First World War there was an outbreak of the deadliest pandemic that humanity faced, the Spanish Flu, which lasted from 1918 to 1920. Its estimated mortality ranged from 17 to 100 million deaths mainly affecting people between the ages of 18-50 and was due to the later identified pathogen of the influenza strain H1N1 [3].

In 1957 there was an outbreak of the Asian Flu

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caused by the flu strain H2N2 with 1-4 million deaths mainly affecting the children and the elderly with an estimated mortality of 1/4.000 population [3-5]. Eleven years later a new strain of influenza, H3N2, was responsible for the Hong-Kong pandemic of 1968, claiming the lives of 0.3-2 million individuals [6, 7]. In April 2009 there was a recurrence of the influenza strain H1N1 in Mexico with children being most affected, with a reproductive index ranging between 1.4 and 1.6 [8]. Almost a century after the deadliest pandemic of the Spanish Flu in 1918 since December 2019 humanity has been facing with the new pandemic of COVID-19 due to a coronavirus strain this time, SARS-CoV-2 (Severe Acute Respiratory Syndrome). The disease caused by this novel coronavirus is COVID-19, as the name of the pandemic, and is characterized by high morbidity and mortality with the most affected population being the elderly and those with co-morbidities and nearly 7 million deaths worldwide were recorded on 7th of March, 2023 (WHO Coronavirus Dashboard). The current pandemic has led to a severe disruption of all human activities worldwide due to the imposed measures to protect public health, which included a total lockdown, closure of schools and businesses, travelling restrictions among others [9-11].

During any pandemic there are some socially vulnerable groups including the people of low income and education level, those living in shelters or remote areas including minorities as well as children and adolescents. The latter are at a high risk due to unique characteristics such their dependence on adults. The risk that this group of population is facing include the disruption of their developmental stages, the inability to comprehend the imposed restrictions, and the manifestation of mental disorders due to their inability to manage the perceived stress and anxiety [12-16]. Children and adolescents are even in more risk during a pandemic and especially during the two more severe ones, the Spanish Flu and COVID-19, because the global community in both cases was unprepared to manage not only the disease itself but the consequences of the imposed measures to delay their spreading [17, 18]. Although these pandemics differ significantly regarding morbidity and mortality among various age groups, they both lack a focus on the mental and physical impact experienced by children and adolescents during them.

This population experiences quite differently the psychological pressure due to a pandemic compared to adults, which is intensified due to their exposure to traumatic, unpleasant and incomprehensible events. Also, their exposure to a high volume of information leads to increased levels of stress and anxiety [19-23].

The literature regarding the impact of pandemics on children and adolescents is not yet developed, especially concerning the Spanish Flu mainly because it coincided with the First World War and the excessively high morbidity and mortality of the economically active adults [24]. For the current pandemic there are a few studies about the psychological impact of the imposed measures on children and adolescents, on the recognition that although the morbidity and mortality in this group is low the mental impact is serious [25].

Based on the aforementioned, the aim of the present review was to highlight the impact of the Spanish Flu and COVID-19 pandemics on children and adolescents. A secondary goal was to identify the short- and long-term impact of the pandemics on the physical and mental health of children and adolescents.

Methodology

The present review aimed at identifying, evaluating and interpreting the relevant with the under-study issue publications in order to conduct an in-depth analysis and thus the following methodology was followed [26, 27]:

- Clarification of terms and definitions describing the under-study issue.
- Evaluation of the sources included in the study considering the relevance of the publications as well as the aim(s) of the author(s).

The extraction of the publications was conducted based on the research principles of scientific articles. The chosen data bases were PubMed and Google Scholar and the websites of valid organizations such as the World Health Organization among others. The set research question, which was that children and adolescents are negatively affected during a pandemic with adverse effects on their physical and mental health which undermine their healthy development, determined the key-words which were: *children, adolescents, pandemics, Spanish Flu/influenza, COVID-19, impact*.

Afterwards, the search filters were defined based on the key-words and more specifically they re-

garded the availability of the publication, its type and language, which was the Greek and English one. The titles and the abstracts of the retrieved publications which derived from the previous steps were read and a further search for publications from certain authors or organizations was conducted as well as publications which were necessary after processing the literature used by other studies or/and articles. The distribution of the publications included in the present review was conducted based on its needs.

All the rules of ethics governing reviews were observed and more specifically all references are mentioned and in the case of an actual quotation, quotation marks are used.

RESULTS

Special characteristics of children and adolescents

During pandemics both children and adolescents due to their not well-developed immune system are at high risk of morbidity by the pathogen [28]. Besides the medical aspect, though, this group depends on adults for covering their basic needs as well as their psychosocial ones since they are incapable of living independently [29]. Another special characteristic is that during pandemics all educational institutes are closed creating supervision problems especially for parents who work resulting in older siblings taking care of younger ones [30].

Except these, children and adolescents lack many cognitive and verbal skills and particularly the

very young children determine a situation which prevents them from managing both their own worries as well as their parents. Due this lack, they are unable to comprehend and process the complex information to which they are exposed, leading to adverse and traumatizing conditions, which prevent the proper adjustment and growth [21].

The disruption of their daily routine is another factor responsible for the aggressive and negative behavior and isolation, factors undermining their mental and physical health [31]. The paucity in their socialization, children and adolescents are inclined to break the imposed rules and measures exhibiting a rebellious behavior disrupting family life [32, 33]. Also, the suspension of their education and interaction with classmates and teacher are sources of high levels of anxiety and fear regarding their academic future effects more profound in children and adolescents with special needs [25, 34-36] (Table 1).

Morbidity and mortality

From the few available data regarding morbidity and mortality of children and adolescents during the Spanish Flu and based on the W curve uniquely characterizing it, most children who died belonged in the age group 1-4 years in contrary to those aged over 10 who were less affected. Most infants whose mother died survived but 16% died a little later. The mortality in the age group 1-4 years was estimated between 30%-35%. Fifteen percent of children of 5-9 years and 4% of children 10-14 years died [37].

Table 1 - Special characteristics and needs of children and adolescents and the impact of pandemics.

<i>Characteristic</i>	<i>Cause</i>	<i>Effect</i>
<i>Inability of independent living</i>	Dependence on parents	Absence of adequate supervision, siblings supervising younger ones
<i>Absence of cognitive, behavioral & verbal skills</i>	Developmental stage	Inability to comprehend the situation & adjust, aggressive behavior, negative impact on physical and mental health
<i>Need of a steady daily routine</i>	Absence of emotional responses & skills	Disruption of family life, deprivation of socialization, non-adherence to new measures & rules
<i>Need of interacting with peers and teachers</i>	Necessary developmental landmarks	Negative impact on development
<i>Education & participation in activities</i>	Acquisition of skills	Stress & anger, undermining of mental wellbeing, uncertainty for the future
<i>Need of supportive networks</i>	Covering emotional & social needs & identification of problems	Inability to identify child abuse, loss of stability in the case of special needs

Table 2 - Morbidity & mortality of children-adolescents.

	Spanish Flu	COVID-19
Morbidity	25.6%	0.185%
Mortality	14%	1-5%

Regarding the current pandemic, most infected children and adolescents is asymptomatic or suffer from mild to moderate disease at 90% with only 5.9% from severe. However, the mean age of infection is estimated at 6.7 years of age with morbidity ranging between 1% and 5% [38,39]. In the case of co-morbidities both mortality and morbidity increase [40] (Table 2).

Psychological and social impact

There are no sufficient data regarding the effects of the Spanish Flu mainly because it coincided with the First World War combined with the fact that in the early 20th century recording psychological and social impact was not common [41]. However, the most important effect was due to the excessive number of deaths of adults who had children resulting in a huge increase of orphans [42]. In New Zealand alone children and adults who lost both parents were estimated at 135 while 6,415 lost one of their parents [43]. In New York about 31,000 lost either one or both of their parents and their care was allocated to institution or other citizens and in the cases of infants they were placed with women who already had their own babies [42, 44]. Another major problem was the lack of supervision es-

pecially for children whose parents had died or were infected and were sent to special accommodation due to the fear of the disease [45]. Such adverse conditions posed a great threat the wellbeing of children especially those who resided in institutions where their psychosocial needs could not be covered [46]. Due to such conditions, it can be assumed that children and adolescents who lost their parents due to the Spanish Flu faced many mental disorders which may have been aggravated by the poverty resulting from the war [47, 48].

During the current pandemic the impact on children and adolescents is associated with parents' fear, the disruption of family life and daily routine and the imposed measures. Almost 50% of the children aged 6-18 years is found to be worried about the pandemic and 1/3 experiences extreme fear [49]. It has been supported that separating children from their parents due to the measures may result in stress and anxiety as well as Post Traumatic Stress Disorder (PTSD) [50, 51]. Also, there is an increase in suicides among adolescents during a health crisis due to social distancing and lockdown and a disproportionate deterioration of adolescents' mental health especially those of low-income families [52].

The lockdown measures during COVID-19 have contributed to the increase in alcohol abuse, a decrease in physical activity and a unique for this pandemic characteristic that of overusing technology both for recreational and educational reasons, which in turn has resulted in sleep disorders, obe-

Table 3 - Psychological & social impact of pandemics on children & adolescents.

	Spanish Flu	COVID-19
<i>Loss of parents</i>	Increase in orphans, hospitality by acquaintances and/or relatives, residence in institutions, increase in mental disorders.	-
<i>Paucity in school units' function</i>	Absence of supervision, increased infection possibility, free time in the streets	Disruption of daily routine, engagement in technology, absence of physical exercise, sleep disorders, unhealthy diet, weight gain, emotional and behavioral disorders, symptoms of mental disorders, insecurity for the future and academic performance
<i>Financial disability</i>	Poverty, residing in streets, malnutrition	Disruption of family relationships, uncertainty, insecurity, high possibility of abuse
<i>Restrictive measures</i>	-	Loss of socialization, increase in anxiety, depression and suicidal ideation, possibility of abuse, disruption in children-parents relationships, deterioration of mental disorders, alcohol abuse, absence of opportunities for developing skills

sity due to the sedentary life making children and adolescents extremely vulnerable to inaccurate information and unhealthy lifestyles which are the major sources of depression, stress and anxiety as well as the fear regarding academic success [36, 49, 50, 53-55].

The lockdown and social distancing measures combined with the closure of schools has contributed in the increase of the possibility of abuse due to family conflicts and the inability of teachers to recognize the signs [50, 56-58].

Several studies have found that both children and adolescents during the COVID-19 pandemic have experienced sleep disorders, depressive symptoms, stress and anxiety as well as irritability, lack of attention and concentration and attachment to their parents especially for younger children [59-61].

Similarly, with the Spanish Flu, during the COVID-19 pandemic poverty constitutes a major problem with an estimation that only in Italy over 1 million children are at risk of living under extreme poverty and malnutrition is predicted to affect around 368.5 million children in 143 countries [49] (Table 3).

Long term effects

Regarding the Spanish Flu the long terms effects have been studied anthropocentrically, one of them being that infants whose mothers were infected during pregnancy had more physical disease, lower academic performance, increased percentages of disabilities and lower socioeconomic level [62, 63].

One explanation for this is that the actual symptoms from the gastrointestinal system prevented pregnant women to receive the appropriate nutrition in combination with the inflammatory responses which might have affected the fetuses [64, 65].

Another long-term effect is that of the increased risk of cardiovascular diseases in case of exposure to the virus during childhood compared to children born before or after the pandemic. More specifically, among the children born during the pandemic, cardiovascular events were at 20% higher than the rest population and were also at 3 to 7 times more risk in developing mental disorders during adulthood [41, 66].

Behavioral disorders, Parkinson’s disease, encephalitis, which was associated with disobedience and delinquency as well as symptoms of Attention Deficit Hyperactivity Disorder were found at high level among children infected by the flu (as well as high percentages of arterial hypertension, diabetes mellitus and schizophrenia in adulthood [40, 67, 68].

Although during the current pandemic of COVID-19 no long-term effects have been demonstrated yet, it can be assumed that the financial impact of the pandemic may affect the proper development of children and teenagers which in turn may lead to a negative effect in their education, behavior and mental health with the potential of developing mental disorders obvious for at least five years after the end of the pandemic [69, 70]. Furthermore, parents’ job insecurity during the current pandemic causes intense stress and anxiety to children which in the long run leads to the manifestation of behavioral problems and lower academic achievement because the development of cognitive skills is inhibited and therefore it negatively affects their behavioral health [71, 72].

The anticipated recession by 3.8% in the economy will lead to high levels of unemployment which is estimated to increase by 14.7% preventing future adults to find a job and combined with the stress, anxiety and depression experienced during the financial hardships of their parents during child-

Table 4 - Long term effects of pandemics on children and adolescents.

	<i>Spanish Flu</i>	<i>COVID-19</i>
<i>Physical health</i>	Increased morbidity & disability, encephalitis, Parkinson’s disease, reduced motor and mental development	Possibility of morbidity due to intense stress, anxiety and depression, cardiovascular diseases, delayed development
<i>Psychosocial health</i>	Delinquency, disobedience, poor academic performance, low socioeconomic level	Possibility of behavioral and mental disorders, poor academic performance, low socioeconomic lever due to recession, reduced work skills

hood and adolescence there is the possibility of a negative influence in the cognitive, emotional and physical development of children and adolescents [73]. This may lead to higher morbidity and social inequality (Table 4).

■ DISCUSSION

The main finding of the present study is that during the two pandemics children's and adolescents' mental and physical health are adversely affected. The main conditions for this finding are the disease itself, the loss of parents and family members, the socioeconomic effects and the potential long-term effects on their health and socioeconomic level.

Therefore, children and adolescents are a highly vulnerable group because of its inability to live independently, its dependence on adults for covering their basic and psychosocial needs. Regarding the latter, this population is characterized by the inability to comprehend the new circumstance because they lack cognitive, behavioral and verbal skills. Furthermore, for them to achieve a normal development, they need a steady daily routine which is disrupted during any pandemic. Another basic need of this population is their interaction with their peers in order to attain a normal socialization, which is achieved through their participation in education and sporting activities so as to gain the necessary skills and achieve the needed developmental landmarks.

This vulnerability is confirmed by several authors who support that both children and adolescents need special management during periods of crisis and particularly during pandemics so as not to disrupt their development. Moreover, without appropriate psychosocial support and evaluation of their mental health the risk of developing both mental and physical diseases is increased [74, 75]. Morbidity and mortality were found to be higher during the Spanish Flu with a reason being that at that time children and adolescents were more exposed to unhealthy environments while during COVID-19 it is not yet clear whether the low percentages of morbidity and mortality are due to the less vulnerability towards the virus or to the higher incidence of asymptomatic cases [39, 76].

The social impact of the Spanish Flu was due to the fact of the high percentages of parent loss because of the unique characteristics of the virus

leaving a very high percentage of children and adolescents orphans, a situation which has been associated with many mental disorders including PTSD, which were probably aggravated by the adverse living conditions in institutions and the associated social stigma [77, 78]. During the current pandemic the mental health is worsened by the fear, stress and anxiety that children and adolescents experience because their parents experience them too as well as the disruption of their steady daily routine and the uncertainty regarding the impact on education and the family's socioeconomic level [79]. The social distancing and isolation themselves are also considered negative prognostic factors for poor mental and physical health due to the adoption of unhealthy behaviors which may lead to pathological diseases [80].

The long-term effects are more obvious for the Spanish Flu and they include high morbidity in later life and low socioeconomic level whereas in the current pandemic although there are no available data yet it can be speculated that based on the unavoidable economic recession such long-term effects may aggravate the already negative feelings that this group is currently experiencing and increase the absence of educational and professional growth [19, 67].

The findings of the present study should be interpreted considering its limitations, the main of which is the inability of finding sufficient data for the negative impact of the Spanish Flu on children and adolescents as well as a lack in evidence for the long-term effects of the ongoing pandemic of COVID-19.

■ CONCLUSION

The present study could be the basis for more original studies to be conducted with the aim of investigating in depth the special characteristic of this population during any crisis so as to develop strategies which would target the prevention, recognition and treatment of the side effects of any pandemic on children and adolescents.

Conflict of interest

The authors have no conflict of interests to disclose.

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