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Psychological impact of the covid -19 pandemic on school age children

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Abstract

Introduction: The psychological impact of the COVID-19 pandemic on the general population has been widely studied. However, few studies have been carried out on children, even though they are experiencing a difficult situation and major stress that may expose them to significant psychological suffering. We are interested in how children perceive these emotional changes during the confinement associated with the COVID-19 pandemic.

The aim is to understand the impact of the pandemic and containment on children. To do this, we assessed the prevalence of depression, anxiety and perceived post-traumatic stress in school-age children, looking for factors associated with these psychopathological dimensions with a view to better management and intervention to reduce the possible negative effects of this situation.

Methodology: This is a cross-sectional study based on gathering information from all primary school pupils in Fez, who responded freely and voluntarily. The study was carried out over a period of two months, from June 2020 to August 2020, using an online self-questionnaire and psychometric evaluation scales: QIPS, CDI, CRIES-13.

Results: 330 students met our inclusion criteria. The mean age of our participants was 8.68 ± 1.94 years, with a minimum of 6 years and a maximum of 12 years. There was a slight female predominance, with 168 girls (50.9%) and 162 boys (49.1%). Most of the pupils (95.2%) lived in urban areas, 92.7% of the children had married parents, and 64.5% of our participants had parents with a university education.

Almost half of the children had a family income of more than Dhs10,000 per month. Only 2.1% of the children had a psychiatric history, 16.7% of the children had a history of somatic illness, 22.1% of the participants had a family psychiatric history, 11.2% of our participants had experienced a stressful event in their lives and 22.1% had parents who had previously experienced a stressful event.

Evaluation of the CRIES-13 scale showed that 39.4% had a positive score of over 30 in favour of significant symptoms of post-traumatic stress disorder, a probable depressive state (CDI score>15) was revealed in 26.1% of the children, and with regard to anxiety disorder, the mean score in our sample was 32.27 (±8.147) with a median of 29.

The analytical study showed a statically significant relationship between certain socio-demographic characteristics, namely: parents' low level of education, living with divorced parents, low monthly family income and negative psychological impact during the pandemic. On the other hand, female gender was correlated with the occurrence of anxiety.

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Our study also revealed other correlations, notably between the presence of a personal history of psychiatric or somatic illness and the occurrence of depression, family psychiatric history, and the experience of a stressful event by the child and parents were factors strongly associated with the three psychological disorders studied.

Factors related to the child's lifestyle, such as the practice of physical activity at home, a daily study period of less than 2 hours, and dissatisfaction with distance learning, were associated with psychological distress during confinement. In addition, certain personality traits seemed to be implicated in the worsening of this condition during confinement: the presence of a relative with covid-19, the child's knowledge of the pandemic, and the fear that the pandemic would continue.

Conclusion: The COVID-19 pandemic has had a severe impact on the general public, particularly children, psychological interventions identifying and targeting children at risk are urgently needed, and future studies are warranted to design and evaluate the effectiveness of interventions.

Keywords: COVID-19; Mental health; Paediatric; Pandemic

1. Introduction

Confinement during the pandemic period is an exceptional experience for children, and is not without consequences. The major changes in children's routines, the fear of being contaminated, of dying and/or of seeing their family fall ill are major stress factors that can affect their mental health (1,2). There are also specific repercussions for schooling. In response to the COVID-19 pandemic, the Ministry of Education decided to suspend all teaching activities in all schools in Morocco to prevent the spread of the infection(3). The resumption of schooling took place in a difficult context. This had negative effects on the psychological health of the children (4), with mood disorders, anxiety and even post-traumatic stress disorder. The risk of these symptoms increases with the length of isolation, but also with other factors such as housing conditions, loss of income, lack of information and boredom (5).

Few studies have looked at the psychological impact of the covid-19 pandemic on children, hence the interest and originality of this research.

Our aim is to determine the psychological impact of the pandemic on school-age children, by assessing the prevalence and nature of any symptoms of depression, anxiety and post-traumatic stress disorder, as well as analysing any potential risk factors associated with these symptoms.

2. Material and method

This is a descriptive and analytical cross-sectional study based on the collection of information through an online self-questionnaire from parents of school-age children.

The sample for this study is made up of pupils from various private and public schools in Fez, continuing their studies for the 2019-2020 academic year, aged between 6 and 12 years, from the first to the sixth year of primary school.

Information was collected using an anonymous online self-questionnaire. The first part is reserved for the socio-demographic characteristics of the children. The second part is designed to determine biographical elements and life habits: personal and family history, the child's psychiatric history, the child's relationship with social networks. The third part is devoted to assessing the child's relationship with those around him during the COVID-19 pandemic. The fourth part is devoted to the child's lifestyle before and during confinement. The last part is devoted to clinical parameters in addition to a psychometric evaluation. We used the following evaluation scales:

- Children's Revised Impact of Event Scale (CRIES) (6): used to assess symptoms of post-traumatic stress disorder. It consists of 13 items: four items measuring intrusion, four items measuring avoidance and five new items measuring arousal. Each item is assessed on a four-point scale (Not at all, Rarely, Sometimes, Often), with a score of 0, 1, 3, 5, with no items reversed. The total score indicates the severity of the child's post-traumatic stress reactions, with a range from 0 to 65. A score of 30 or more was confirmed as the most effective threshold score for detecting cases of PTSD.

CDI scale (7): (current version CDI 2) is a self-assessment 'child depression inventory' scale for measuring the intensity of depression. It is the most widely used and best-studied instrument for the self-assessment of depression in children, and can be used with children aged 7 to 17. It is a 27-item self-questionnaire designed to measure the intensity of various

aspects of depression, such as negative mood, interpersonal problems, ineffectiveness, anhedonia and negative self-esteem, with three response options scored from 0 to 2: 0 = absent; 1 = moderate; 2 = severe. The total score could vary from 0 to 54, with a CDI score >14 considered pathological. A high CDI score corresponded to a greater severity of depressive symptoms.

-QIPS (R) scale: The Penn State Worry Questionnaire is one of the instruments used to assess the general characteristics of worry in children and adolescents aged 7 to 17. More specifically, the PSIQ measures the tendency of young people to engage in excessive, generalised and uncontrollable worry. It is a self-questionnaire with 14 items designed to measure the tendency to worry, the items are scored on a five-point Likert scale: 1 = not at all corresponding, 2 = somewhat corresponding, 3 = fairly corresponding, 4 = very corresponding, and 5 = extremely corresponding. This scale has not yet been validated in dialectal Arabic. The French version was used in our study.

The survey was conducted over a two-month period (June 2020-August 2020). The self-questionnaire was drawn up in collaboration between the Psychiatry Department of the Hassan II University Hospital in Fez and the clinical epidemiology team in Fez, then transformed into an online digital format using Google Forms and tested with 20 subjects to check the clarity and comprehension of the items before subsequently disseminating it via the various social networks and to parents of pupils in the various primary schools in Fez.

The time required to complete our online self-questionnaire is estimated at 15 minutes.

2.1. Statistical analysis

All variables were summarised using descriptive statistics, qualitative variables were described in terms of proportions and quantitative variables were described in terms of mean, and standard deviation. The association between post-traumatic stress, depression and anxiety and several potential explanatory variables was investigated. Classical parametric tests (Chi-square test, Student's t test, ANOVA), logistic regression and linear regression models were used to determine the explanatory factors most associated with depression, anxiety and post-traumatic stress disorder, adjusting for potential confounding factors. For each statistical test used, the test was considered significant when p (significance level) was less than 0.05. Statistical analysis was performed using SPSS software (version 26).

3. Results

3.1. Descriptive results

3.1.1. Socio-demographic characteristics

We recruited 330 participants. The mean age was 8.68 ± 1.944 years, and the extremes of age ranged from 6 to 12 years. Table 1 Summarizes the socio-demographic characteristics of our sample.

Table 1 Socio-demographic characteristics of the study population (N=330).

Features	Number	Percentage
Sex:		
- Male	162	49.1%
- Female	168	50.9%
School level:		
-CP	71	21.5%
-CE1	49	14.8%
-CE2	50	15.2%
-CE3	77	23.3%
-CE4	35	10.6%
-CE5	48	14.5%
Residential Zone :		
-Urbain	314	95.2%

-Rural	16	4.8%
Parents marital status:		
- Married	306	92.7%
- Divorced	19	5.8%
- Father deceased	4	1.2%
- Mother deceased	1	0.3%
Function of parents :		
Mother : -Official	143	43.3%
-Liberal function	53	16.1%
-Without profession	134	40.6%
Father : -Official	185	56.1%
-Liberal function	137	41.5%
-Without profession	8	2.4%
Parent's school level :		
Mother : Illiterate	20	6.1%
Primary	29	8.8%
Secondary	81	24.5%
Academic	200	60.6%
Father : Illiterate	6	1.8%
Primary	29	8.8%
Secondary	82	24.8%
Academic	213	64.5%
Monthly family income :		
-<2000 DH	38	11.5%
-2000-5000 DH	50	15.2%
-5000-10000 DH	77	23.3%
->10000 DH	165	50.0%

Past history

55 of our participants reported a personal history of chronic somatic disease, i.e. 16.7%, among these histories: heart disease, diabetes, stunted growth, asthma. Most of the participants (83.3%) had no history of somatic illness. We found a psychiatric history in 7 of our participants. A psychiatric history was found in 22.1% of the parents.

37 (11.2%) of our participants had experienced stressful life events, dominated by domestic violence (3%), divorce (2.7%), a history of chronic illness (2.7%), stress related to confinement (1.8%) and the death of a close relative (1.2%). On the other hand, 293 (88.8%) had not experienced any stressful event. In our series, 73 (22.1%) of the parents had experienced a stressful life event, compared with 257 (77.9%) who had not.

Children's lifestyles before and during confinement

Children's reactions to the health crisis, their behaviour, their pace of life and their family relationships were all radically altered by the quarantine of the country. The following table summarises the difference between children's lifestyles before and during confinement.

Table 2 summarises the difference between children's lifestyles before and during confinement.

Table 2 Lifestyle data before and during containment

Value N(%)			
variable	Front confinement	During confinement	
Daily study period			
<1hour	68 (20.6%)	92 (27.9%)	
1-2 hours	119 (36.1%)	116 (35.2%)	
2-4 hours	114 (34.5%)	98 (29.7%)	
>4 hours	29 (8.8%)	24 (7.3%)	
Preparation of homework			
-Alone	108 (32.7%)	94 (28.4%)	
-With the help of a third party or in a group	222 (67.3%)	236 (71.5%)	
Academic performance			
-Weak	14 (4.2%)		
-Means	123 (37.3%)		
-Raised	193 (58.5%)		
Activities for school/at home			
Yes	201 (60.9%)	99 (30.0%)	
No	129 (39.1%)	231(70.0%)	
Media use			
< 1 hour	58 (17.6%)	29 (8.8%)	
1-2 hours	129 (39.1%)	54 (16.4%)	
2-4 hours	96 (29.1%)	114 (34.5%)	
> 4 hours	47 (14.2%)	133 (40.3%)	
The child's behaviour the school :	Yes	No	
Inhibition, shyness			
Sociable	127 (38.9%)	144 (43.6%)	
Hyperactive	203 (61.5%)	186 (56.4%)	-
Aggressive	241 (73.0%)	173(52.6%)	
Opponent	89 (27%)	156 (47.4%)	
The child's behaviour within the family	125 (37.9%)	147 (44.5%)	
Isolated	205 (62.1%)	182(55.3%)	
Sociable	18 (5.5%)	35 (10 .6%)	
Hyperactive	312 (94.5%)	294 (89.4%)	-
Agressive	42 (12.7%)	75(22.7%)	Yes 122(37.0%) No 208(63.0%)
Opponent	288 (87.3%)	254 (77.0%)	
Change in the child's behaviour			

Behaviour towards children before and after the pandemic?	Weak	Moderate	Raised	Step change	Decrease	Increase
-Care behaviour	21(6.4%)	224(67.9%)	85(25.8%)	174(52.7%)	15(4.5%)	141(42.7%)
-Punitive behaviour	126(38.2%)	177(53.6%)	27(8.2%)	188(57.3%)	87(26.4%)	53(16.1%)
-Overprotection behaviour	74(22.4%)	194(58.8%)	62(18.8%)	163(49.4%)	25(7.6%)	140(42.7%)

3.1.2. Characteristics related to the COVID-19 pandemic

During the pandemic, 265 of the children (80.3%) had family support during this period compared with 65 (19.7%) who did not.

Of all the participants, 35.2% often received information about the pandemic, while 4.6% were never informed.

In our series, 13 pupils (3.9%) had a close relative with COVID-19.

The main concerns of children during this pandemic are summarised in Figure 1.

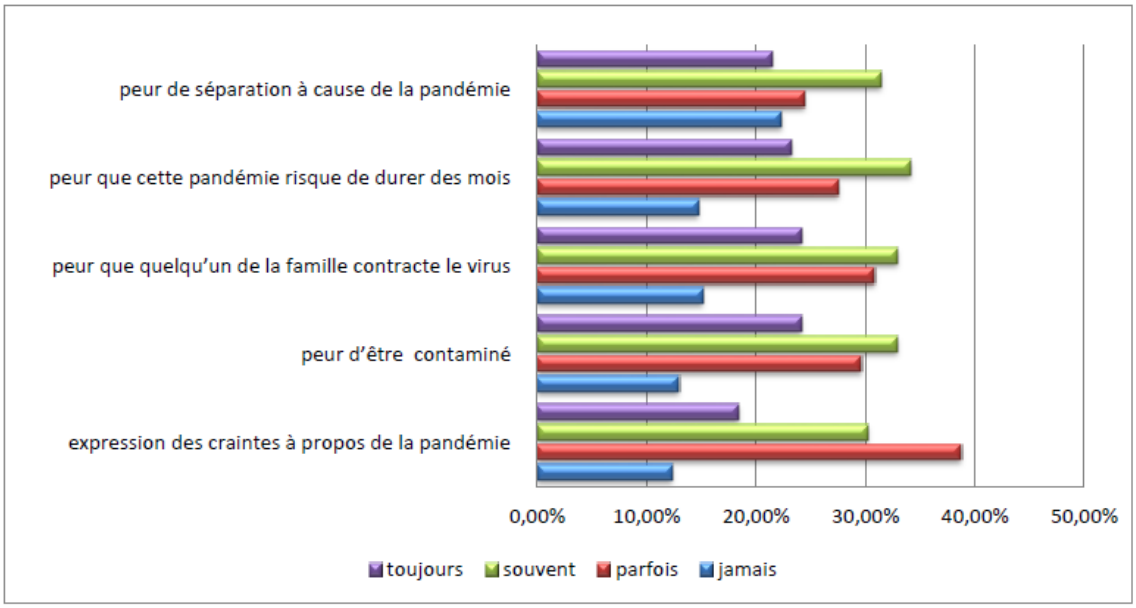

Figure 1 Distribution of children according to their concerns during the pandemic.

3.1.3. Psychometric assessment

-Post-traumatic stress disorder

The mean CRIES-13 score was 22.73(±17.34). Scores above 30, in favour of significant symptoms of post-traumatic stress disorder, were found in 130 pupils (39.4%).

- Depression

The mean CDI score was 10.01 (±8.05). The proportion of children suffering from depression with a score above 15 was 26.1%.

- Anxiety

The mean QIPS score was 32.27 (±8.147), with a median of 29, a minimum of 19 and a maximum of 63.

3.2. Analytical results

We conducted a uni-variate study to determine the risk factors predictive of the onset of depressive, anxiety and post-traumatic stress disorders in school-age children.

3.2.1. Correlation between post-traumatic stress disorder and the parameters studied

Socio-demographic characteristics

A study of the various socio-demographic factors showed that female gender, low monthly family income, the 'divorced' marital status of the parents, and their low level of education were the main risk factors ($p< 0.05$). However, there was no significant relationship with the other factors (age, level of education, and residential area).

Clinical parameters

Our study showed a significant relationship between the occurrence of post-traumatic stress and the presence of a family psychiatric history on the one hand ($p=0.03$), and the experience of a traumatic event by the child and by one of the parents appeared to be equally significant on the other hand ($p = 0.04$; $p = 0.03$). However, no significant association between the other clinical data and the onset of post-traumatic stress disorder was demonstrated by our study.

Data related to the pandemic

The daily study period <2h and the practice of extracurricular activities at home were factors associated with PTSD ($P=0.03$). Children who prepared their homework with the help of a third party were more likely to develop PTSD. In addition, the child's personality traits (in particular hyperactivity at school ($P=10-3$) and within the family ($P=10-3$), opposition ($P=10-3$), shyness ($P=10-3$) and sociability ($P=0.003$)) appear to be factors strongly associated with the onset of PTSD. Our study also showed that 64.8% of children who had a change in behaviour during confinement were more stressed than those who had no change in behaviour.

A comparison of the factors associated with confinement in children with PTSD and those without PTSD showed that children who had a relative with covid-19 developed more PTSD than those who did not (76.9% vs 37.9%) and this association was statically significant ($p=0.003$), in addition to the fear that the pandemic would be prolonged.

Children who always expressed their fears and who knew enough about the pandemic were more traumatised than their peers (63.6% vs 36.7%; 76.9% vs 37.9%; 62.3% vs 26.8% respectively), and this difference was statistically significant ($P<0.05$).

3.2.2. Correlation between depression and the parameters studied

Socio-demographic characteristics:

Our results showed that parental marital status, low monthly family income and low level of education were significantly associated with the risk of depression respectively ($P=0.002$; $P=0.004$; $P=0.000$). On the other hand, there was no statistically significant association between gender, age, residential area, level of education and the occurrence of depression.

Clinical parameters

The presence of a personal history of somatic or psychiatric illness in the child, and the experience of a stressful event either by the child or his or her parents, were the clinical parameters significantly correlated with the occurrence of depression in our participants ($p<0.05$).

3.2.3. None of the other parameters was incriminated in the occurrence of depression.

Pandemic-related data

The results revealed that a daily study period <2h and dissatisfaction with course input were factors significantly associated with depression ($P=10-3$; $P=0.006$). In addition, the child's personality traits (in particular the hyperactive, aggressive, oppositional personality ($P=10-3$)) within the family, and the shy ($P=10-3$), sociable personality at school

(p=0.001), appear to be factors strongly associated with the onset of depression. Our study also showed that 40.5% of children who had a change in behaviour during confinement were more depressed than those who had no change in behaviour.

Comparison of the factors associated with confinement in children with a probable depressive state and those with a non-depressive state showed that children who had a relative with covid-19 were more depressed than those who did not (53.8% vs 19.7%) and this association was statically significant (p=0.003). In addition to the fear that the pandemic would be prolonged, children who always expressed their fears and who knew enough about the pandemic were more likely to develop depression, this difference being statistically significant (P<0.05).

3.2.4. Correlation between anxiety and the parameters studied

Socio-demographic characteristics:

Our results showed that the child's level of education, low monthly family income and low level of education were significantly associated with the risk of anxiety (P=0.01, P=0.07, P=0.02 respectively). On the other hand, there was no statistically significant association between gender, age, residential area, and parental marital status.

Clinical parameters

The results of our study showed that the experience of a stressful event by the child was a factor associated with the occurrence of anxiety (P=0.002). However, no significant association between the rest of the clinical data and the occurrence of anxiety was demonstrated.

Pandemic-related data

The results revealed that the child's personality traits (in particular shy (P=0.006), aggressive (P=0.02), not sociable (P=0.01) at school, aggressive (P=0.008)), appeared to be factors strongly associated with the occurrence of anxiety. Our study also showed that children who experienced a change in behaviour during confinement were more anxious than those who did not.

Comparison of the factors associated with confinement in anxious and non-anxious children showed that children who always expressed fear about the pandemic had higher anxiety scores than their peers, and this association was statically significant (P=0.005).

4. Discussion

The mass home confinement imposed for the first time in the spring of 2020 caused the population to suddenly lose their bearings, causing psychological and psychosocial effects in them that are important to grasp and measure. During this pandemic, general medical complications and the potential effect on the mental health of the adult population have received the most attention, while very few studies have looked at the effect on the mental health of children.

In our series, the average age of our participants was close to that found in studies in the literature, in particular that of M. Avila (8) (8.8 years), that of M.A.Deldar (9) (9.7 years), and that of I.Claudet (7) (10.8 years). The same value was far from that found in the study by Z.Qin (10) (12.04 years), which included adolescents in its sample.

We noted a slight predominance of females, with 168 girls (50.9%) and 162 boys (49.1%), which is close to the results of the literature, especially in the study by M. Avila (8) et al carried out in Brazil, which found a predominance of females (54.3%), and in the study by M. Deldar (9), which revealed that 53.3% of all their participants were girls.

In contrast to our study, there was a slight male predominance in the study by I. Claudet (7) with a percentage of 54.6%, as well as in that of Z.Qin (10) with a percentage of 51.6% and that of X.Xie (11) with 56.6% of boys.

In our series, we found that the majority of our participants lived in urban areas, 314 (95.2%) and only 16 (4.8%) in rural areas. This is consistent with a study by D. Urrunaga-Pastor, who found that 75.3% lived in urban areas and 24.7% in rural areas (12), unlike the study by L. Duan (13), carried out in China, where 49.7% lived in urban areas and 50.2% in rural areas, and the study by Y. Liu (14), in which 26.32% lived in urban areas and 73.68% in rural areas.

As regards the marital status of our participants' parents, 92.7% were married, 5.8% were divorced and 1.5% were widowed. These results are similar to those found in the study by W. W. Y. Tso, in which 94.5% of parents were married

compared with 5.5% divorced (15), and in the study by R. Almhizai (16), carried out in Saudi Arabia, in which 87.2% of parents were married, 9.45% divorced and 3.34% widowed.

With regard to the educational level of parents, we found in our series that :

- -1.8% of fathers had no schooling, 8.8% of fathers had primary schooling, 24.8% of fathers had secondary schooling and 64.5% had university education.
    - 6.1% of our participants had a mother with no schooling, 8.8% had a mother with primary schooling, 24.5% of mothers had secondary schooling, and 60.6% had university education.
- In a study carried out in China by F. Chen (17):
- -9.1% of mothers and 5.79% of fathers had primary education
- -34.7% of mothers and 36.1% of fathers had secondary education
- -56.0% of mothers and 58.1% of fathers had a university degree.

In another study conducted by M. Orgilés (18), 6.7% of the parents had primary education, 31.1% had secondary education and 61.9% had secondary education.

7% of participants had a medical history, compared with 83.3% of children with no notable history. Our results are similar to those of a study by RD Goldman, in which 88% of participants had no medical history, compared with 12% who did (19). These results were less significant in the W.Tso study (15) carried out in China, in which 3.68% of children had a medical history. A second study carried out in Greece reported that the introduction of containment to contain the spread of COVID-19 had affected the routine of children with chronic illnesses such as type 1 diabetes. These children generally require regular monitoring, and the same study revealed that the glycaemic control of diabetic children was affected during the containment period (20). It is for this reason that people with chronic diseases need special attention during the pandemic, and there should be a plan for them during containment to reduce the impact on their health.

In our series, we found a psychiatric history in 7 of our participants (2.1%), compared with 323 (97.9%) who had no notable psychiatric history. These results were higher in a Spanish study by M. Orgilés, who found 11% with a history of psychiatric illness (21). Previous studies have reported that having a history of psychiatric illness can trigger anxiety and anger four to six months after the end of quarantine (22), and it has also been observed that these children are the most likely to suffer the effects of the pandemic.

Shang. J et al. conducted a study of 241 parents of school-age children with an established diagnosis of attention-deficit/hyperactivity disorder (ADHD). Being in a stressful situation such as the pandemic considerably alters the mental state of children, so that the symptoms of children with ADHD are even more exacerbated (23).

The child and adolescent psychiatry department at the Mongi Slim Hospital in Tunisia has set up a telephone follow-up service for patients deemed to be at risk. This follow-up involved 166 cases, the majority of which suffered from neurodevelopmental disorders, followed by depressive disorders and adjustment disorders. A third of the children reported a worsening of their symptoms during confinement (24), so continued monitoring of patients with mental disorders by telemedicine is a major challenge if we are to limit the negative impact of the pandemic and prevent its long-term repercussions.

We found a psychiatric history in 22.1% of the children's parents. These results were higher in an Australian study by E. Westrupp, who found 41.3% of parents with a psychiatric history (25). Another study carried out in Hong Kong by W. Tso found that 1.7% of fathers and 4% of mothers had a psychiatric history (26). A survey of the mental health of children and young people in England provided a resource on what the pandemic has meant for children. Children with a parent in psychological distress were more likely to have a probable mental health problem.

This is of particular concern because parents, compared with those without young children, experienced greater than average increases in mental distress during the pandemic, suggesting that support for parents at this time is important for children's mental health (27).

- Psychological impact of COVID-19 in children:
- Depressive symptoms:

In our series, we used the CDI scale to assess depressive symptoms. We found that 26.1% of children had depression, while 72.4% had no symptoms. These findings are consistent with the results of previous studies, notably that of X. Xie in China's Hubei province, who found scores suggestive of depression in 22.6% of children (11), and also that of Y. Liu in China, who found an estimated prevalence of 26.01% during the confinement period (14), and another study by L. Duan, which found a prevalence of 22.28% (13). These findings remain much lower, reaching 19.7% according to the study conducted by S. Tang (28), and that of M. Orgilés in Spain, which found an estimated prevalence of 19% (29).

Concerning the traumatic impact of the pandemic, in our sample, the prevalence of post-traumatic stress disorder according to the CRIES-13 scale score was estimated at 39.4%. These results are in line with the data in the literature, particularly those from the Italian study conducted by C. Davico, which found an estimated prevalence of post-traumatic stress disorder in 30.9% of children (30). This figure was higher in the E-COCCON study conducted by I. Claudet et al in France, which found an estimated prevalence of PTSD of 19% (7), as well as the study by H. Xu and Z. Ma et al in China, which estimated the prevalence of PTSD in children as high as 12% (8). Ma et al in China, which estimated the prevalence of PTSD in school-age children at 20.3% and 20.6% respectively (31) (32). Similarly, a study carried out in February 2020 by K. Yue found a prevalence of 3.16% of children at risk of PTSD (33), which may be explained by the period during which the study was carried out, corresponding to the start of the pandemic.

Analysis of the results obtained revealed two types of risk factors interfering with the psychological impact: factors linked to the child and factors linked to the environment.

- Factors related to the child and his lifestyle

Analysis of the socio-demographic data showed that 50.9% of our participants were girls and 49.1% boys, with equal presence of symptoms of depression and post-traumatic stress disorder in both sexes. However, girls tended to have higher anxiety scores than boys. Our study revealed that age was not a risk factor for symptoms of depression, anxiety and post-traumatic stress disorder, nor was educational level.

These results are perfectly in line with those of the study conducted by S. Tang et al (34) and that of X. Xie et al (11) in China, which found no association between gender and the presence of psychological distress. A Spanish study by J.P. Pizarro et al (35) confirmed that gender had no impact on the occurrence of psychological distress during confinement in children aged between 8 and 12.

Contrary to these results, a meta-analysis by L. Ma et al assessing the prevalence of mental health problems between children and adolescents during containment showed that the impact of the pandemic was greater in female adolescents compared with school-age children (36). Similarly, the study by L. Duan et al found that factors associated with increased anxiety included being female, living in an urban area and having an emotionally centred coping style. The difference between girls and boys could be explained by greater perceived stress in girls than in boys, or by differences in response modalities between the two sexes (girls being more inclined to express emotions) (13) .

In a study designed to assess the impact of the epidemic on the behaviour of children and the mental health of their parents in China, Bai et al,

Bai et al highlighted the influence of socio-demographic factors (age, sex, place of residence, siblings) (37). According to their results, all these variables could explain the changes in children's psychological and behavioural state during this pandemic, which was significantly impacted by these factors. However, their study took place when the epidemic was at its most intense and over a relatively short period of time, so they were unable to assess changes in their psychological state.

The disruption of children's schooling and lifestyle are essential elements to be studied in the evolution of the impact on mental health during the pandemic. According to Ghosh et al, the essential coping mechanisms are school routines, so factors linked to the consequences of confinement, such as repeated interruption of schooling, boredom, social isolation and lack of space, are likely to have harmful effects on children's mental health (38).

The impact of confinement and the problems associated with it can be explained by the lack of social contact. Our study was able to show that those who felt distress during confinement did less physical activity outside and spent less than 2 hours a day studying ($p<0.05$). These results are consistent with the study carried out in France, where researchers Thierry et al highlighted changes in the length of school work and time spent in front of screens among 8-9 year olds, with parents stating that two-thirds of their children spent less than three hours a day on homework (38).

The study by S. Vandentorren et al found that the lack of outdoor activities was a factor associated with the occurrence of psychological distress ($p<0.001$) (39). In addition, the children who experienced distress used more screens per day to watch videos or films (22.7% more than 3 hours vs. 12.2%, $p=0.002$).

According to Wang et al, children are considerably more sensitive to restrictions and more likely to present high levels of depression and anxiety during and after confinement following the disruption of daily life.(40), and Magson et al claim that online schooling and confinement without contact with peers increase the appearance of socio-emotional disorders during the developmental period, and that children are more exposed to the risk of developing psychological problems (41).

Finally, psychological distress may increase if the child has certain personality traits. C. Raymond indicates that the more vulnerable a young person was before the pandemic, the more likely they were to react to the pandemic and be distressed. Our study confirmed these findings, indicating that children with certain personality traits (hyperactive, oppositional, sociable, shy) were more likely to experience psychological and emotional problems. This risk was greater in children with a history of mental disorders, a history of traumatic events, parental mental illness or severe parental distress.

- Environmental factors

The measures put in place to reduce the spread of SARS-CoV-2 and the associated psychosocial and economic effects have repercussions on the day-to-day lives of families and the various environments in which children live. These include the complete or partial closure of schools and activity areas such as libraries and parks, reducing sources of stimulation. In addition, the pandemic situation has necessitated professional rearrangements such as teleworking and supervision of children's education at a distance, as well as job losses or financial difficulties that can have consequences for parents' physical and mental health. All these changes are likely to have had an impact on children's mental health. Living conditions therefore play an important role in the well-being of children and young people.

The results of our study highlight the links between difficult living conditions and children's psychological distress. Among the associated factors are parental characteristics such as single parenthood, parents' low level of education, low monthly family income, deterioration in the parent's mental health, and experience of stressful events.

Our study also highlighted the fact that being confined to a rural area was a factor associated with psychological distress in our participants, the distress of young people was also associated with the occurrence of a Covid-19 infection in a close relative, the increased use of the media during confinement which allows the child to have excess knowledge about the pandemic, this distress was more marked in children expressing fears about the pandemic and those who were afraid that the pandemic would last a long time.

Some of these conditions have been described in the literature, including psychosocial factors such as social isolation and socioeconomic factors that can have a negative influence on children's mental health. In their study, Singh et al also showed that confinement could lead to increased use of the internet and social networks and that this excessive consumption could be associated with high levels of depression and anxiety (42), while L.Duan et al conducted a study based on an online questionnaire with 359 children, and some of the factors linked to the increase in depressive and anxiety symptoms in this study were smartphone addiction and internet addiction(43).

Another study of children in France also found that mental health could be affected by the factors already mentioned, in addition to being confined to an urban area, living in a flat or house without a garden, not having access to the outdoors, living in over-occupied accommodation, and lack of social support (40).

In China, W.Tso et al showed that the risk of psychosocial problems in children was higher among children from low-income families. In fact, some families had no income during confinement, which may have led to insecurity and a feeling of powerlessness that can make children vulnerable to mental health problems, and the risk of psychosocial difficulties in children was higher in children from single-parent families (43).

In the report on suicide mortality among children and adolescents during the first 56 days of confinement in Great Britain, the authors stress that the interruption of care and support services, as well as tensions at home and isolation, could be important factors (44). On the other hand, many children may be exposed to an increased risk of domestic violence and abuse, due to the isolation measures linked to the pandemic, which is considered to be an additional risk of psychological distress during this pandemic.

- Strengths and limitations of the study

Our work represents a new experiment in Morocco concerning the psychological impact of the Covid-19 pandemic on school-age children, and has several strengths. It is the first Moroccan study to assess the psychological health of young people by asking them directly about their experiences of confinement.

Firstly, we were able to assess their mental health on the basis of their responses to questions and scales, and secondly, statistical analysis was used to highlight relationships between variables and causal links over a specific period, and to develop perspectives and recommendations.

The study took into account the diversity of social situations in order to better take account of social inequalities. In addition, children's mental health was assessed from several angles, using validated mental health scales (CDI, CRIES-13, QIPS), as well as questions from reliable tools. Another strength of our study is that the sample was large enough to allow stratification by age and gender, while retaining sufficient statistical power.

Finally, this study will enable us to identify prevention levers for mental health in children, who have been particularly hard hit by this health crisis.

Certain limitations in our study must be taken into account when interpreting the results:

-The main one concerns the representativeness of the sample. Sampling bias is possible given the type of recruitment. It is made up of subjects from a population that has access to a computer. The sample is therefore not representative of the general population, particularly disadvantaged families.

-The results are mainly based on parents' perceptions, not those of the children. Perceptions may have been biased by various factors: parents' psychological state, their interpretations, retrospective response bias. In addition, it should be borne in mind that the parents were asked to respond on the basis of 'compared with before the pandemic'. This can be tricky to remember correctly. It would therefore be necessary to carry out future research using more objective parameters in order to assess children's emotional and behavioural state.

5. Conclusion

The COVID-19 pandemic has had a severe impact on the general public, particularly children. Psychological interventions to identify and target children at risk are urgently needed, and future studies are justified to design and evaluate the effectiveness of the interventions. Our study responds to this need, highlighting the significant value of introducing a psychological support and monitoring programme in the care of children, particularly in the most vulnerable populations.

The aim of our study was to assess the psychological disorders caused by the COVID-19 pandemic in children. Our results showed a significant prevalence of anxiety-depressive disorders and post-traumatic stress disorder in this category. These disorders were also correlated with certain socio-demographic factors and mainly factors linked to the child's environment.

These results suggest that psychological treatment is necessary for children at risk of developing psychological reactions that go beyond the normal range.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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