Assessing the Mental Health of School Children in the Pre-COVID-19 and Post-COVID-19 Pandemic Lockdown Era: A Comparative Analysis

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ABSTRACT.

Background: The effects of COVID-19 on children's mental health are well-documented and were compounded by the lockdown measures. Studies showed worsening post-COVID-19 mental health, but, whether these are at variance with those of the pre-COVID-19 era is controversial. **Objectives**: To compare children's mental health during the pre-COVID-19 and post-COVID-19 lockdown eras. **Materials and Methods**: A cross-sectional and comparative study involving 484 school children categorized into two equal groups according to their enrolment periods. Strengths and Difficulties Questionnaire was employed to assess Mental Health Abnormalities (MHA) in them. Ethical approval and consent were obtained before commencing the study. **Results**: Children from the post-COVID-19 lockdown era had a significantly higher MHA prevalence and were four times more likely to have MHA than those from the pre-COVID-19 era (p = 0.025; adjusted Odds Ratio [aOR] = 3.89, 95% CI = 2.43 – 24.26). Except for hyperactivity/inattention, MHA types in the children showed a significantly higher prevalence of emotional, conduct and peer-relationship disorders (p<0.05). However, a multivariate analysis showed that only emotional disorders (p = 0.037) were significant. The children from the post-COVID-19 lockdown era were three times more likely to have emotional disorders than those from the pre-COVID-19 (aOR = 2.68; 95% CI = 1.06 – 6.74). **Conclusions**: We noted a higher MHA burden among children from the post-COVID-19 lockdown era and emotional disorders were the most common.

Keywords: COVID-19; Lockdown; Mental Health; School children.

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INTRODUCTION

The devastating effects of the COVID-19 pandemic on children are well-known,[1,2] including worsening morbidity and mortality.[2,3] To curtail its alarming spread, a global lockdown was declared;[3-5] a policy that restricts the movement of individuals (and children) in the interest of public safety and to combat a specific risk.[4,6,7] The COVID-19 lockdown resulted in palpable tensions due to its health, economic, social and psychological consequences.[3,8] These are stressors that may trigger Mental Health Abnormalities (MHA),[8-10] defined as abnormalities in thoughts, emotions, behaviours and/or relationships that manifest with symptoms expressed inwardly (internalizing problems) or outwardly (externalising problems).[11-14] Examples of MHA include anxiety, depression, peer-relationship, conduct and attention-deficit hyperactivity disorders.[13,14]

The MHA prevalence in children from the post-COVID-19 pandemic lockdown era is high, as reported by Liverpool *et al*[15] in 2023 in the Caribbean Islands and Li *et al*[16] in 2022 in China. However, a similar high prevalence was noted during the pre-COVID-19 lockdown era in the report by Nkporbu and Alex-Hart[17] in 2019 in Port-Harcourt, Nigeria. Despite the aforementioned studies [15,16] and other post-COVID-19 lockdown studies, including those of Bai *et al*[18] in 2022 in China and Ravens-Sieberer *et al*[19] in 2023 in Germany showing an increasing MHA prevalence in children from the post-COVID-19 lockdown era, these studies[15-19] had some drawbacks, as the MHA prevalence of the children from the post-COVID-19 lockdown era was not compared with those of the children from the pre-COVID-19 era, to detect any significant difference (worsening). Notwithstanding a well-documented negative MHA impact on children from the pre-COVID-19[20,21] and post-COVID-19 lockdown eras,[22,23] knowledge gaps exist regarding the comparison of the MHA prevalence of children from these eras. This comparison may help to draw attention to the worsening of children's mental health from COVID-19 negative effects and may encourage the institution of more drastic measures to curb and reverse these negative effects of MHA in children.

Unfortunately, studies comparing the MHA prevalence of children from the pre-COVID-19 and post-COVID-19 lockdown eras are few and inconsistent.[23-26] For instance, a systematic review by Kauhanen *et al*[24] in 2023 showed a significantly higher MHA prevalence in children from the post-COVID-19 lockdown era than those from the pre-COVID-19 era, while a systematic review and meta-analysis by Sun *et al*[26] did not observe any difference in prevalence in children from the pre-COVID-19 and post-COVID-19 lockdown eras. Also, Gilligan *et al*[25] in 2022 in Ireland reported a lack of significant difference in MHA prevalence between children from the pre-COVID-19 and those from the post-COVID-19 lockdown eras. The variations in findings from these studies[24-26] may be due to differences in their study populations. The study population of Kauhanen *et al*[24] comprised both children and young adults while that of Sun *et al*[26] included much older adult populations. Also, Gilligan *et al*[25] enrolled only primary school children. The inclusion of the adult population in studies by Kauhanen *et al*[24] and Sun *et al*[26], and the omission of other paediatric age groups in the study by Gilligan *et al*[25] may not provide a true representation of the MHA prevalence in children in these studies. The choice of a study population may vary the outcome of a study, especially when the study population does not completely reflect the desired target population.[27] Therefore, it becomes important to know the actual outcome of this discourse, to draw a logical conclusion that may help in interventions. This is this study's rationale, which sought to compare children's mental health during the pre-COVID-19 and post-COVID-19 pandemic lockdown eras in Umuahia, Nigeria. The null hypothesis stated no difference while the alternate stated a difference in MHA prevalence between children enrolled during the pre-COVID-19 and post-COVID-19 lockdown eras. The essence was to either reject the null (and accept the alternate) or fail to reject the null (and reject the alternate) hypothesis.

MATERIALS AND METHODS

Study design and site

A cross-sectional and comparative study design was deployed on primary and secondary schools in Umuahia, Abia State. The cross-sectional study design was chosen because it encourages the collection of data at a single point in time and from a large pool of subjects. Also, it enables comparison of data between two groups and establishes preliminary evidence for future studies. The drawback is the lack of follow-up of the subjects.

Study population

This comprised children aged 2-17 years, categorized into two equal groups. Group 1 were children recruited during the pre-COVID-19 lockdown era while Group 2 were those recruited from the post-COVID-19 lockdown era.

Determination of sample size

Each group's sample size was 248, based on the statistical formula for comparing proportions in two equal-sized groups.[28] It depended on the power of the study (usually set at 90%), a *p*-value of 0.05, a constant defined as the product of the study's power and significance (usually set as 10.5), an attrition rate of 10%, and a pre-COVID-19 and post-COVID-19 lockdown MHA prevalence of 7.3%[29] and 17.5%[16] respectively. The formula is as shown below:

$$n = \frac{[\rho_1(1-\rho_1) + \rho_2(1-\rho_2)]}{(\rho_1 - \rho_2)^2} \times C_{p,power}$$

Where n = the minimum sample size in each group.

ρ_1 = MHA prevalence in children in the pre-COVID-19 era (Group 1) = 7.3%[29]

ρ_2 = MHA prevalence in children in the post-COVID-19 era (Group 2) = 17.5%[16]

$C_{p,power} = (V+U)^2$ = a constant defined by the values chosen for the *p*-value and power of this study. The power of this study is set at 90% at a p-value of 0.05; yielding a p-value (V) and power of the study (U) of 1.96 and 1.28 respectively. Thus, $C_{p,power} = (U+V)^2 = 10.5$

Inclusion and exclusion criteria

Children whose caregivers consented and those older than seven years who assented to the study were included while those with evidence of acute or chronic illnesses, or whose family history is suggestive of a chronic illness were excluded.

Sampling method

To avert selection bias, each group was enrolled using a multi-stage random sampling technique comprising five stages. The ratio of the number of private-to-public schools and those of primary-to-secondary schools in Umuahia was reflected in this random selection process. In the first stage, all the schools in Umuahia were divided into private and public schools. The second stage involved categorizing the private and public schools into primary and secondary schools. In the third stage, the sample size was distributed according to the ratio of the selected primary and secondary schools of the private and public schools while the fourth stage involved determining the sample sizes of each of the selected schools. In the final stage, the class registers were used to assign serial numbers and the children were randomly selected until the calculated sample size for the particular school was achieved. To ensure a wider representation of each group and avert selection bias, not more than 10% of the overall sample size was drawn from each of the selected schools. Thus, a total of 13 schools comprising eight private (six primary and two secondary) and five public (four primary and one secondary) schools were randomly chosen. Thereafter, 19 subjects (7.7% of the overall sample size) were randomly chosen from each selected school, for each group.

Data collection

Data collection for Group 1 was before the global declaration of the pandemic (COVID-19) while that for Group 2 was six months after the announcement of the ease of the pandemic lockdown in Umuahia. Sociodemographic information was obtained from each group and MHA was determined using the Strengths and Difficulties Questionnaire (SDQ). The SDQ, used in children aged 2-17 years, has good psychometric properties.[30-32] It is grossly utilized in determining MHA, both internationally[33-35] and in Nigeria.[35-37] It comprises five domains that describe MHA and its types.[337-40] Domain-1 (emotional) assesses anxiety and depressive states in children; Domain-2 (conduct) assesses aggression and violation of rules by children; Domain-3 (hyperactivity/inattention) assesses fidgeting,

boredom, inattention and excessive physical activities in children; while Domain-4 (peer-relationship) assesses social isolation.[38] Domain-5 (prosocial) assesses prosocial behaviour but plays no part in determining MHA in children.[39,40] Domains 1-4 are scored on a three-point scale[33,35,37] and cumulatively added to generate a Total Difficulty Score (TDS).[33-35] According to the developer's instruction,[33] a TDS greater than 15 in children aged five years and above, or greater than 16 in those aged below five years, is considered abnormal and signified an MHA. In addition to an abnormal TDS; scores greater than four on the emotional domain, greater than three on the conduct domain, greater than six on the hyperactivity/inattention domain, and greater than three on the peer-relationship domain; signified emotional, conduct, hyperactivity/inattention, and peer-relationship disorders respectively.[38]

Pre-testing of the questionnaires

The questionnaires were pre-tested on some selected caregivers of the children, to detect any ambiguity. The questionnaires were unambiguous, as these caregivers answered the questions correctly. Caregivers who partook in the pre-test were excluded from the main study.

Ethical approval and consent

The institutional ethics committee approved the study (FMC/QEH/G.596/Vol.10/377) and the researchers ensured strict adherence to ethical norms. Study details were provided and only the caregivers who consented and the children older than seven years, who assented, participated. They were allowed to voluntarily opt in or out, without any form of inducement or gratification. A consent form was filled and signed/thumb-printed by the consenting caregivers.

Data confidentiality

This was ensured, as the questionnaires were de-identified, requiring only serial numbers and not names. The hard copies of the data were secured in a private cupboard while the electronic version was secured in a private passworded computer, to prevent unauthorized access.

Data analysis

The generated data was checked for accuracy and adequacy. It was then coded and analysed with IBM SPSS-21 statistical software. The distribution pattern of the children's ages was normal, as determined by the Shapiro-Wilk test (assumption of normality test). Thus, means and standard deviations were used to describe their ages. Frequencies (percentages) were used to describe their categorical variables (age groups, sex, SEC, school type and class, type of caregivers and MHA) and a bivariate analysis (Chi-squared test) was done to detect any significant difference in MHA prevalence (the dependent variable) between Groups 1 and 2 children (the independent variables). The significant difference in MHA prevalence was further analysed using logistic regression, to eliminate confounding variables, and determine the degree of the difference in prevalence and the likelihood (odds) of developing MHA between these groups. Having eliminated confounding variables, the odds ratio was presented as an adjusted ratio (aOR) rather than a crude ratio. This study's significance level and confidence interval were set at 5% and 95% respectively, and $p<0.05$ was considered significant. Thus, outcome variables with $p<0.05$ necessitated rejecting this study's null and accepting its alternate hypothesis. Conversely, outcome variables with $p\geq0.05$ necessitated a failure to reject the null and a rejection of the alternate hypothesis. The findings were presented in prose and/or tables

.

RESULTS

Of the 496 children, 12 were excluded due to incomplete filing or non-return of filled questionnaires. Thus, 484 children comprising 242 from each group, finally participated. The mean age of the children in both groups was 8.35 ± 3.98 years. In both groups, most of the children were preadolescents (73.6%), males (56.2%), attending private schools (64.5%) and primary schools (73.6%), and residing with their biological caregivers (Group 1 = 66.1%; Group 2 = 61.6%). However, while a greater proportion of Group 1 children belonged to the middle SEC (38.8%), Group 2 belonged more to the lower SEC (39.7%). Table 1 summarises the sociodemographic information of the children and shows that the sociodemographic variables of both groups were comparable ($P>0.05$).

Twenty-six (10.7%) of the 242 children in Group 1 and 42 (17.4%) of the 242 children in Group 2 had MHA, and this difference was significant. Group 2 children significantly had a higher MHA prevalence than Group 1 ($p = 0.025$) and were four times more

likely to have MHA than those in Group 1 (aOR = 3.89, 95% CI = 2.43 – 24.26). Therefore, the null hypothesis, which stated no difference in MHA prevalence between Group 1 and 2 Children, was found to be false and was rejected. Conversely, the alternate hypothesis was accepted. Tables 2 and 3 respectively describe the difference in MHA prevalence and the degree of the difference between Groups 1 and 2.

The MHA type showed that Group 2 children had higher prevalences of emotional, conduct, hyperactivity/inattention, and peer-relationship disorders than Group 1. Except for hyperactivity/inattention disorders, bivariate analysis showed a significant difference in the MHA type (p<0.05). Table 4 describes the difference in MHA types between Groups 1 and 2 children.

A multivariate logistic regression analysis was done on all significant MHA types, to eliminate confounders and consider the effects of the individual types. In the multivariate analysis, only emotional disorders showed a significant difference (p = 0.037) between Groups 1 and 2 children, and Group 2 children were three times more likely to have emotional disorders than Group 1 (aOR = 2.68; 95% CI = 1.06 – 6.74). Table 5 describes the multivariate logistic regression analysis of the significant MHA types of Groups 1 and 2 children.

Table 1: The sociodemographic characteristics of the children.

Variables	Group 1 (N = 242) n (%)	Group 2 (N = 242) n (%)	χ2	*p*-value
Age category				
Preadolescents (2-9 years)	178 (73.6)	178 (73.6)	0.00	>0.99
Adolescents (10-17 years)	64 (26.4)	64 (26.4)		
Sex category				
Males	136 (56.2)	136 (56.2)	0.00	>0.99
Females	106 (43.8)	106 (43.8)		
SEC				
Upper	66 (27.3)	60 (24.8)	1.74	0.418
Middle	94 (38.8)	86 (35.5)		
Lower	82 (33.9)	96 (39.7)		
School type				
Private	156 (64.5)	156 (64.5)	0.00	>0.99
Public	86 (35.5)	86 (35.5)		
School class				
Primary	178 (73.6)	178 (73.6)	0.00	>0.99
Secondary	64 (26.4)	64 (26.4)		
Type of caregivers				
Biological	160 (66.1)	149 (61.6)	1.08	0.298
Non-biological	82 (33.9)	93 (38.4)		

Group 1 = School children enrolled during the pre-COVID-19 era; Group 2 = School children enrolled from the post-COVID-19 lockdown era; SEC = Socioeconomic class.

Table 2: Bivariate analysis of the difference in MHA prevalence between Groups 1 and 2.

MHA	Group 1 (N = 242)	n (%)	Group 2 (N = 242)	n (%)	χ2	*p*-value
Present	26 (10.7)		42 (17.4)		4.38	0.025*
Absent	216 (89.3)		200 (82.6)			

** = Significant p-value; MHA = Mental Health Abnormalities; Group 1 = School children enrolled during the pre-COVID-19 era; Group 2 = School children enrolled from the post-COVID-19 lockdown era.*

Table 3: The degree of difference in MHA prevalence between Groups 1 and 2

Variables	aOR	95% CI for aOR	*p*-value
Group 1	Reference	-	-
Group 2	3.89	2.43–24.26	0.001*

** = Significant p-value; aOR = Adjusted Odds Ratio; CI = Confidence Interval; Group 1 = School children enrolled during the pre-COVID-19 era; Group 2 = School children enrolled from the post-COVID-19 lockdown era.*

Table 4: Bivariate analysis of the difference in MHA types between Groups 1 and 2.

MHA types	Group 1 (N = 242)	n (%)	Group 2 (N = 242)	n (%)	χ2	*p*-value
Emotional disorders						
Present	11 (4.5)		30 (12.4)		9.62	0.001*
Absent	231 (95.5)		212 (87.6)			
Conduct disorders						
Present	5 (2.1)		13 (5.4)		3.69	0.044*
Absent	237 (97.9)		223 (94.6)			
Hyperactivity/inattention disorders						
Present	3 (1.2)		6 (2.5)		1.02	0.252
Absent	239 (98.8)		236 (97.5)			
Peer-relationship disorders						
Present	19 (7.9)		33 (13.6)		4.22	0.028*
Absent	223 (92.1)		209 (86.4)			

** = Significant p-value; MHA = Mental Health Abnormalities; Group 1 = School children enrolled during the pre-COVID-19 era; Group 2 = School children enrolled from the post-COVID-19 lockdown era.*

Table 5: A multivariate analysis of the significant MHA types between Groups 1 and 2.

MHA types	aOR	95% CI for aOR	*p*-value
Emotional disorders			
Group 1	Reference	-	-
Group 2	2.68	1.06–6.74	0.037*
Conduct disorders			
Group 1	Reference	-	
Group 2	1.96	0.66–5.82	0.229
Peer-relationship disorders			
Group 1	Reference	-	-
Group 2	1.01	0.46–2.21	0.985

** = Significant p-value; aOR = Adjusted Odds Ratio; CI = Confidence Interval; Group 1 = School children enrolled during the pre-COVID-19 era; Group 2 = School children enrolled from the post-COVID-19 lockdown era.*

DISCUSSION

The MHA prevalence among the children from the pre-COVID-19 era (10.7%) and those from the post-COVID-19 lockdown eras (17.4%) reported in this present study was high. This finding was expected and likely due to an increase in pressure to excel at school, peer pressure, bullying, substance abuse, poverty, bereavement and family disharmony. Though not specifically tested in this study, these factors pose as life stressors that precipitate MHA.[14,41,42] The high MHA prevalence from the pre-COVID-19 era reported in this present study was also observed by Akpan *et al*[43] in 2020 in Ikot-Ekpene, Nigeria, Jha *et al*[44] in 2019 in Nepal and Malik *et al*[45] in 2019 in Pakistan. Also, the high MHA prevalence from the post-COVID-19 lockdown era reported in this present study was observed by Ma *et al* [46] in 2021 in Nepal.

The MHA prevalence among the children from the pre-COVID-19 era reported in this study (10.7%) is comparable to those reported in the same era by Akpan *et al*[43] in Ikot-Ekpene, Nigeria (9.8%) and Jha *et al*[44] in Nepal (11.2%). Also, the MHA prevalence among the children from the post-COVID-19 lockdown era reported in this study (17.4%) is comparable to those reported by Ma *et al*[46] in Nepal (18.3%). These similarities may be due to the good psychometric properties of the deployed psychometric tools in these studies.

In this present study, the MHA prevalence among the children from the post-COVID-19 lockdown era (17.4%) was significantly higher than that of the children from the pre-COVID-19 era (10.7%), and the children from the post-COVID-19 lockdown era were four times more likely to have MHA than those from the pre-COVID-19 lockdown era. These findings were not surprising as the devasting effects of the COVID-19 pandemic resulted in grievous panic, social isolation, worsening socioeconomic situations and family separation, with consequent economic, social, psychological and medical implications.[2,3] These are potential triggers of MHA, which in addition to the pre-existing triggers from the pre-COVID-19 lockdown era, may have compounded the children's mental health.

Studies that compared the MHA prevalence between the pre-COVID-19 and post-COVID-19 pandemic lockdown eras also corroborated the difference in MHA prevalence between these eras: A meta-analysis by Wang *et al*[23] in 2022 on Chinese children and a systematic review by Kauhanen *et al*[24] in 2023 on Finnish children and young adults, reported significantly higher MHA prevalence from the post-COVID-19 than the pre-COVID-19 eras. The agreement in findings between this present study and those of Wang *et al*[23] and Kauhanen *et al*[24] may be due to the similar psychometric properties of the tools used to determine MHA. In contrast, Sun *et al*[26] in 2023 in Canada and Gilligan *et al*[25] in 2022 in Ireland, observed no difference in MHA prevalence between children from the pre-COVID-19 and post-COVID-19 lockdown eras, a variation that may be due to differences in the study population. The study population of this present study comprises children from primary and secondary schools, that of Gilligan *et al*[25] comprises only primary school children while that of Sun *et al*[26] focused more on adult populations. The studies by Gilligan *et al*[25] and Sun *et al*[26] omitted children from secondary schools, a significant proportion that may have MHA and may significantly contribute to the comparison. In addition, Gilligan *et al*[25] had an 87% response rate from participants in the pre-COVID-19 era and a 35% response rate from those of the post-COVID-19 lockdown eras. This difference in responses may be significant and may have affected the actual MHA prevalence of the children from the post-COVID-19 lockdown era.

Despite higher prevalences of emotional, conduct, hyperactivity/inattention, and peer-relationship disorders among children from the post-COVID-19 lockdown era, only emotional disorders had a significant difference. The children from the post-COVID-19 lockdown era had a significantly higher prevalence of emotional disorders and were three times more likely to have emotional disorders than those from the pre-COVID-19 era. This finding was expected as COVID-19 produced high morbidities and mortalities, school closures, economic hardships, devastating fears and uncertainties about the future.[18] These may have resulted in anxiety and depression, which are components of emotional disorders and may be responsible for the significantly higher prevalence and likelihood of developing emotional disorders in children from the post-COVID-19 lockdown era. This finding was collaborated by other studies. For instance, Wang *et al*[23] in 2022 in China and Ravens-Sieberer *et al*[19] in 2023 in Germany, reported higher prevalences and significant rise in anxiety and depressive states among children in the post-COVID-19 lockdown era compared to those in the pre-COVID-19 era. A review by Bai *et al*[18] in 2022 showed a significant rise in anxiety and depressive states among children from the post-COVID-19 lockdown era compared to the pre-COVID-19 lockdown era. Also, Racine *et al*[47] in a meta-analysis in 2021 documented the doubling of the worldwide prevalence and significant rise in anxiety and depressive states among children from the post-COVID-19 lockdown era.

CONCLUSION

We concluded that the prevalence of MHA in children is higher in the post-COVID-19 lockdown era than in the pre-COVID-19 era, and emotional disorders are the most common MHA type among these children. The implications of these findings are increased risk of school absenteeism, poor school performances and suicidal tendencies. Thus, there is a need for increased awareness and improved mental health assistance for these children. There is also a need to explore the coping strategies of the children who did not develop MHA, as this may help mitigate the negative effects of MHA.

To the best of our knowledge, this study is the first study in Umuahia that compared school children's mental health from the pre-COVID-19 and post-COVID-19 lockdown eras. However, the study design (cross-sectional) is a limitation, as the children were not followed up to ascertain the final outcome.

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Authors' contribution: IFO conceptualized and designed the study, and analysed the data. IFO, CNN, and UUO contributed to the implementation

of the project and were actively involved in the writing, revision, reading, and final approval of the manuscript. The authors agree to be accountable for all aspects of the work.

Data availability: Data used in this study is available from the corresponding author based on a credible request.

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We have no conflict of interest

Ethical approval:
This study was approved by the Institutional Health Research Ethics Committee (HREC).

Informed consent:
Informed consent was obtained from the caregivers of the children and assent was obtained from the children aged seven years and above.

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