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Clinical features of children with coronavirus disease 2019 (COVID-19) at a single isolation centre in Ghana

Joycelyn A Dame ^{1*}, Peter Puplampu ², Akosua S Ayisi ^{3,6}, Ali Samba⁵, Nana E Appiah ^{4,6},
Nana F Agyeman ⁶, Lorna Renner ¹

¹ Department of Child Health, University of Ghana Medical School, College of Health Sciences, University of Ghana, Accra, Ghana; ² Department of Internal Medicine, University of Ghana Medical School, College of Health Sciences, University of Ghana, Accra, Ghana; ³ Greater Accra Regional Health Directorate, Ghana Health Service, Accra, Ghana; ⁴ Department of Dentistry, Korle Bu Teaching Hospital, Accra, Ghana; ⁵ Department of Obstetrics and Gynaecology, University of Ghana Medical School, College of Health Sciences, University of Ghana, Accra, Ghana; ⁶ Pentecost Convention Isolation Centre, Ministry of Health and Ghana Health Service, Accra, Ghana.

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Abstract

Background: Children with coronavirus disease 2019 (COVID-19) who do not require hospitalisation must isolate to prevent the virus's spread.

Objective: This study describes the prevalence, characteristics, source of infection, and treatment outcome among children with asymptomatic or mild COVID-19 admitted to Ghana's largest isolation centre.

Methods: We conducted a retrospective descriptive study among children 0 - 18 years admitted to Pentecost Convention Isolation Centre in Ghana between April 24 and August 31, 2020. We extracted their clinical details and patient outcome information from their medical records.

Results: The number of children enrolled was 57, with a median age of 16 years (interquartile range: 12 - 17 years). The most common symptom was a headache. Most of the participants admitted from school attributed their source of infection to a school colleague. One patient required transfer to a hospital while the rest were discharged home after de-isolation.

Conclusion: Children with asymptomatic and mild COVID-19 were managed successfully in a facility repurposed as an isolation centre. The use of repurposed isolation centres can reduce hospital care load during this pandemic. As schools re-open fully, school authorities must collaborate closely with public health institutions for rapid testing of all persons suspected to have COVID-19, to initiate early contact tracing and isolate those who are positive.

Keywords: COVID-19, asymptomatic, mild, children, Ghana, isolation

INTRODUCTION

In December 2019, an outbreak of unexplained pneumonia occurred in patients in Wuhan, Hubei Province, China [1]. The aetiological agent was identified as a novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), and the clinical syndrome named coronavirus disease 2019 (COVID-19) [2]. Soon COVID-19 cases were imported from China to other countries, reaching pandemic status. Ghana recorded the first 2 imported cases of COVID-19 on March 12, 2020. By the end of June 2020, the number of cases had increased to 17,741, with an intense community transmission [3]. The

clinical symptoms of COVID-19 are similar to that of other acute respiratory viral infections and include fever, cough, sore throat, breathlessness, fatigue, and malaise [4,5]. The disease is mild in about 80% of the reported cases [6] but may be severe in the elderly and those with underlying comorbidities [6]. Notably, infection in children is less severe than in adults [7]. In a case series of 171 children treated for COVID-19 in Wuhan, the typical clinical symptoms and signs were cough (48.5%), pharyngeal erythema (46.2%), fever (41.5%), and pneumonia (64.9%). Three children with pre-existing medical conditions (hydronephrosis, leukaemia, and intussusception) required invasive mechanical ventilation in the intensive care unit [8]. Most infected children with mild to moderate disease recover 1 - 2 weeks after the onset of symptoms. Severe COVID-19 cases may rapidly progress to acute respiratory distress

* Corresponding author

Email: jassimeng-dame@ug.edu.gh

syndrome and multiple organ failure [4]. A multisystem inflammatory syndrome associated with COVID-19 in children with features of Kawasaki disease and or toxic shock syndrome has been previously described [9]. In Ghana, asymptomatic or mild COVID-19 is managed at home if it is safe for isolation, in keeping with WHO's guidelines for home management of COVID-19 [10]. When the home cannot be used, a repurposed facility or a hospital is used for isolation. During the year 2020, Ghana was one of the African countries with a high prevalence of COVID-19 and was named by WHO as one of the top 10 African countries with 'accelerating' COVID-19 cases [11]. As restrictions ease and schools re-open fully, children could be an important source of disease transmission, and the school community may enhance the spread of SARS-CoV-2. There is a lack of data on the epidemiology of COVID-19 in children in Africa, especially in a non-hospital setting and when the disease is not severe. This study sought to address the knowledge gap. It describes the clinical characteristics and source of infection in children with asymptomatic and mild COVID-19 admitted into a facility repurposed as an isolation centre in Ghana and their treatment outcome.

MATERIALS AND METHODS

Study setting

We conducted a descriptive retrospective study at the Pentecost Convention Isolation Centre (PCIC), located in Ghana's Central Region. The Pentecost Church gave out 5 of its hostels at the convention centre to Ghana's Ministry

of Health to manage asymptomatic and mild COVID-19. The isolation centre has a 1000-bed capacity. Most COVID-19 patients admitted at PCIC are from the Greater Accra Region, the pandemic's epicentre in Ghana, and the rest come from the Central Region. A team of medical officers, specialists, psychologists, and nurses live in one of the hostels and provide clinical care.

Study population

Children aged 0 - 18 years who were admitted between April 24 and August 31 2020, with confirmed COVID-19 were included in the study. Children with incomplete data were excluded. A confirmed case of COVID-19 was a person with laboratory confirmation of COVID-19 using real-time reverse transcriptase-polymerase-chain-reaction (RT-PCR) of nasal and/or pharyngeal swabs, irrespective of clinical signs and symptoms [6].

Data collection

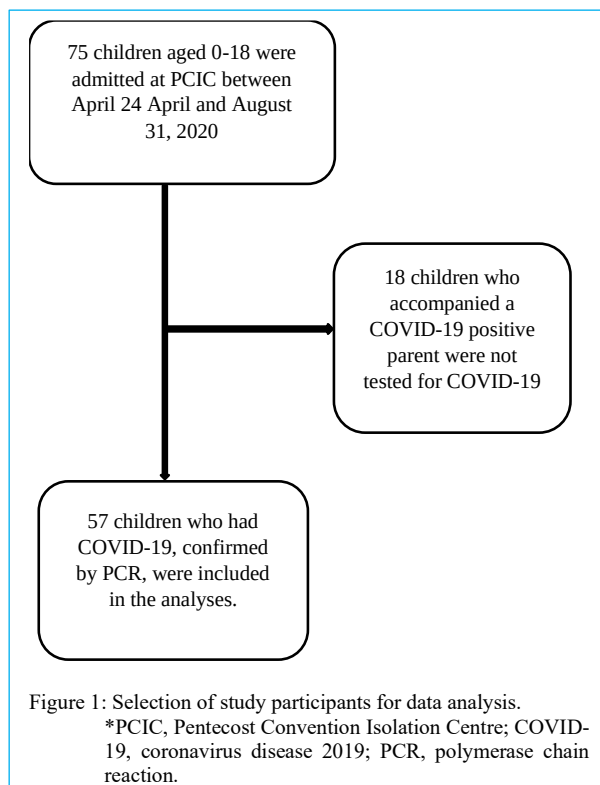
We retrospectively reviewed the medical records and extracted the clinical details, time to admission after the COVID-19 test, source of infection, and treatment outcome. The data was entered into study-specific collection datasheets. The discharge criteria used in Ghana was used at PCIC. Discharge criteria 1 (according to the WHO definition) referred to a person who tests negative for COVID-19 on two consecutive nasal or pharyngeal specimens using RT-PCR, at least 24 hours apart after the initial positive test for COVID-19, and is clinically asymptomatic [12]. Discharge criteria 2 referred to Ghana's modification of WHO's new criteria for discharge - a person with symptomatic COVID-19 is discharged 14 days after symptom onset, plus at least 3 additional days without symptoms (fever and respiratory symptoms inclusive) [13,14]. A person without symptoms is discharged 14 days after a positive test for SARS-CoV-2 [13,14].

Statistical analysis

All data were entered into and analyzed using the IBM Statistical Package for Social Sciences (SPSS) Statistics for Windows, Version 23.0. Descriptive statistics of mean, standard deviation, frequencies and percentages were used to describe the data. Univariate associations were determined using cross-tabulation and compared using the Chi-Square test. All $p < 0.05$ were considered significant.

RESULTS

There were 75 children aged 0 - 18 years admitted to PCIC during the study period; out of this number, 57 had a positive test for COVID-19 and were used in the subsequent analyses (Figure 1). They included 24 final year students from various secondary schools who were in school to complete their final term exams during a partial lockdown in the country. The rest of the 18 children accompanied a parent who had tested positive for COVID-19 and was never tested. The total number of patients admitted with COVID-19 during the study period was 1,745 and the proportion of children was 3.3% ($n = 57$).



Characteristics of study participants

There were 50.9% (n = 2957) of asymptomatic participants and 49.1% (n = 28/57) of patients who had mild disease. The median age for participants with asymptomatic infection was 16 years (interquartile range: 14 – 16 years) and 17 years (interquartile range: 11 – 16 years) for those

with mild disease. There was no known exposure to COVID-19 in 41.4% (n = 12/29) of participants with an asymptomatic infection and 32.1% (n = 9/28) with mild disease. Out of those who knew their infection source, 61.2% (n = 22/57) thought it was from a school colleague (Table 1).

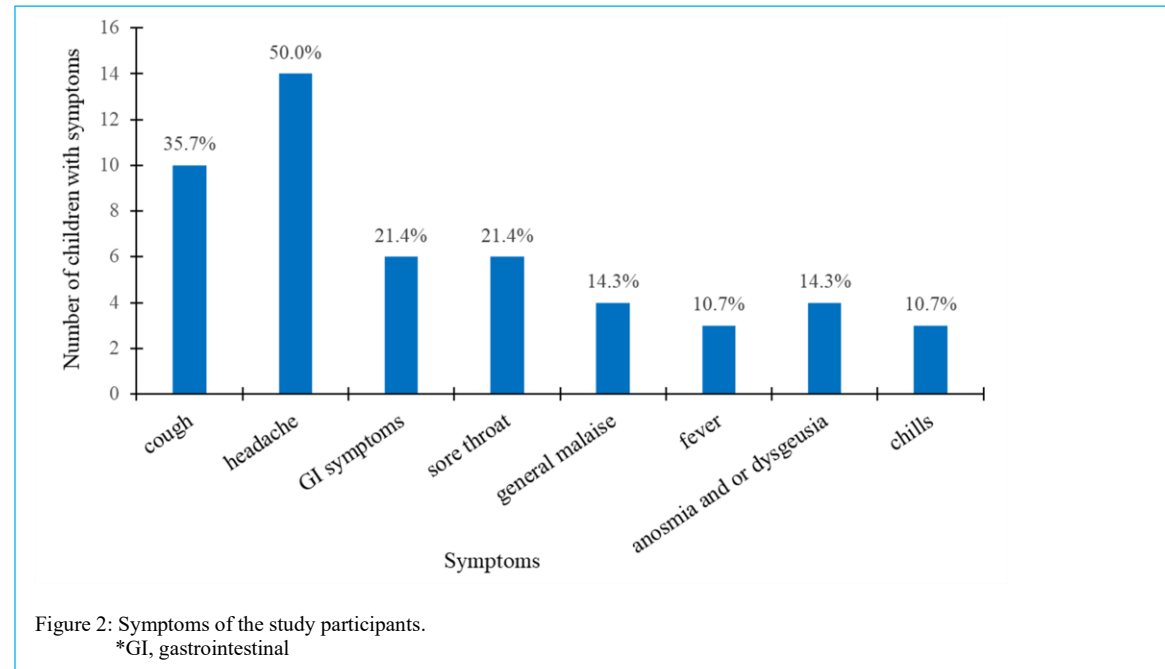


Table 1: Characteristics of study participants

Variable	Total (%) n = 57	Asymptomatic (%) n = 29	Mild Disease (%) n = 28
Age (years) median (IQR)	16.0 (12,17)	16.0 (14, 16)	17.0 (11,16)
Age category			
< 5	1 (1.8)	0 (0.0)	1 (3.6)
5 - 9	9 (15.8)	4 (13.8)	5 (17.9)
10 - 14	9 (15.8)	5 (17.2)	4 (14.3)
15 - 18	38 (66.6)	20 (69.0)	18 (64.3)
Sex			
Male	15 (26.3)	10 (34.5)	5 (17.9)
Female	42 (73.7)	19 (65.5)	23 (82.1)
Educational level			
None or preschool	4 (7.0)	2 (6.9)	2 (7.1)
Primary	13 (22.8)	6 (20.7)	7 (25.0)
Secondary	40 (70.2)	21 (72.4)	19 (64.9)
Known exposure to COVID -19 patient			
Yes	36 (63.2)	17 (58.6)	19 (67.9)
No	21 (36.8)	12 (41.4)	9 (32.1)
Source of Exposure (n = 36)			
Part of household exposure	7 (19.4)	3 (18.8)	4 (20.0)
School	22 (61.2)	10 (62.4)	12 (60.0)
Travel or gathering	0	0	0
Other ^a	7 (19.4)	3 (18.8)	4 (20.0)
Mean time to admission after initial COVID-19 test/days (SD)	8.1 (4)	8.1 (4)	7.9 (4)

^a Other; adult neighbour (n = 4), visitors (n = 2), adult childminder (n = 1)

Table 2 Laboratory findings, treatment, and outcome

Variable	Total (%) n = 57	Asymptomatic (%) n = 29	Mild Disease (%) n = 28
Underlying medical condition	0	0	0
Mean lymphocyte count/ $10^9/L$ (SD)	2.9 (1.57)	2.9 (0.73)	2.8 (0.72)
Mean neutrophil count/ $10^9/L$ (SD)	2.8 (0.72)	2.57 (1.26)	3.6 (1.83)
Azithromycin given for treatment			
Yes	51 (89.5)	24 (82.8)	27 (96.4)
No	6 (10.5)	5 (17.2)	1 (3.6)
Mean number of days on admission/days (SD)	13.5 (8.1)	14.8 (8.4)	12 (7.7)
Discharge criteria			
Fulfilled criteria 1	30 (52.6)	18 (62.1)	12 (42.9)
Fulfilled criteria 2	27 (47.4)	11 (37.9)	16 (57.1)
Treatment outcome n/N (%)			
Discharged home	56 (98.2)	29 (100.0)	27 (96.4)
Referred to a hospital	1 (1.8)	0 (0)	1 (3.6)

Presenting features, treatment, and outcomes

Among the participants with mild disease, the most common symptom was a headache 50.0% ($n = 14/28$), followed by cough (35.7%, $n = 10/28$) (Figure 2). Some (25%, $n = 7/28$) of the participants had more than one symptom. The mean ($\pm$ standard deviation) lymphocyte count was normal at $2.9 \times 10^9 \pm 1.7$ L, and the range was $1.55 - 3.75 \times 10^9$ L. Almost (89.5%, $n = 51$) all the children enrolled in the study were treated with azithromycin, including 82.7% ($n = 24/29$) who had no symptoms (Table 2). There was a significant difference between the mean duration of admission among patients who fulfilled discharge criteria 1 and 2: 20.1 ± 5.3 days versus 6.6 ± 3.7 days respectively ($p = 0.0001$). The mean number of COVID-19 PCR tests done for those who fulfilled discharge criteria 1 was significantly higher than the tests done for those fulfilling discharge criteria 2: 3.4 ± 1.2 tests versus 1 ± 0 test respectively ($p = 0.0001$).

DISCUSSION

This study describes the successful management of children who had asymptomatic and mild COVID-19 in a repurposed facility used as an isolation centre in Ghana. Only 1 patient required transfer to a hospital facility. He was a 3-month-old infant with gastroenteritis who was subsequently discharged home from the hospital. Similarly, in Italy, out of 154 children with COVID-19 who were asymptomatic or had mild disease and were managed in community health homes, only 1 required admission to the hospital [15]. According to WHO's guidance for clinical management of COVID-19, patients who are asymptomatic or have mild and moderate illness may not require hospitalisation but must isolate to prevent virus transmission [16]. They can isolate at home or in repurposed facilities like hotels, hostels, or stadiums [16].

In Africa, rapid urbanisation, unmatched by an associated housing supply, results in overcrowded homes and makes

home isolation unsafe [17]. Thus, repurposed facilities for isolation during this pandemic may decrease healthcare facilities' burden while containing the virus's spread. The proportion of children with COVID was 3.3%, which is in keeping with infection rates of 1 - 5% found in children [9]. Reasons for the lower proportion of COVID-19 in children include simultaneous viruses in the mucosa of their lungs and airways, a structurally and functionally less mature angiotensin-converting enzyme II in the airways, differences in the immune system, and fewer chronic health problems [18]. The median age was 16 years (interquartile range 12-17). It falls in the group of children aged 10-19 years who were found during contact tracing in Korea to transmit the virus to their household contacts more than other age groups [19]. Another report showed that asymptomatic children can shed high viral loads in their respiratory tract specimens and transmit the virus [20]. Thus, isolating children with asymptomatic or mild COVID-19 is essential to prevent spread in the community.

The most common symptom was a headache, 50.0%, followed by a cough, 35.7%. Headache is a frequent neurologic symptom in COVID-19, and among adults COVID-19 related headaches are associated with anosmia and ageusia [21]. However, among 820 paediatric cases described in a literature review, the headache was an uncommon symptom [22]. The prevalence of headaches in children with COVID-19 may be underestimated, as the focus of infection in children has been directed toward respiratory and gastrointestinal symptoms. The least frequent symptom was fever and chills, indicating that body temperature as the only screening tool in children may be inadequate. The mean lymphocyte count was normal, 2.9×10^9 L (SD 1.7). Other studies have reported normal, increased, or decreased white cell counts in children with COVID-19 [8, 23]. Our samples were taken days into the infection due to the delay in receiving the COVID-19 results and may explain the normal findings. The majority of the participants ascribed their source of infection to a

school colleague. As schools re-open fully, institutional heads must collaborate closely with public health institutions for rapid testing, tracing, and isolation of all suspected or contacts of COVID-19 cases. Simultaneously, pupils must adhere strictly to all COVID-19 protocols appropriate for their age. The other participants who knew their source of infection identified the index case as an adult within the household or a neighbour. This finding supports the studies that showed that household infections in children were usually transmitted from adults [24]. The mean time to admission after the COVID-19 test was prolonged, 8.1 days (SD 4.0), due to delayed COVID-19 test results. The virus's infectivity peaks near the onset of symptoms and falls rapidly a week after [25]. We can infer that our participants remained in the community when they were most infectious and were admitted when they were recovering. A quick turnaround of COVID-19 results can prevent the spread of the virus within the community.

There was a statistically significant difference in admission duration between those discharged with criteria 1 and those with criteria 2, $p=0.001$. The former spent an average of 20 days. Participants discharged with criteria 1 had an average of 3.4 PCR tests done, and criteria 2 had 1 PCR test done. This difference was statistically significant, $p=0.0001$. Prolonged hospitalisation could result in income loss for caregivers who work in the informal sector, such as traders, and repeat tests are a financial burden to the government. After WHO released the new de-isolation criteria, Ghana reviewed its discharge criteria to reflect the change [13,14]. The majority of the participants, 90.0%, were prescribed azithromycin. Azithromycin is recommended in COVID-19 when atypical pneumonia is suspected. Routine use of azithromycin or other antibiotics for COVID-19 must be discouraged to prevent antibiotic resistance. National COVID-19 protocols must be evidence-based and updated when new evidence is available. None of the children had chest imaging done; therefore, we could not determine if any of the participants had radiologic pneumonia. Due to the study's retrospective nature, the source of infection was ascertained only from the study participant's record and we relied only on the clinicians assessment of the patient.

Conclusion

The study provided insights into the clinical features of children with asymptomatic and mild COVID-19 in Ghana. Asymptomatic or mild COVID-19 in children can be managed successfully in repurposed isolation facilities when the home is not safe for isolation. As schools re-open, school authorities must collaborate closely with public health institutions for rapid testing, quick turnaround of results, tracing, and isolation of all suspected or contacts of COVID-19 cases.

DECLARATIONS

Ethical considerations

The study was completed following the Declaration of Helsinki and approved by the Ghana Health Service

Ethical Review Committee, Ghana Health Services, Accra, reference number: GHS-ERC 11/07/20. Informed consent was not obtained from patients or caregivers because data were collected retrospectively. Patient details were anonymised before data analysis.

Consent to publish

All authors agreed to the content of the final paper.

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None

Competing Interests

No potential conflict of interest was reported by the authors.

Author contributions

JAD conceived the study and participated in the methodology design, provision of resources, analysis, writing the original draft, review, and editing the final manuscript; PP was involved in conceiving the study and methodology design, writing and reviewing the submitted manuscript; ASA was involved in data collection, writing and reviewing the manuscript; AS and PP were involved in conceiving the study and participated in the methodology design, writing and reviewing the submitted manuscript; NEA participated in data collection, and was involved in writing and reviewing the submitted manuscript; NFA participated in data collection, writing, review and editing the final manuscript; LR participated in writing, reviewing, and editing the final manuscript.

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Availability of data

Data is available upon request to the corresponding author.

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