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Research Article

The Clinical Profile of COVID-19 Infected Children and Adolescents in a Regional Treatment Center in Cameroon

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Abstract

Objectives: To describe the clinical features, comorbidities and outcome of COVID-19 infected children and adolescents in Cameroon.

Methods: A retrospective cross-sectional study conducted among COVID-19 patients aged 19 years or less, managed at the treatment center of the Bamenda Regional Hospital from 6th March 2020 to 6th June 2021. Data collected from the medical records included demographic data, Clinical characteristics at presentation, laboratory findings, treatment and outcome were collected.

Results: The study included 290 children representing 17.7 % of the total number of cases, with a mean age of 13.4±4.72 years and a sex ratio 0.44. Contamination was mainly from close contact with a positive case in school (74.10%) or a family member (25.50%). While most symptomatic cases were mild (67.9%), 3.1% were moderate cases and 29% remained asymptomatic. Among symptomatic patients, there was a 2 times increased odds among adolescents compared with the pre-adolescent (OR= 2.16 95%CI: 1.09 - 4.22; p=0.02). The most reported symptoms were cough (43.80%) and nasal symptoms (41.4%). All subjects had a good outcome with 99.7% cured rate.

Conclusion: COVID-19 is common in children of all ages, most of whom are either asymptomatic or present with mild forms with a very good outcome.

Keywords: Children, COVID-19, clinical presentation, outcome, transmission

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Coronavirus disease-2019 (COVID-19) is a novel infectious disease caused by a new strain of corona virus, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) which emerged from Wuhan, Hubei province, China, in December 2019.[1,2] Characterized by its exceptional rapid spread,COVID-19 (SARS-CoV-2) was declared Public Health Emergency of International Concern on February 1st 2020 by the WHO and a pandemic on March 11, 2020, the first to be caused by a coronavirus.[1–4] In Cameroon, the first case was confirmed on the 6th of March 2020.[1-5] As of June 1st, 2021, the WHO weekly epidemiological update reports about 170 million cumulative cases of COVID-19 worldwide, with more than 3.5 million deaths. Cameroon has recorded 78.000 cases and 1270 deaths since the beginning of the pandemic.[6] The COVID-19 case fatality rate is 3-5%, but this varies widely with comorbidities and age.[6-10] The overall case fatality rate for COVID-19 in Cameroon is 2%.[10] As of June 1st, 2021, children represented 14.1% of all

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COVID-19 cases in the United States, 2.1% total cumulated hospitalizations and only 0.06% of all COVID-19 deaths.[11]

Children are typically more vulnerable to viral respiratory infections, given their fragile immune system.[12] Surprisingly, children with COVID-19 appear to have a milder clinical course compared to adults, and a better outcome which poses a big unexplained paradox to the scientific community.[1, 13-15]

Despite the mild course of the disease, children and adolescents play a vital role in the community spread of the virus, because of their predisposition to develop upper respiratory tract infections with nasopharyngeal carriage.[15-16]Very few studies have been done, and this prompted us to do this study with the aim of determining the epidemiological and clinical features, and outcome of COVID-19 infection in children and adolescents at the Bamenda Regional Hospital.

Methods

We carried out a hospital-based cross sectional retrospective study at the Bamenda COVID-19 Treatment Centre. The Bamenda Regional Hospital is a third category second referral hospital situated in the regional capital of the North West region of Cameroon.

Our study population comprised files of all children and adolescents managed at the Bamenda COVID-19 Treatment Center during the study period 6th March 2020 to 6th June 2021. We included in our study all children aged 0 to 19 years old with a COVID-19 positive test (Rapid antigenic test and/or reverse transcription polymerase chain reaction).

Information was extracted from the files of all eligible participants concerning the following: the demographic information, the comorbidities, exposure history, treatment received before consultation, the symptoms, vital signs (temperature, respiratory rate, heart rate, blood pressure), laboratory examination results (Complete blood count, D-dimer, c-Reactive Protein and others), treatment received at the COVID-19 treatment center and the outcome.

Patients were clinically classified according to their disease severity as follows:[7]

- Asymptomatic infection; tested positive for 2019-nCoV, but without manifestations of clinical symptoms or abnormal chest imaging findings.
- Mild disease/Acute upper respiratory tract infection; flu-like symptoms (fever, cough, pharyngeal pain, nasal congestion, fatigue, headache, myalgia or discomfort) without signs of pneumonia by chest imaging or sepsis.
- Moderate disease/Mild Pneumonia; symptomatic patients with clinical signs or chest imaging indicating pneumonia, but not reaching the criteria of severe pneumonia.
- Severe disease; Increased respiratory rate: ≥ 70 times/min (<1 year), or ≥50 times/min (≥1 year) (after ruling out the effects of fever and crying); Oxygen saturation <92%; Hypoxia: assisted breathing (moans, nasal flaring), cyanosis, intermittent apnea; Disturbance of consciousness: somnolence, coma, or convulsion; Food refusal or feeding difficulty, with signs of dehydration.
- Critical cases; Those who met any of the following criteria and require ICU care: a) Respiratory failure requiring mechanical ventilation; b) Shock; c) Combined with other organ failure.

Data Management

Data were analyzed using Epi info version 3.5.4. Continuous variables were expressed as mean, SD, and range while Categorical variables was analyzed as counts and percentages. Chi-square and Fischer test was used for the comparison of categorical variables and the evaluation of the degree of influence of the factors was made using the odds ratio with a level of significance set at p value <0.05.

Ethics Approval

Ethical clearance was obtained from the institutional review board of the University of Bamenda and administrative authorisations were obtained from the Regional Delegation of Public Health North West region as well as the Director of the Bamenda Regional hospital.

Results

By June 6, 2021, 1696 confirmed cases of COVID-19 infection had been managed at the Bamenda COVID-19 infection treatment center. Out of which, 300 were children and adolescents between the ages of 0 and 19 years, which represented 17.7 % of the total cases. However, 10 cases were not eligible, as they did not have complete data. Our study involved the analysis of 290 medical records. We observed a slight peak in the month of June 2020 and a higher peak of new cases between February and March 2021 (Fig. 1).

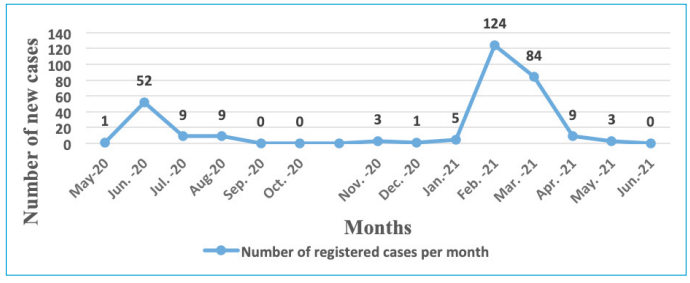

Figure 1. Evolution of number cases per month.

Most of the cases studied were adolescents within the age group 15 to 19 years (51.7%) with only 17.6% pre-adolescents. The subjects had a mean age of 13.4±4.72 years, with their ages ranging from 0.17 (2 months) to 19 years. The frequency of COVID-19 positive cases was found to increase with increasing age (Table 1).There were 89 (30.7%) males and 201 (69.3%) females giving a sex ratio of 0.44.

Contamination was from close contact with a positive case in school and at home in 74% and 25.5% of children respectively. None of the children had a history of travel out of Cameroon. About 41% of cases were identified from schools during screening campaigns or contact tracing (Table 2). One female single-sex school was the main source of patients yielding 31% of the total cases.

Only 2 cases presented with co morbidities; an asthmatic, and a patient with sickle cell anemia, but these had no impact on the clinical presentation and outcome.

While most symptomatic cases were mild (67.9%), 3.1% were moderate, and 29% were asymptomatic. No severe nor critical case was registered (Fig. 2).

Table 1. Socio-demographic characteristics of the study population

	Number	Percentage (%)
Age group (year)		
<1	8	2.80
[1-5]	12	4.10
[5-10]	31	10.70
[10-15]	89	30.70
[15-19]	150	51.70
Total	290	100.00
Gender		
Male	89	30.70
Female	201	69.30
Total	290	100.00

Table 2. Disease exposure

	Number	Percentage (%)
Contamination mode		
School	215	74.10
Family case	74	25.50
Unknown	1	0.30
Total	290	100.00
Referral structure		
Health facilities	150	51.70
Schools	118	40.70
Not identified	22	7.60
Total	290	100.00

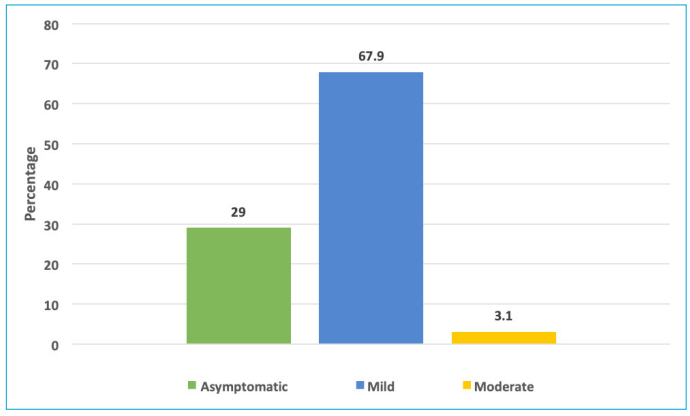

Figure 2. Classification of severity of clinical manifestations.

The most reported symptoms were cough (43.8%), and rhinorrhoea (41.4%) (Table 3).

A higher percentage of the infected adolescents were symptomatic, with a significant association between the age categories and presence of symptoms. Adolescents tested positive had 2 times probability to have symptoms than those younger (OR=0.022; CI95(1.0955-4.2211); p=0.022) (Table 4).

A limited number of para clinical investigations were done in our patients because most had mild or asymptomatic disease.

D-dimer was done in 112 patients (88 symptomatic and 24 asymptomatic), and it was elevated in 33 (29.5%). There was no significant relationship between the D-dimer elevation and the presence of symptoms (p=0.22).

Only 10 (3.4%) patients had a complete blood count, and

Table 3. Distribution of symptoms

Symptoms (N=290)	Number	Percentage (%)
Cough	127	43.80
Rhinorrhoea	120	41.40
Headache	56	19.30
Fever	38	13.10
Anosmia	17	5.90
Sore throat	16	5.50
Loss of sense of taste	14	4.80
Abdominal pain	11	3.80
Joint pain	10	3.40
Muscle pain	8	2.80
Chest pain	7	2.40
Intense fatigue	6	2.10
Shortness of breath	5	1.70
Diarrhea	3	1.00
Chills	3	1.00
Back pain	3	1.00
Others*	13	4.50

Table 4. Relationship between the age category of children with COVID-19 and the presence of symptoms

	Presence of symptoms			X^2		Odds Ratio	
	Symptomatic	Asymptomatic	Total	Value	P	Value	CI
Age category (years)							
[10-19]	177 (74.1%)	62 (25.9%)	239 (100%)	5.2336	0.022	2.1657	1.0955-4.2211
[0-10]	29 (56.9%)	22 (43.1%)	51 (100%)				
Total	206 (71.0%)	84 (29.0%)	290 (100%)				

it was nonspecific in most cases. It showed a normal white blood cell count in 7 (70%), leukopenia in 2 (20%), a normal lymphocyte count in 4 (40%), lymphopenia in 3 (30%), and lymphocytosis in 3 (30%). Were also noted, neutropenia in 7 (70%), a hypochromic microcytic anaemia in 6 (60%), and a normal platelet count in 6 (60%).

Management

Only one case was hospitalized, all the others were confined at home. A combination of azithromycin, hydroxychloroquine, vitamin C and zinc was the main treatment regimen. An anticoagulant was only given to a case with elevated D-dimers. Few patients received paracetamol as adjuvant treatment. None received steroids, and all the patients had a favourable outcome and were declared cured, and no case of death was recorded (Table 5).

Discussion

Children and adolescents accounted for 17.6 % of the total cases managed at the Bamenda COVID-19 treatment centre. This percentage is close to the finding in Nigeria by Adedeji et al. (18%) and USA (14.1%) but far greater than most studies in the other part of the globe including China (1.3%), Republic of Korea (6.2%), Italy (1.4%), and Australia(5.6%).[1,11,15] Due to the milder presentation and higher asymptomatic cases, children and adolescents are generally underdiagnosed.[15] This high percentage of children in our sample is likely because of the mass screening and the contact tracing that has been carried out in schools during the first two peaks of the pandemic in the region. We also observed a slight peak of COVID-19 cases in the month of June 2020 and a higher peak of new cases between February and March 2021. These correspond to the peaks of the first and second wave of COVID-19 in Cameroon respectively.[17] This shows that the rate of infection in children and adolescents not only follows the general pattern within the population but also plays a probable key role in the spread of the infection.

Table 5. Management and outcome of the studied population

	Number	Percentage (%)
Level of care		
Hospitalized	1	0.3
Confined	289	99.7
Total	290	100
Treatment (N=290)		
Azithromycin	290	100
Hydroxychloroquine	289	99.7
Vitamin C	288	99.3
Zinc	288	99.3
Anticoagulants	1	0.3
Outcome		
Recovered	289	99.7
Deceased	0	00.0
Lost to follow up	1	0.3
Total	290	100

Most of the subjects in our study (82.4%) were adolescents with a mean age of 13.4±4.72 years, which is similar to the 12.63±4.31 years found by Adedeji et al in Nigeria and a preliminary analysis from the USA.[15] This was in contrast to study carried by Adetola et al in Northern Sierra Leone where majority of the subjects were pre-adolescents with a mean age of 5.8±4.3 years.[18] A multicenter study in Europe and study in China and United States found that most infected cases below 19 years were aged less than 10 (pre-adolescents).[19] The difference may be due to the method of testing with most cases (40.7%) in our study diagnosed during contact tracing or screening campaign in schools where most of the subjects were adolescents. Compared with all the others study which focused only on children (0-18 years), our study included participants aged 19 years (7.6%), contributing to the higher proportion of adolescents.

The frequency of COVID-19 positive cases was found to increase with increasing age which could be explained by the fact that most cases in our study were diagnosed during mass screening or contact tracing in secondary and high schools where most of the students were adolescents. Children below age of 5 are less likely to express some symptoms when present which will make them less likely to be tested and diagnosed.[15]

Only 30.7% of cases were boys, giving a sex ratio of 0.44. This is in contrast with most previous study where there was a

slight male to female preponderance.[2,15,19,20] This could be explained by the testing pattern in our setting where most cases were detected mostly during special campaign. One of the tested schools, a female single sex school was the main site where screening was done and this site provided up to 31.1% of the total cases.

Contamination was from close contact with a positive case in school (74.10%) or a family member (25.50%). The higher contamination in school was probably due to closer contact between students in school where they spend most of their time during the day. Many subjects were from boarding schools which are generally crowded environments. Children and adolescents are believed to be more prone to nasopharyngeal carriage which could also play a major role in disease spread in schools.[15,16]

In this study, most cases were either asymptomatic or only had mild forms of the disease. Why children and adolescents present with mild illness is not fully understood but a few explanations have been attempted. Firstly, recent evidence suggest that ACE2 receptor used by SARSCoV-2 receptor is lower in children.[15, 20-22] Secondly, it is possible that because children are also exposed to other viral infection, they may have an enhanced antibody levels with cross-immunity that reduces up-regulation of ACE2, hence reducing the likelihood of severe COVID-19 infection.[10,20–22] Thirdly, BCG vaccination which is routinely given to children has been associated with decreased rates of respiratory infections.[15,20,21] Fourthly, immaturity of children's immunity may result in a different response to the infection compared to adult.[15,20,22] Fifthly, children have a better alveolar regeneration and this may favour recovery after COVID-19 infection.[15] Finally, children are less likely to be living with a chronic medical condition compared with adults which could explained their mild illnesses.

The most commonly reported symptoms were cough (43.80%) and nasal symptoms (41.40%). Surprisingly, fever which is one of the main presenting symptoms in most studies was present in only 13.10% of the cases.[16,19] Fever is probably underreported because most children were diagnosed during screening campaigns and contact tracing and not during routine consultation. Fever is also reported to resolve rapidly in mild disease and this may have led to under-report of the symptom.[1]

We found in our study, a case with asthma and sickle cell disease, but this had no impact on the clinical presentation and nor outcome. Low comorbidities could just be due to the fact that children are less likely have chronic medical conditions compared with adults. There is probably need for a larger sample size to evaluate the impact of comorbidities in children and adolescents with COVID-19.

D-dimer is a soluble product of fibrin degradation, and is an important biomarker of coagulation and fibrinolysis, with a high value indicating an ongoing blood clot dissolution.[25] COVID-19 can be associated with a coagulopathy, consistent with infection-induced inflammatory changes which presents initially with prominent elevation of D-dimer similar to cases of disseminated intravascular coagulopathy (DIC).[23, 26] Out of the 112 patients in our study who did the D-dimer assays, only 29.5% had an elevated value, with a non-significant relationship between the D-dimer elevation and the presence of symptoms or severity of the disease. This contrasts the observation in a review by Rod et al involving 17 studies which demonstrated a high consistency in the association between D-dimer and CRP elevation and mortality of COVID-19.[8] This difference may also be explained by the fact that most of our patients were either asymptomatic or had mild illness, stage at which the pathophysiology is primarily inflammatory and D-dimer plays a minor role at this stage of the disease. Furthermore, Oualim et al. in Morocco found that despite the association between D-dimer elevation and covid-19 severity and mortality, D-dimer greater than 1360 ng/ml on day 5 was more predictive of the poor outcome than a value taken early during the course of the disease.[23]

The complete blood count was non-specific and showed predominantly neutropenia 70%. Lui et al, noted significant hematologic changes in adult patients in China, including lymphopenia, neutrophilia, thrombocytopenia, and low haemoglobin.[24]

As with other studies[6,7], all our patients had a favourable outcome with 99.7% cured rate and a case fatality rate of 0%.

Conclusion

COVID-19 affected children of all ages and they were either asymptomatic or only had mild disease. Age was a significant factor in the development of symptoms, as adolescents seemed more likely to be symptomatic than younger children. The symptoms were non-specific and similar to other common febrile diseases found in sub-Saharan Africa. No deaths were recorded, implying an excellent outcome of covid-19 infection in these children.

Disclosures

Ethics Committee Approval: Ethical clearance was gotten from the Institutional Review Board of the University Of Bamenda project identification number; 2021/055H/UBa/IRB.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

Authorship Contributions: Concept – A.C.; Design – A.C., A.G., S.A.; Supervision – A.C., C.M.M., D.N.N.; Materials – All authors; Data collection & processing – A.G., S.L.N., M.P.A., G.T.; Analysis and interpretation – A.G., S.A., S.N.L., A.C.; Literature search – All authors; Writing – A.G., S.N,L., S.A., Critical review – A.C.

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