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Epidemiological and clinical aspects of covid 19 in children Experience of Rabat children's hospital

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Abstract

Objective: To identify the epidemiological characteristics and transmission patterns of pediatric patients with the 2019 novel coronavirus disease (Covid-19) in Rabat.

Methods: This is a descriptive prospective study, carried out at the Rabat Children's Hospital between March 24, 2020 and May 25, 2020. The study population consists of all children hospitalized with their mothers during the study period (Inclusion Criteria: All children who are hospitalized for covid 19 having age between 1 month and 18 years. Exclusion Criteria: Children < 1 month, and children who are suspected of covid 19 but have been excluded by PCR.) The diagnosis is established on the basis of the PCR positivity of a nasopharyngeal swab.

Results: From March 24 to May 25, 2020, the total number of children admitted to the Rabat children's hospital was 60 patients, including 32 male children (53.3%), and the sex ratio (M / F) is 1.14. The median age of all patients is 8.7 years; with extremes of 5 months and 17 years. Contamination was essentially interfamilial in 84.1% of cases and extra familial in 11.9% of cases and unspecified in 4%. Symptomatic Sars-Cov-2 infection seems to be uncommon in this population: 91.6% of our patients are asymptomatic, mild cases representing 6.7%, moderate cases representing 1.7%. For the symptomatic cases, cough is the most common sign (80% of the cases). 98.3% of our patients received symptomatic treatment with isolation measure. The case-fatality rate was 0% and 98.3% of our children are declared cured.

Conclusions: Children of all ages appeared susceptible to Covid-19, and there was a significant sex difference. Although clinical manifestations of children's Covid-19 cases were generally less severe than those of adult patients, young children, particularly infants, were vulnerable to infection. The proportion of asymptomatic cases indicates the difficulty of identifying pediatric patients with the lack of information clear epidemiology, This discovery suggests that Future longitudinal studies are needed to confirm our findings and better understand

which patients are at increased risk for developing severe inflammation and multiorgan failure.

Keywords: Epidemiology, Covid 19, Children, Clinical Aspect.

Introduction

The coronavirus (Covid-19) pandemic has caused a stir in the world on more than one level and the mystery surrounding this virus further blurs the vision, giving rise to the proliferation of rumors and unfounded information, sometimes antinomic and at best imprecise, such as that this disease does not affect children or that the infection is transmitted from children to adults.

Unlike other respiratory virus, in the majority of family clusters it is the parents who infect the children. Clinical evidence suggests that children often have a mild clinical presentation and are frequently asymptomatic. [1]

Serious cases and deaths are extremely rare in children (data up to May), in France less than 1% of intensive care admissions are for children Under 15 years old and only one death occurred in a 16 year girl. (1) According to a large Chinese study of 2,143 children, 5.8% of the children reported serious symptoms (9), in the United States, only 0.58% of 2,572 Covid- 19 children were admitted to intensive care units(8).

In Morocco; about 9% of the recorded cases of Covid19 concern children under 14 years. Of the 6,623 confirmed cases, 625 children have been infected until May 15, 2020. [2]. In order to better understand Covid-19 disease and its particularities in children, a study was conducted at Rabat Children's Hospital. The objective of this study is to describe the epidemiological and clinical characteristics of Covid-19 in children.

Materials and methods

This is a descriptive prospective study, carried out at the Rabat Children's Hospital between March 24, 2020 and May 25, 2020. The study population consists of all children hospitalized with their mothers during the study period We extracted the data from the hospitalized patients' files using exploratory sheets.

The circuit

Our pneumo-allergology departement (P1) converts to Covid 19 service receives via the covid circuit (triage unit): any child with an acute respiratory infection with unexplained fever and cough or having close physical contact with a confirmed case.

Inclusion Criteria

All children who are hospitalized for Covid 19 having age between 1 month and 18 years.

Exclusion Criteria

Children < 1 month and children who are suspected of covid 19 but have been excluded by PCR.

The diagnosis is established on the basis of the PCR positivity of a nasopharyngeal swab.

Performance of nasopharyngeal swab-PCR [3]

- Use the necessary personal protective equipment: use gloves, coveralls, surgical mask ,protective glasses and over shoes
- Identify the sample: Patient's name and date of birth/national patient number, Date of sample
- Warn the patient that this test may be unpleasant for a short time
- Hold the patient's head slightly tilted backwards.
- Insert the swab into the nostril and gently push it as far as possible along the floor of the nasal cavity, parallel to the palate.
- Swab the epithelium of the nasal fossae with rotating movements for 15 seconds, scraping the walls of the nasopharynx in order to collect cells.
- Slowly remove the swab, the cotton of the swab should be covered with mucus

- Place the swab into the tube with transport medium (UTM1) and break off the end of the rod.
- Close the tube tightly.
- While waiting for shipment, keep the sample in the refrigerator (approximately +4°C).

Therapeutic protocol

- Children admitted to the service were treated according to the protocol established and validated by the Ministry of Health
- Asymptomatic forms: hospitalization; isolation and clinical monitoring.
- Symptomatic forms :

Mild: Symptomatic treatment

Moderate: specific treatment

Hygiene measures have been applied by the covid team to fight against nosocomial infections (hand washing, regular disinfection of the premises and the circuit, etc.).

Cure criteria: Apyrexia more than 3 days, improvement of clinical signs and two negative PCR samples taken 24 hours apart.

Results

From March 24 to May 25, 2020, the total number of children admitted to the Rabat Children's Hospital was 60 patients, including 32 male children (53.3%), and the sex ratio (M / F) is 1.14. The male predominance is noted in the majority of age groups: 5-10 years, 10-15 years, 15-18 years, on the other hand the age group of 6 months to 5 years is characterized by the predominance of the female sex, while both sexes are affected in the same way for the 0-6 month age group.

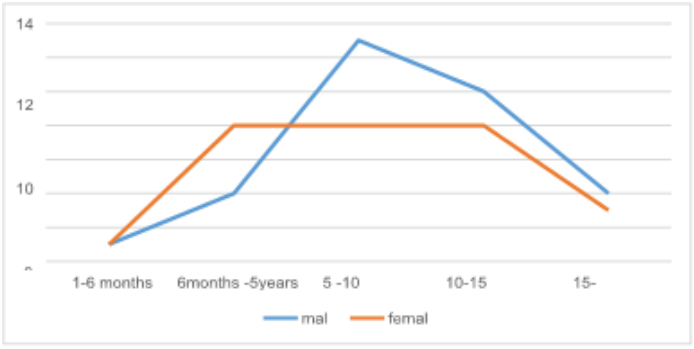

Figure 1: Distribution of the sex according to age

The median age of all patients is 8.7 years; with extremes of 5 months and 17 years.

The percentage of infections in children under 6 months is estimated at 3.3%, 20% for children aged 6 months to 5 years old, 35% for children aged 5 to 10 years old, 30% for children aged 10 to 15 years old and 11.7% for the age group 15-18 years old: children over 5 years old are the most affected in our study (76.7%).

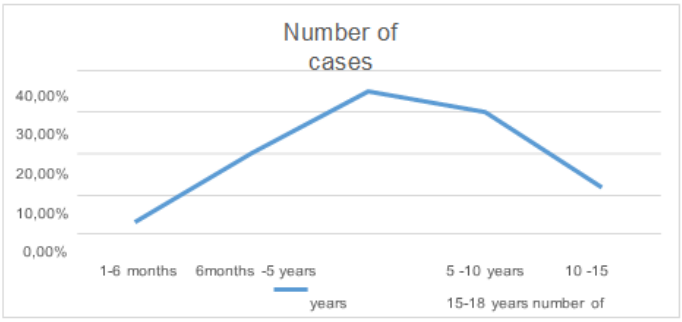

Figure 2: Distribution of COVID-19 cases in children by age group (%)

Contamination was essentially intrafamilial in 84.1% of cases (the contaminator was the father in 72% of cases, the mother in 5.4% of cases, the grandmother in 6.7%); and extrafamilial in 11.9% of cases (neighbor 6.7, uncle 3.5%; cousin 1.7%) and unspecified in 4%. So in total 94.3% of the affected children had contact with an adult covid-positive. The median incubation period from the moment the child contracts the virus until the onset of symptoms was estimated to be 6 days in our study, with a minimum of 4 days and a maximum of 10 days.

Symptomatic Sars-Cov-2 infection seems to be uncommon in this population: indeed, 91.6% of our patients are asymptomatic, and mild cases representing 6.7% and moderate cases representing 1.7%. For the symptomatic cases, cough is the most common sign (80% of the cases). In the case of our patient admitted for respiratory distress, it is a 4-month-old infant with a history of undocumented low birth weight admitted for covid 19 infection in whom the examination was in favor of a harmonious staturoponderal retardation less than 3 SD, a FR of 54 cycles/min and a suprasternal retraction and in whom the investigations were in favor of HIV and CMV co-infection 98.3% of our patients (asymptomatic case, mild case) received symptomatic treatment (antipyretic) with isolation measure One patient with co-morbidities (HIV+ cmv+) classified as moderate form with respiratory distress required specific treatment (azithromycin 10 mg/kg/d (Day 1) then 5 mg/ kg /d for 5days and chloroquine 5mg/ kg /12H for 5days ,declared cured after 9 days. The average duration of PCR negativity is 14 days. The case-fatality rate was 0% and 98.3% of our children are declared cured.

Discussion

The emergence and spread of a new coronavirus (Sars-CoV-2 or Covid-19) from Wuhan, China, has been designated as a public health emergency of international concern by the World Health Organization [4]. The first confirmed pediatric case of Sars Cov-2 infection was reported in Shenzhen China on January 20, 2020 [5]. Sars-Cov-2 infection appears to be infrequent in the pediatric population: indeed, children accounted for about 2% of covid 19 cases in China [6], 1.2% of cases in Italy [7], 5% of cases in the United States [8] and 9% of cases in Morocco [2]. The median age of our children is 8.7 years, which is not consistent with data reported in the literature: According to a Chinese pediatric case study of 2143 children, the median age is around 7 years [9]. 9] In contrast, the median age is higher in the United States around 11 years (extreme 0-17 years) and it is 10 years in Spain with a range of 0-15 years. [10] A male predominance (52.5%) was noted in our children, which is agree with the data in the literature: A large retrospective study conducted by Lu X., Zhang including 171 patients under 16 years of age found a male predominance (60%) [11]. Another study conducted in the United States by Stéphanie Bialek and her colleagues involving 2,572 children confirmed the male predominance: 57% of cases [12].

The male predominance is explained by several hypotheses: [13]

Protective effect of estrogen.

- Increased expression of ACE2 coronavirus receptors in males, particularly since the ACE2 gene is located on the X chromosome.
- The TMPRSS2 protein: whose role is to facilitate viral entry, the expression of the TMPRSS2 gene is favored by androgens only; this upregulation of TMPRSS2 by androgens could explain the increased susceptibility to COVID-19 in men.

In our study, the most affected age group is that of children over 5 years old (76.7%), which agrees with the data in the literature, According to a study in China involving 36 children 72% of children were over 5 years old [14], and according to another study involving 16 children 75% of children were over 5 years old. [15]

Many theories have been postulated to explain why young children and infants are less affected: [16]

Role of angiotensin 2 converting enzyme: Recent evidence indicates that entry of SARS-CoV-2 into cells requires the presence of the converting enzyme protein

ofangiotensin 2 (ACE2). ACE2 receptors are expressed in the epithelia of the respiratory tract, as well as in the lung parenchyma. It should be noted that undifferentiated cells expressing little ACE2 were found to be less infected withSARS-Cov2, while well-differentiated cells expressing more ACE2 were easily infected. ACE2 is less mature in young children and therefore cannot function properly as a receptor for SARS-CoV-2 which could be a protective factor in young children.

Fetal hemoglobin: The Sars-Cov-2 virus proteins (orf1ab, ORF10 and ORF3a) have been shown to attack heme of the hemoglobin 1β chain to break down iron to form porphyrin. This attack not only reduces hemoglobin leading to hypoxia, but also inhibits the normal metabolic pathway of heme. Liu and Li suggest that this mechanism further interferes with the normal anabolic pathway of heme in the human body causing the disease. Young infants have a predominance of fetal hemoglobin, made up of alpha and gamma chains, which may play a protective role against the coronavirus.

Cross-immunity with other viral agents: Acquired immunity against other viruses, may protect the pediatric population. A study on the presence of short-lived relative cross-protection conferred by Prior specific viral infections showed that children infected with adenovirus tended to be protected against adenovirus, coronavirus, enterovirus, rhinovirus, and influenza virus On average, children up to 6 years of age can have between 8 and 12 respiratory infections per year compared to older children and adults. Adolescents who have an average of 2 to 4 respiratory infections per year. So frequent viral infections could be an important protective mechanism against SARS-CoV-2 infection in small children and infants.

Role of BCG [17]: It was postulated that countries where BCG vaccination is routine had less Covid-19 morbidity and mortality.

Following BCG vaccination, there is an increased expression of recognition receptors in monocytes and an increased Th1 and Th17 immune response to non-mycobacterial stimulation, up to 1 year after vaccination. In a randomized trial, BCG vaccination was associated with reduced viraemia with attenuated experimental infection. BCG vaccination has been associated with a decrease in acute upper respiratory tract infection (URI) and a decrease in mortality in children under 5 years of age.

Cells T more effective: Day et al. Have shown that T lymphocytes are particularly important in clearing viruses from mice infected with Sars-CoV 2. Another study in mice also highlighted the importance of CD4, the helper T cells, which stimulate cells'B to produce antibodies against the pathogen, to control infection with SARS-CoV2. In young children, the young immune system and efficient T cells can potentially do a better job of responding to Sars-CoV-2. T cell subsets also undergo dynamic changes between young children and adolescents, in especially with the decrease in regulatory T cells and the increase in memory cells. 84.1% of children in our series had a familial cluster and 94.3% of the affected children had contact with a covid 19 positive adult; these results are identical with the data in the literature: according to a study by Jiehao, C and colleagues, 90% of reported cases of SARS- CoV-2 infection in children; are secondary cases, due to family contamination; [18] In another study involving 171 patients under the age of 16, contamination was also primarily intra familial (90%) [11], something which was also reported in the series of A. Moranda, b: Most children

have been infected after coming into contact with an adult who carries the virus. [19] These data suggest that the contamination of children is mainly by adults

There is now an abundant literature on the role of the child in the transmission of covid 19:

In a Study of Choi et al [20], they found no case of child-to-child or child-to-adult transmission, However, a few reports have described family homes where a child has been identified COVID-19 positive first, followed by other family members [21, 22] Zhuet al also cited two other studies; one looked at 66 family homes and found no cases where the child was the index case. The other looked at 419 family homes and reported that there were no instances where the index individual was under the age of 15. [23] According to a study by Danis K and his colleagues: a nine-year-old boy attended three schools while he was symptomatic of COVID-19, but none of his 112 school contacts contracted the disease [24] Other study confirms that transmission of viruses from children is rare, and this since the physical transmission of the disease is lower in this age group as children have fewer symptoms, such as coughs and sneezing compared to the adult; and since viral load levels are below those of adults [25] The median incubation in the children in our series is 6 days; this result is consistent with the data in the literature: in a smaller study of 10 children diagnosed with covid 19 carried out in china; the median incubation was estimated at 6.5 days [26] On a cohort of patients hospitalized in China including 115 children. The clinical symptoms observed are variable, associating respiratory signs: rhinorrhea, cough, fever, and digestive signs: diarrhea and/or vomiting. [27]In the United States, fever, cough, and shortness of breath were reported in 56%, 54%, and 13% of pediatric patients, respectively. [28] Relatively similar, 41.5% of children in Spain had fever and 48.5% had cough; other digestive signs were reported: abdominal pain, vomiting, and nausea. [29]

Consistent with this, 68% of the 78 confirmed US pediatric cases had no fever, cough or shortness of breath [28]. These mild to moderate clinical presentations may suggest weaker viral circulation in children. To support this hypothesis, a Spanish study showed that only 11.2% of the 365 children tested positive had a clinical presentation compatible with Covid-19 [30]. In any case, the disease is less frequent in children and asymptomatic or mild forms are predominant. These data are consistent with the results of our study involving 58 children where 91.6% of our patients were asymptomatic and 6.7% had a mild form. (Cough) and none of the patients required resuscitation. According to a study conducted by Yang CS, Jinxiu Li, Jing Yuan, et al: the systemic inflammatory response with cytokine release associated with overproduction of immune cells and their activating compounds leading to an inflammatory reaction and accumulation of fluid that can cause respiratory distress, this reaction increases the risk of mortality in patients. 39] In children this reaction is underdeveloped and may explain the predominance of mild forms in this population. [40] According to a study conducted by Yang CS, Jinxiu Li, Jing Yuan, et al: the systemic inflammatory response with cytokine release associated with overproduction of immune cells and their activating compounds leading to an inflammatory reaction and accumulation of fluid that can cause respiratory distress, this reaction increases the risk of mortality in patients. 39] In children this reaction is underdeveloped and may explain the predominance of mild forms in this population. [40] The average duration of PCR negativity is 14 days in our study, which does not agree with the data in the literature: according to a study conducted by J.Cai

and his colleagues involving 10 children, the average duration of PCR negativity was 12 days [31]; these results suggest that we should think about doing the control PCR between day 12 and day 14. Overall, the prognosis is good and remission occurs almost after 1 to 2 weeks, [32] data from published studies have shown that the most severe clinical presentations in children with Covid-19 are rare in different countries: According to a large Chinese study of 2,143 children [9], 5.8% of children reported serious manifestations: dyspnea, decreased oxygen saturation, acute respiratory distress syndrome, shock, encephalopathy, heart failure, coagulation disorder and acute renal failure. [33]

In the United States, of 2,572 Covid-19 children only 0.58% were admitted to intensive care units. [34] The percentage was higher in Spain 60% of confirmed children were admitted to hospital and 10% of them required intensive care and respiratory assistance [35].

The Most of the deaths and serious presentations reported in covid 19 children occurred in people with underlying comorbidities, according to a large study by Zhang L and colleagues 171 children 1.7% of patients were admitted to intensive care with need to mechanical ventilation had associated comorbidities: leukemia under immunosuppressant (chemotherapy), bilateral hydronephrosis [36].

Other studies have shown that regardless of age, the presence of immunosuppression in a covid positive patient can be associated with a severe form but the prognosis is generally good [37].

Which is in accordance with our study; a single patient with moderate to severe with respiratory distress had an associated comorbidity: CMV on immunodepression field HIV but the outcome was good. Children seem to have a shape milder of disease caused by Sars-CoV-2 and deaths are very rare.

In our study no deaths were noted which is in agreement with a study made by Ilaria Liguoro and her colleagues including 224 children Covid-19 where the mortality rate was 0.08% [38].

Conclusion

In conclusion, our study shows that children seem less affected by the Sars Cov 2 and they are unlikely to be the main drivers of the pandemic. Although dry cough is the manifestation most common clinic, more than half of our patients have no obvious symptoms or radiological abnormalities. The proportion of asymptomatic cases indicates the difficulty of identifying pediatric patients with the lack of information clear epidemiology. This discovery suggests that Understanding the role of the pediatric population in the dynamics of epidemic transmission and monitoring of the epidemiological situation is very important in order to better understand its specificities, guide treatment decisions, response to this disease and the deconfinement strategy including the reopening of schools and daycares.

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