

Impact of COVID-19 on child tuberculosis hospitalization

Impact du COVID-19 sur l'hospitalisation des enfants atteints de tuberculose

تأثير كوفيد-19 على استشفاء الأطفال بمرض السل

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ABSTRACT

Introduction: Morocco has made remarkable progress in the fight against tuberculosis, but the Covid-19 pandemic has affected tuberculosis control worldwide, with notable fluctuations in tuberculosis epidemiology during and after the pandemic.

Aim: To describe the impact of the Covid-19 pandemic on the rate of hospitalization for tuberculosis and its different localizations in children.

Methods: We conducted a retrospective study based on the analysis of medical records of TB patients hospitalized within the Children's Hospital in Casablanca, during the periods before (2018-2019), during (2020) and after (2021-2022) Covid-19 quarantine.

Results: Throughout the study period (2018-2022), the total number of patients hospitalized in our department was 7390, including 283 children were hospitalized for tuberculosis, with a mean age of 6 years. Before the Covid-19 pandemic, the average number of tuberculosis cases was 49 per year, of which the percentage of pulmonary tuberculosis was 32% and extra-pulmonary tuberculosis 68%. The number of cases was 23 per year during the quarantine period, with a percentage of pulmonary tuberculosis of 26% and extra-pulmonary tuberculosis of 74%. After the quarantine period, this number rose to 81 cases per year, of which 21% were pulmonary tuberculosis and 79% extrapulmonary tuberculosis (pleural tuberculosis was predominant in 44.1% of cases).

Conclusion: These results are consistent with data published by the World Health Organization, and with the findings of another study we carried out on the impact of COVID-19 on hospital admissions for acute lower respiratory tract infections. It is very likely that the reduction in the number of tuberculosis cases during the quarantine period is due to social distancing, which leads to a reduction in the transmission of tuberculosis between people as well as to the disruption of the national tuberculosis control program in Morocco, when positive cases are identified.

Key words: TB epidemiology, childhood TB, COVID-19, extrapulmonary TB, TB hospitalization, Morocco

RÉSUMÉ

Introduction: Le Maroc a réalisé des progrès remarquables dans la lutte contre la tuberculose, mais celle-ci reste un défi majeur pour la santé publique. La pandémie de COVID-19 a affecté la lutte contre la tuberculose dans le monde entier, avec des fluctuations notables de l'épidémiologie de la tuberculose pendant et après la pandémie.

Objectif: Analyser l'impact du COVID-19 sur le taux d'hospitalisations pour tuberculose et ses types chez les enfants qui nous intéressent.

Méthodes: Nous avons mené une étude rétrospective basée sur l'analyse des dossiers médicaux des patients tuberculeux hospitalisés au sein de l'Hôpital des Enfants du Centre Hospitalier Universitaire Ibn Rochd de Casablanca, pendant les périodes avant (2018-2019), pendant (2020) et après le confinement (2021-2022).

Résultats: Tout au long de la période d'étude (2018-2022), 283 enfants ont été hospitalisés pour tuberculose, l'âge moyen était de 6 ans. Avant la pandémie de COVID-19, le nombre moyen de cas de tuberculose dans notre établissement était de 49). Le nombre de cas est diminué à 23 cas pendant la période de quarantaine, avec une diminution du pourcentage de cas de tuberculose pulmonaire. Après la période de quarantaine, le nombre est passé à 81 cas, dont 80% de tuberculose extrapulmonaire

hygiène et distanciation sociale.

Conclusion: Notre étude a démontré l'impact du COVID-19 sur la répartition de la proportion et des types d'hospitalisations pour tuberculose chez les enfants.

Mots clés: Epidémiologie de la tuberculose, tuberculose infantile, COVID-19, tuberculose extrapulmonaire, hospitalisation pour tuberculose, Maroc

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ملخص :

مقدمة: حقق المغرب تقدماً ملحوظاً في مكافحة السل، لكن جائحة كوفيد-19 أثرت على مكافحة السل في جميع أنحاء العالم، مع تقلبات ملحوظة في وبائيات السل أثناء الجائحة وبعدها. لذلك قمنا بتحليل تأثيرات جائحة كوفيد-19 على معدل دخول المستشفيات بسبب السل ومواقعها المختلفة لدى الأطفال.

الطرق: لقد أجرينا دراسة بأثر رجعي استناداً إلى تحليل السجلات الطبية لمرضى السل الذين تم إدخالهم إلى مستشفى الأطفال في الدار البيضاء، خلال الفترات التي سبقت (2018-2019) وخلال (2020) وبعدها (2021-2022) الحجر الصحي لكوفيد-19.

النتائج: طوال فترة الدراسة (2018-2022)، تم إدخال 283 طفلاً إلى المستشفى بسبب السل، بمتوسط عمر 6 سنوات. قبل جائحة كوفيد-19، كان متوسط عدد حالات الإصابة بالسل قبل جائحة كوفيد-19 49 حالة سنوياً، وبلغت نسبة السل الرئوي 32% والسل خارج الرئة 68%. بلغ عدد الحالات 23 حالة سنوياً خلال فترة الحجر الصحي، وبلغت نسبة السل الرئوي 26% والسل خارج الرئة 74%. بعد فترة الحجر الصحي، ارتفع هذا العدد إلى 81 حالة في السنة، منها 21% سل رئوي و79% سل خارج الرئة (كان السل الجنبني هو السائد في 44.1% من الحالات).

خاتمة: تتفق هذه النتائج مع البيانات التي نشرتها منظمة الصحة العالمية، ومع نتائج دراسة أخرى أجريتها حول تأثيرات كوفيد-19 على حالات دخول المستشفيات بسبب التهابات الجهاز التنفسي السفلي الحادة. من المحتمل جداً أن يكون الانخفاض في عدد حالات السل خلال فترة الحجر الصحي ناتجاً عن التباعد الاجتماعي الذي يؤدي إلى انخفاض عدد حالات السل بين الأشخاص، وكذلك إلى تعطيل البرنامج الوطني لمكافحة السل في المغرب، عند اكتشاف حالات إيجابية.

الكلمات المفتاحية: وبائيات السل، السل الطفولي، كوفيد-19، السل خارج الرئوي، الاستشفاء بالسل.

INTRODUCTION

Tuberculosis (TB) is one of mankind's oldest endemics, but today it remains a major global public health problem, as it is caused by a bacterium (*Mycobacterium tuberculosis*) that mostly affects the lungs [1]. The most common form is pulmonary TB, it can also affect other organs and give rise to extra-pulmonary forms. In Morocco, in 2019, 2081 cases of tuberculosis were reported in people aged under 15 years, the extra-pulmonary form was the most frequent, accounting for 81% of cases, with a strong predominance of lymph node localization (45% of cases), the mode of transmission is generally the emission of airborne tubercle bacilli by people with tuberculosis. Progress has been made in eradicating the disease, thanks to systematic screening of patients and the rapid introduction of curative treatments [2].

Since March 2020, Routine tuberculosis (TB) services have been disrupted by strict confinements and the fight against the new SARS-CoV-2 virus [3], which has led to serious dysfunctions in tuberculosis (TB) prevention and control, although these confinements are important measures to mitigate the direct impact of Covid-19, however, unintended consequences are inevitable [3,4,5]. Many analysis has drawn attention to the serious impact related to containments on tuberculosis care in different countries. The World Health Organization (WHO) reported an 80% daily drop in TB notifications in India compared to average levels before containment measures, it indicates a significant decrease in the reporting of tuberculosis cases on a daily basis [6,7].

Similar changes have been reported elsewhere. South Africa reported a halving of the number of TB tests [8]. The United Kingdom has experienced a significant wave of Covid-19, which has led to enormous pressure on relevant TB services, and many normal clinical practices have been suspended [9]. Therefore, we analyzed the impact of Covid-19 on the rate of tuberculosis hospitalizations and its types among children.

METHODS

We conducted a retrospective, descriptive study based on a chart review of patients followed for tuberculosis at the Children's Hospital at the Ibn Rochd University Hospital Center in Casablanca, during the pre-containment (2018-2019), containment (2020), and post-containment (2021-2022) periods of the pandemic Covid-19 in Morocco.

We used a sampling technique based on the selection of patients with different types of tuberculosis, patients included were those diagnosed with TB (bacteriological, radiological, clinically compatible). A questionnaire containing demographic information such as age, sex, place of residence at the time of onset of the disease and at the time of diagnosis, treatments, consanguinity and family history of similar diseases in the parents. For our statistics we used Excel software.

Patients in our department presented various forms of tuberculosis, so we have grouped pulmonary forms together with primary infections. The World Health Organization (WHO) defines pulmonary tuberculosis as a form of tuberculosis that affects the lungs, according to WHO guidelines, pulmonary tuberculosis is characterized by symptoms such as persistent cough, production of sputum sometimes tinged with blood, fever, weight loss, fatigue and chest pain, symptoms of pleural tuberculosis are percussive dullness and reduced vesicular murmur with or without pleuritic-type pain in the thorax, abdominal tuberculosis is characterized with abdominal distension with ascites or abdominal masses, meningeal tuberculosis symptoms are a subacute onset (over 5 days) of headache, irritability or abnormal behavior, vomiting (without diarrhea), lethargy, decreased level of consciousness, convulsions, stiff neck, bulging fontanel and cranial nerve palsies, miliary tuberculosis is a form with nonspecific symptoms and persistent fever; bone tuberculosis is characterized by limitation of movement and abnormal gait, unilateral joint effusion at the knee or hip and swelling at the ends of the long bones or small bones of the hand (dactylitis), ganglionic tuberculosis is an asymmetrical, painless and non-tender swelling of lymph nodes (usually larger than 2 × 2 cm) for more

than 1 month, unresponsive to any other treatment (e.g. antibiotics), cutaneous tuberculosis is a form of tuberculosis that affects the skin.

RESULTS

During the 2018-2022 study period, 283 children were hospitalized for TB, 143 male and 140 female, the mean age at diagnosis was 6 years. In the two years (2018-2019) preceding COVID-19 (pre-containment), the average annual number of hospitalizations was around 49 TB cases, in the containment year (2020), 23 cases were recorded, the average number of cases in 2021-2022 (post-containment) is 81 cases (Figure 1).

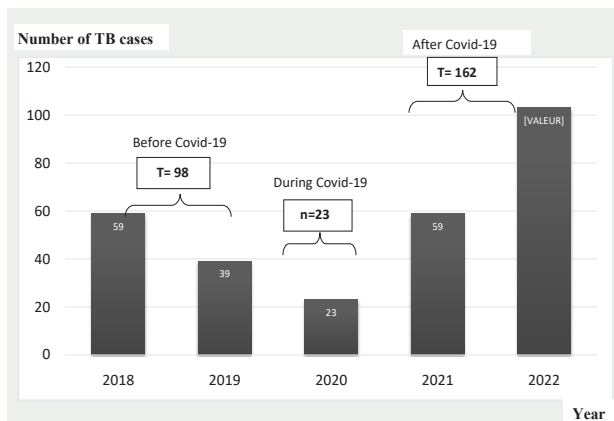


Figure 1. Evolution of number of hospitalizations for tuberculosis before during and after containment (Before Covid-19, T=98, or the average number n=49/year. During Covid-19, T=23. After Covid-19, T=162, or the average number n=81)

T: Total, n : number

Table 1. Comparative table of number and percentages of forms of Tuberculosis before during and after Containment

Types of Tuberculosis	Before Containment n (%)	During Containment n (%)	After Containment n (%)
Pleural TB	24 (25%)	5 (22%)	56 (35%)
Pulmonary TB	31 (32%)	6 (26%)	34 (20%)
Abdominal TB	11 (11%)	7 (30%)	32 (18%)
Lymph node TB	12 (12%)	2 (9%)	13 (7%)
Multifocal TB	7 (7%)	2 (9%)	16 (9%)
Neuromeningeal TB	6 (6%)	0	9 (5%)
Miliary TB	6 (6%)	0	6 (4%)
Cutaneous TB	1 (1%)	0	2 (1%)
Bone TB	0	1 (4%)	2 (1%)
Total	98 (100%)	23 (100%)	162 (100%)

n: number, (%): percentages

Number of hospitalizations with localized tuberculosis before, during and after Covid-19: The main clinical forms of tuberculosis observed (Table 1) before confinement were pulmonary tuberculosis 31% and pleural tuberculosis 24.5%, during confinement, abdominal tuberculosis was 30%, after confinement, pleural tuberculosis with a percentage of 56%.

DISCUSSION

This retrospective study focuses on the impact of COVID-19 on the hospitalization of children with tuberculosis in Children's Hospital at the Ibn Rochd University Hospital Center in Casablanca, concerning the evolution of the number of hospitalizations for tuberculosis between 2018 and 2022, we found a difference of 53% between the period before and during Containment and 28% between the period during and after containment (Figure 1), This result is consistent with the results of some studies carried out, such as in Mexico [30], where they also indicate that COVID-19 has had a negative impact on tuberculosis and note a sharp decline in case notifications for all forms of tuberculosis during the period. During the COVID-19 outbreak compared to the previous year, a percentage difference of 31% between before and during Covid-19 was noted [30], in comparison with other large-scale studies. internationally, countries have had a decrease in the percentages of tuberculosis cases during the Covid19 period, Italy presented a percentage 24%[31], Sierra Leone 43%[32], India 17%[33], Addis Ababa 29% [34] (Table 2), in comparison with other respiratory diseases, a study in China indicated that the number of children infected with pertussis, measles, scarlet fever, mumps and influenza decreased significantly during the COVID-19 epidemic from 2020 to 2022 compared to data from 2016 to 2019 [28], this can be explained by the families who generally do not have the right to go out and especially do not go to the hospital, due to social distancing and national containment measures, which could interrupt the therapeutic accompaniment of the patients [7].

The decrease in tuberculosis cases has been reported in several studies worldwide, globally, from 502 healthcare facilities in Asia and Africa, hospitalizations for tuberculosis decreased by 59% in 2020 versus 2019. The World Health Organization showed that 4.1 million people received no healthcare for the disease, a 21% decrease in 2019 [8].

The impact of the combination of TB and Covid-19 on health services and research has been clearly demonstrated in various studies, with a recent study by the global tuberculosis network indicating that the rate of diagnosis of active and latent tuberculosis fell during the COVID-19 pandemic in many countries, which can cause serious consequences for the incidence and mortality of tuberculosis in the future [9]. In terms of priorities for the clinical management of tuberculosis patients, the COVID-19 pandemic has placed different burdens on intensive care units in affected countries, and managers involved in the clinical management of tuberculosis (pulmonologists and infectious disease specialists) appear to play a central role in the frontline response to the COVID-19 pandemic [10,11,12]. Thus, after antituberculosis treatment, sequelae of tuberculosis may appear in some patients, inducing a variety of health problems, patients may not be able to resume their normal daily life and a proportion of patients may benefit from assessment and rehabilitation to improve their quality of life [13,14,15].

Given that tuberculosis is a major public health problem and COVID-19 is a health emergency with a growing number of cases, the control of COVID-19 relies on the same strategies that enable us to develop the better management of these two infectious diseases. Early detection of infectious cases, prevention of infections, contact tracing [16] and the use of virtual tools for management at domicile of cases, these tools can help increase compliance TB treatment and should be integrated into TB control programs [17].

Although much has been written about the subject of tuberculosis and COVID-19, the amount of evidence in the literature is still modest and important research questions can be deduced [18]. These questions are related to the following main areas of interest: epidemiology, preventive measures, rapid diagnostics, resource mobilization, focus on healthcare systems and data availability [19,20,21].

The risk of tuberculosis infection is high in children, with a risk of rapid progression to progressive and severe TB. Among the forms of extrapulmonary tuberculosis collected, pleural tuberculosis ranked first in our study in comparison with international studies. The prevalence of extrapulmonary tuberculosis was 1.2% in hospitals, and extrapulmonary forms accounted for 12.71% of tuberculosis cases in Madagascar [25], in another study, 32% of tuberculosis cases found in children under 15 years of age were extrapulmonary [26] with extrapulmonary localizations represented mainly by lymph node involvement (18.03%) and pleural involvement (16.54%), in Cameroon, extrapulmonary tuberculosis (62.1%) was mainly found in children aged 0 to 5 years [27], this predominance of extrapulmonary tuberculosis could be explained by the immature immune capacities of children [28].

Table 2. Comparative table of number and percentages of hospital admissions for tuberculosis patients in Morocco and other countries before and during Covid-19

Countries and services	Before Covid-19 n (%)	During Covid-19 n(%)	After Covid-19 n (%)
Morocco(Children's Hospital at the Ibn Rochd University Hospital Center in Casablanca)	98 (35%)	23 (8%)	162 (57%)
Sierra Leone (Connaught Hospital, University of Sierra Leone Teaching Hospitals Complex) [30].	114 (57%)	86 (43%)	-
Italy (Pediatric Infectious Diseases Unit) [31].	91 (76%)	29 (24%)	-
Mexico (General Hospital infectious disease)[32].	165 (59%)	114 (41%)	-
India (Dept. of Pulmonary Medicine, WHO Collaborating Centre for Research & Capacity Building in Chronic Respiratory Diseases)[33].	724 (83%)	153 (17%)	-
Addis-Ababa (Mycobacterium Diseases Research, Armauer Hansen Research Institute, Addis Ababa, Ethiopia)[34].	386 (71%)	161 (29%)	-

n: number, (%): percentages

Data suggests a decrease in TB case percentages in most countries and cities during the COVID-19 pandemic. This

could be due to several factors:

- Increased awareness of hygiene and social distancing: During the COVID-19 pandemic, there has been increased awareness of the importance of personal hygiene and social distancing to reduce the spread of infectious diseases, these practices may also have helped reduce the transmission of tuberculosis, which is also an infectious disease. [30] [35][36].

- Limited access to health services: During the COVID-19 pandemic, many health systems have been overburdened and resources have been redirected to respond to the health crisis. This may have led to a decrease in TB testing and diagnosis, which could explain the decline in reported case percentages. [31] [37][38].

- Impact of containment measures: Quarantine measures put in place to combat the spread of COVID-19 may have reduced social interactions and population mobility, which may also have contributed to a decrease in transmission of tuberculosis.[39][40].

Study limitations

To extend the epidemiological study to the pediatric population, it should be noted that access to patient files in our department and other departments of the hospital represented a challenge.

CONCLUSION

In this study, we noted a negative impact of the Covid-19 pandemic on pediatric tuberculosis at the Casablanca Children's Hospital. The causes of the very significant drop in the number of patients hospitalized during the quarantine period seem to be more a delay in consultation than a reduction in tuberculosis transmission.

In fact, the increase in the number of hospitalizations post-Covid-19 is due to the increase in tuberculosis transmission, as well as to the slowdown in the national tuberculosis control program.

We believe that during the Covid-19 pandemic, control programs need to be stepped up to avoid this phenomenon of increasing numbers of tuberculosis patients in the post-Covid-19 period.

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