GSC Biological and Pharmaceutical Sciences
eISSN: 2581-3250 CODEN (USA): GBPSC2
Cross Ref DOI: 10.30574/gscbps
Journal homepage: https://gsconlinepress.com/journals/gscbps/

(RESEARCH ARTICLE)

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Evaluation of C - reactive protein among the pediatric population at the biochemistry UPFR of the hospital CHU RA from 2018 to 2020

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GSC Biological and Pharmaceutical Sciences, 2022, 19(02), 175–179

Publication history: Received on 04 April 2022; revised on 12 May 2022; accepted on 14 May 2022

Article DOI: https://doi.org/10.30574/gscbps.2022.19.2.0176

Abstract

Introduction: C - reactive protein or CRP is an acute-phase protein of inflammation. CRP is of interest in the diagnosis and management of patients, particularly in paediatrics and in an infectious context. Our study aims at evaluating CRP in children under 15 years of age at the Biochemistry UPFR of the hospital CHU JRA.

Methods: This is a retrospective and descriptive study conducted at the Biochemistry UPFR of the hospital CHU JRA during 3 years. All analysis request forms containing a request for CRP dosage and belonging to patients under 15 years of age were included. All incompletely filled out forms and/or with missing or inaccurate clinical information were excluded from this study.

Results: A total of 476 cases were selected. A pathological CRP was found in 70.6% of cases. The sex ratio was 1.57. The average age was 6.67 years. Pathological CRP was found in 70.6% of cases, 25.0% of which were between 10 and 40 mg/L, 24.6% between 40 and 100 mg/L and 21.2% ≥ 100 mg/L. Infectious syndrome (26.3%), mainly fever, was the most common clinical finding. After the paediatric department (24.6%), CRP was prescribed by the emergency department (21.6%), oncology (12.6%), paediatric surgery (10.5%) and thoracic surgery (8.8%).

Conclusion: CRP dosage is a key test for suspected infectious diseases in order to make a therapeutic decision and also to determine the prognosis of the underlying disease.

Keywords: CHU JRA; CRP; Infectious Syndrome; Paediatrics

1. Introduction

C - reactive protein or CRP is a protein of the acute phase of inflammation. It is synthesised by the liver. The main inducer of the CRP gene is Interleukin 6 (IL-6) [1]. IL-6 is produced by phagocytes, dendritic cells, fibroblasts and endothelial cells, mast cells and activated recruited cells at the inflammatory location. The secretion of IL-6 will promote the care and amplification of the inflammatory response. After stimulation by proinflammatory cytokines, CRP is detected in the blood as early as the 6th hour. Its half-life in humans is short, approximately 12 hours [2, 3]. Its secretion has no

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nycthemeral variations. For the quantitative method, the techniques mainly used in medical laboratories are the immunonephelometry and immunoturbidimetry techniques [4]. The latex particle agglutination technique offers only semi-quantitative CRP assays.

This study aims at evaluating the prescription of CRP at the Biochemistry UPFR of the hospital CHU JRA and describing the interests of CRP dosage among the pediatric population.

2. Methodology

Our study was conducted at the Biochemistry Training and Research Paraclinical Unit of the hospital *Centre Hospitalier Universitaire Joseph RavoahangyAndrianavalona* Antananarivo Madagascar. This is a retrospective and descriptive study lasting 3 years. All analysis request forms containing a request for CRP dosage and belonging to patients under 15 years of age were included. The variables studied were age, gender, CRP value, requesting department, clinical information. The blood sample was delivered to the Biochemistry Department in a green tube with heparinised lithium heparinate, transported at room temperature as quickly as possible to the laboratory and centrifuged at 3500 rpm for 15 minutes to obtain plasma. The measurements were carried out on a BS-300® MINDRAY machine; the measuring principle was based on absorbance photometry, turbidimetry. The reagent kit used for the CRP determination was the MINDRAY - C - Reactive protein Kit (Turbidimetry Method). In this work, any CRP value exceeding 10 mg/L was considered as pathological CRP. Word and Excel 2007 were used for the descriptive analysis of the data.

3. Results

During the study period, we retained 476 cases. The sex ratio was 1.57. The average age was 6.67 years with extremes from 1 day to 14 years. Requests among children under 3 years of age were the most common (Table 1). Pathological CRP was found in 70.6% of cases. Twenty-five percent of the results were between 10 and 40 mg/l (Table 2).

Table 1 Distribution of requests by age

Age range (years)	Number	Proportion (%)
[0-3]	161	33.82
[4-6]	87	18.28
[7-9]	87	18.28
[10-12]	66	13.86
[13-14]	75	15.76

Table 2 Distribution of requests according to CRP values

CRP values	Proportion (%)
<10mg/l	29.4%
10 – 40 mg/l	25.0%
40-100 mg/l	24.4%
≥ 100 mg/l	21.2 %

The departments that prescribed CRP were represented in figure 1, with the paediatric department (24.60%), the emergency department (21.60%) and oncology (12.60%) in the lead position (cf. figure 1).

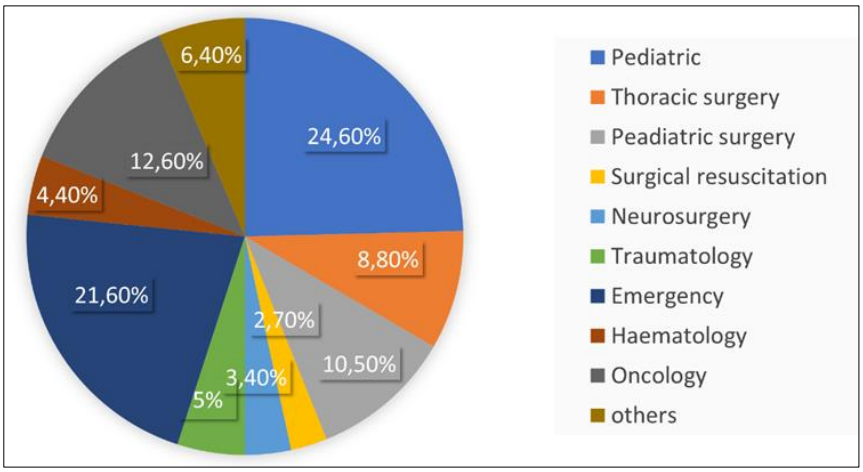

Figure 1 Distribution of CRP requests by requesting department

One hundred and twenty-five (26%) requests were prescribed in the context of an infectious syndrome, 73 of which had an associated fever (see Table 3).

Table 3 Variation of the pathological CRP value in relation to the main clinical information:

CRP values (mg/l)	infectious syndrome	fever	inflammatory syndrome with infectious syndrome	postoperative work-up	Pulmonary problem	Digestive disorder
<10	42	16	16	13	9	8
10-40	36	23	21	6	14	11
40-100	31	24	14	16	10	7
≥ 100	16	10	13	18	9	11
Total	125 (26.2%)		64 (13.4%)	53 (11.1%)	42(8.8%)	37 (7.8%)

4. Discussion

The CRP dosage is frequently requested by prescribers and is even part of the standard check-up for some. Its determination is simple and precise, which explains its availability without requiring a sophisticated technical platform. Thus we want, through this study, to evaluate the C - reactive protein among the paediatric population. CRP is ideal for diagnosis and for better monitoring of the evolution of an underlying pathology because its level rises very quickly and also returns quickly to normal thanks to its short half-life. It is a marker of the acute phase of inflammation. The rise in CRP is observed 4-6 hours after inflammation and peaks after 36-50 hours [5]. On average, it is frankly pathological 24 hours after the onset of inflammation and rapidly normalises after its disappearance (7-14 days). The increase in CRP can be up to 1000 times its basal level [6]. It is elevated regardless of the etiology of the inflammation. Its level is not influenced by other parameters such as certain inflammatory markers.

The average age in our study was 6.6 years. Requests among children under 3 years of age were the most frequent.

CRP is a key test in the management of infection in children, particularly in neonatology. Indeed, CRP dosage may be requested in emergency in paediatric wards as it allows diagnostic orientation and management. According to a 1997 European study on biomarkers of sepsis in neonates in an intensive care unit, CRP is the most requested test by prescribers for the detection of bacterial infection [7]. Furthermore, because CRP does not cross the placenta, it can be used to differentiate between maternal and infant inflammation in neonatal care [2].

A previous study carried out in Madagascar highlights the interest of CRP measurement in febrile diseases of children and particularly as a diagnostic orientation test to identify infections given the socio-economic context that prevails in the country [8].

CRP values between 10 and 40 mg/l were the most frequently encountered in our study regardless of the clinical information except for the postoperative workup where CRP values greater than or equal to 100 mg/l predominated. In children with fevers without an obvious focus of infection, meta-analysis studies show a sensitivity of 77% and a specificity of 79% of CRP to identify severe bacterial infection. An elevated CRP value thus suggests the presence of a severe bacterial infection, but the clinical decision must be made on a case-by-case basis. In this case, it is advisable to combine the CRP measurement with a blood count, blood culture and urine cytobacteriological examination [5]. In febrile children with identified foci of infection, studies have attempted to identify the role of CRP in distinguishing between viral and bacterial etiology. A meta-analysis of eight studies including 1230 children with pneumonia was performed [9]. They found that children with obvious clinical and radiological signs of pneumonia and CRP values exceeding 40-60 mg/L had a 64% probability of having bacterial pneumonia. According to the literature, an elevated plasma CRP level can differentiate between gram-negative and viral meningitis with a high sensitivity of 96%, specificity of 93% and a negative predictive value of 99% [10]. Threshold values ranging from 12 to 95 mg/L have been used for infantile gastroenteritis. And an elevated plasma CRP level is strongly suggestive of a bacterial origin and CRP is suggested in immunocompromised children with diarrhea [11]. In an effort to ensure the appropriate use of antibiotics, a study of general practitioners in Eastern Europe focused on the contribution of CRP dosage to antibiotic prescription during acute cough and respiratory tract infection [12]. This study showed that the rate of antibiotic prescription and chest radiography was reduced by introducing CRP dosage into the practice of these general practitioners. Indeed, a CRP concentration below 20 mg/L reduces the prescription of antibiotics, but some general practitioners have prescribed antibiotics even if these values are below 20 mg/L when they have deemed it necessary after a well conducted physical examination. A CRP > 100 mg/L may indicate a severe bacterial infection and therefore a prescription of antibiotics is recommended, a CRP concentration between 20 and 25 mg/L corresponds to a grey area requiring special attention. A concentration < 20 mg/L can exclude a severe bacterial infection provided the patient is not a neonate and therefore does not require an antibiotic prescription for 6-12 hours and should be checked after 6-12 hours. A CRP < 10 mg/L is suggestive of a viral infection but to be confronted according to the health clinics. An English study carried out in 2014 focused on the prediction of a preoperative CRP level and the severity and probability of complications after laparoscopic appendectomy. According to the results of this study, when the preoperative CRP plasma concentration is higher than 150 mg/L, laparoscopy individualises an inflammation making the operation more complex and requiring more complex techniques. This eventuality also predisposes to a high complication rate [13]. It should be noted that following surgery, the longer the operation, the higher the CRP. This is followed by a rapid normalisation. If the CRP persists or increases postoperatively, a complication may be expected [12].

5. Conclusion

CRP is a key test in suspected infectious diseases for therapeutic decision making and also for prognosis of the underlying disease.

Compliance with ethical standards

Acknowledgments

We would like to thank all the staff of the laboratory of University Hospital of Ravoahangy Andrianavalona Similarly, we would like to express our gratitude to the director of establishment for authorizing us to carry out this study.

Disclosure of conflict of interest

The Author declare no conflict of interest.

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